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T.E. (Petroleum) (Semester – I) Examination, 2011
DRILLING & PRODUCTION OPERATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Question Nos.* ***1*** *and* ***5*** *are* ***compulsory****. Out of the* ***remaining*** *attempt* ***2*** *questions from Section* ***I*** *and* ***2*** *questions from Section* ***II****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) ***Use*** *of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is* ***allowed****.*
6) Assume ***suitable*** *data, if* ***necessary****.*

SECTION – I

1. What are different systems on a drilling rig ? Explain any one in detail with suitable diagramme. **18**

2. a) Calculate Bottom hole pressure if well depth is 2500 m and mud weight is 1.2 gm/cc. **2**

   b) Calculate mud weight if mud gradient is 0.87 psi/ft. **2**

   c) Calculate volume bbl/meter for drill pipe O.D. = 5″ inch and I.D. = 4.276 inch. **2**

   d) Draw circulation system on a drilling rig. **10**

3. a) Discuss IADC classification of a bit in details. **8**

   b) Discuss different factors affecting rate of penetration in details. **8**

4. Write short note on : **16**

   i) Coring

   ii) Fishing tools

   iii) BOP

   iv) Directional well

P.T.O.

SECTION – II

5. a) Discuss different types of casings and function of the casings in brief. **8**

   b) Discuss different types of well completion techniques. **10**

6. a) Discuss primary cementation process with suitable sketch. **10**

   b) Discuss different perforation methods in brief. **6**

7. a) What are different types of packer ? Discuss any one in brief. **8**

   b) Draw well head assembly for A, B and C section. **8**

8. Write short note on : **16**

   i) Drill stem test

   ii) SSSV

   iii) X – Mas tree

   iv) Squeeze cementation.

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T.E. (Petroleum) (Semester – II) Examination, 2011
PETROLEUM PRODUCTION ENGINEERING – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6** from Section – **I** and Q. No. **7** or **8**, Q. No. **9** or **10**. Q. No. **11** or **12** from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, calculator is **allowed**.*
*6) Assume suitable data if **necessary**.*

SECTION – I

1 a) Define and explain the following properties with the help of graph : **12**
i) Gas compressibility factor
ii) Specific gravity of oil
iii) Bubble-point pressure
iv) Oil formation volume factor.

b) Discuss the concept of drainage area for horizontal well and vertical well. **6**

OR

2. a) State and explain Vogel's equation, Standings correlation and Fetkovich equation to draw IPR for a reservoir. **9**

b) Draw the generic trend of Pressure, GOR and P.I. against time for reservoirs having depletion drive, gas cap drive and water drive mechanism in them. **9**

3. a) Write a note on 'Heading cycle'. **4**

b) Explain the meaning of choke performance using graph. **4**

c) Discuss in brief the Gilbert's method/procedure to select optimum tubing size for the given reservoir data and production conditions. Draw the typical graph of vertical lift performance. **8**

OR

4. a) Discuss Poettmann and Carpenters method to calculate frictional pressure losses. **8**

   b) What is the difference between surface GOR and GLR ? Explain the concept of optimum GLR. **8**

5. a) What is matrix acidizing ? Describe the necessary elements and the general design considerations to accomplish a sandstone acidization job. **10**

   b) Define fracture gradient, fracture conductivity and fracture geometry. **6**

OR

6. a) Calculate the maximum acid injection rate using, safety margin of 230 psi and maximum expected surface injection pressure at above rate for following job. **10**

   Data given :

   35 ft thick, 40 md sandstone pay zone at a depth of 9,000 ft is to be acidized with 1.07 Sp. Gravity acid solution and viscosity of 1.2 Cp using 2 inch ID coiled tubing. Fracture gradient is 0.7 psi/ft. Wellbore radius is 0.328 ft.

   Assume : reservoir pressure = 4100 psia,

   drainage area radius = 1600 ft and S = 9.

   b) Explain hydraulic fracturing process in brief. **6**

SECTION – II

7. Write short notes on the following : **18**

   a) liquid loading of gas well

   b) water and gas shut off job

   c) sand control

   d) applications of horizontal well technology.

OR

8. a) Explain any two workover problems and their solution in detail. **12**

   b) Write the various general reasons for decrease in well productivity. **6**

9. a) Design a two phase horizontal separator using the following data : **12**

Gas flow rate (Qg) = 10 MMscf/day

Oil flow rate (Qo) = 2100 bbls/day for 42° API

Operating Pressure = 960 psia

Operating Temperature = 60° F

Specific Gravity of Gas = 0.6

Gas Compressibility = Z = 0.83

From graph, value of k = 0.284 (Constant based on liquid gas properties)

Liquid drop to be separated = dm = 100 micron

Assume slenderness ratio of 3 and 4. Retention time 2, 2.5 and 3 minutes.

b) Discuss the mechanism of water separation used in three phase oil and gas separator. **4**

OR

10. a) Draw the neat schematic sketch and explain the principle of operation and working of two phase vertical separator in detail. **12**

b) Write the functions of mist extractor in brief. **4**

11. a) Write the various possible safety issues during the separation and processing of oil and gas and the solution in brief for each. **8**

b) Draw neat schematic sketch and explain the working of skimmer tank. **8**

OR

12. Explain the following (**any four**) : **16**

i) Group Gathering Station

ii) Environmental problems at production establishments

iii) Produced emulsion treating methods

iv) Skimmer sizing equations

v) Theory of emulsion.

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T.E. (Petrochemical) (Semester – II) Examination, 2011
TRANSPORT PHENOMENA
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **any 3** question from **each** Section.*
*2) Figures to the **right** indicate **full** marks.*
*3) **Use** of electronic calculators is **allowed**.*
*4) Draw **neat** sketch **wherever** necessary.*

SECTION – I

1. a) Differentiate between any three : Laminar – Turbulent flow, Compressible-Incompressible flow, Viscid-Inviscid flow, Uniform-Nonuniform flow, Steady-Unsteady flow. **6**

   b) State Various Non-Newtonian fluid models. **6**

   c) Explain different time derivatives encountered in transport phenomena giving examples. **6**

2. a) Derive Hagen-Poisuelle equation with Shell balance approach, clearly stating the assumptions involved. **10**

   b) State Navier-Stokes equation in Tensor notations clearly explaining the role of each constituent term. **6**

3. a) Explain different flow regimes within turbulent Boundary. **5**

   b) Explain Ludwig Prandtl's contribution to Studies in characterization of turbulent flow. **5**

   c) Write short note on Turbulent scales. **6**

P.T.O.

4. a) Explain various mixing problems in process industry. **6**

   b) A flat – blade turbine agitator with disk having flat six blades is installed in a tank. The tank diameter is 1.83 m, the turbine diameter is 0.61 m, the width is 0.122 m and the depth of the liquid in the tank is equal to its diameter. The tank contains four baffles, each having a width of 0.15 m. the turbine is operated at 90 rpm and the liquid has a viscosity of 10 cp and a, density of 929 kg/m^3.

   Calculate :

   1) The power required kW of the mixer.

   2) The power required per unit volume if the vessel is scaled up to three times the original volume keeping the mass transfer rates identical. **10**

SECTION – II

5. a) A tank containing 22,679.5 kg material with a specific heat of $2.1\ kJ/kg \cdot K$ is to be heated from 293 K to 398 K. The tank contains a heating coil with a neat transfer surface of 9.29 m^2, and the overall heat transfer coefficient from the coil to the tank contents of 850 $W/m^2 \cdot K$. Derive the expression and solve for the time required to heat the tank contents with steam condensing at 433 K. **10**

   b) Derive the expression for cooling a batch with an external heat exchanger and an isothermal cooling medium. **6**

6. a) Explain the classification of Partial differential equations with examples in transport phenomena. Discretize any one form applying finite difference method. **8**

   b) What is computation fluid dynamics ? Explain in detail various steps involved in solution of a problem with CFD. **8**

7. a) Define the following with respect to Multiphase flows :

   1) Volume Fractions and densities

   2) Superficial velocity

   3) Quality, Concentrations and Loading

   4) Response times. **10**

   b) Explain various flow regimes in a vertical gas-liquid flow through circular pipe. Define Hold up ratio and Slip velocity. **6**

8. Write a short note on **any three** of the following : **18**

   a) Heat, mass and momentum transfer analogies

   b) Blasius equation

   c) Phase coupling

   d) Dimensionless numbers and process design

   e) Mechanisms of mixing.

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T.E. Polymer (Semester – I) Examination, 2011
MATHEMATICAL METHODS IN POLYMER ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *1) In Section **I** : Attempt Que. **1** or Que. **2**, Que. **3** or Que. **4**, Que. **5** or Que. **6**.*
*In Section **II** : Attempt Que. 7 or Que. **8**, Que. **9** or Que. **10**, Que. **11** or Que. **12**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Electronic Pocket Calculator is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Use Regula-Falsi method to find real root of the equation $e^x - 4x = 0$ correct to three decimal places. **8**
Write algorithm for above method.

   b) Solve the system of equations, by using Gauss-elimination method **8**

$2x_1 - x_2 + 2x_3 = 3$
$x_1 + 3x_2 + 3x_3 = -1$
$x_1 + 2x_2 + 5x_3 = 1.$

OR

2. a) Find the real root of the equation $x^3 + 2x - 5 = 0$ by applying Newton-Raphson method at the end of fifth iteration. **8**
Write the algorithm for the above method.

   b) Solve the following system of equations by the Gauss-seidel method. **8**

$10x_1 + x_2 + x_3 = 12$
$2x_1 + 10x_2 + x_3 = 13$
$2x_1 + 2x_2 + 10x_3 = 14$

P.T.O.

3. a) With usual notations, establish the following : **9**

i) $E = \left(\frac{\delta}{2} + \sqrt{1 + \frac{\delta^2}{4}} \right)^2$

ii) $\Delta = \mu\delta + \frac{1}{2}\delta^2$

iii) $\frac{1}{\nabla} Y_n - \frac{1}{\Delta} Y_0 = Y_0 + Y_1 + Y_2 + ... + Y_n$

b) For the tabulated data : **8**

x	0	1	2	3	4	5
y	1.12	3.45	6.67	10.8	16.12	24.52

Find y at x = 0.5, $\frac{dy}{dx}$ at x = 5.5.

OR

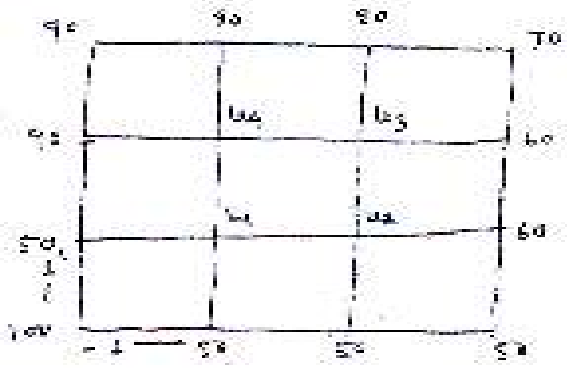
4. a) Using method of least squares, fit the parabola of the form $y = ax^2 + bx + c$ to the following data : **9**

x	0	1	2	3	4	5	6
y	–4	1	10	23	40	61	86

b) Calculate the value of π by evaluating a suitable definite integral, using Simpson's $\frac{1}{3}$rd rule. State the bound of truncation error. **8**

5. a) Solve the equation $\frac{dy}{dx} = \sqrt{x + y}$ with x = 0, y = 1 to calculate y at x = 0.2 taking h = 0.1, using Runge-Kutta method of fourth order. **9**

b) Evaluate the function u(x, y), satisfying the Laplace equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ at pivotal points of the figure. Take h = k = 1



8

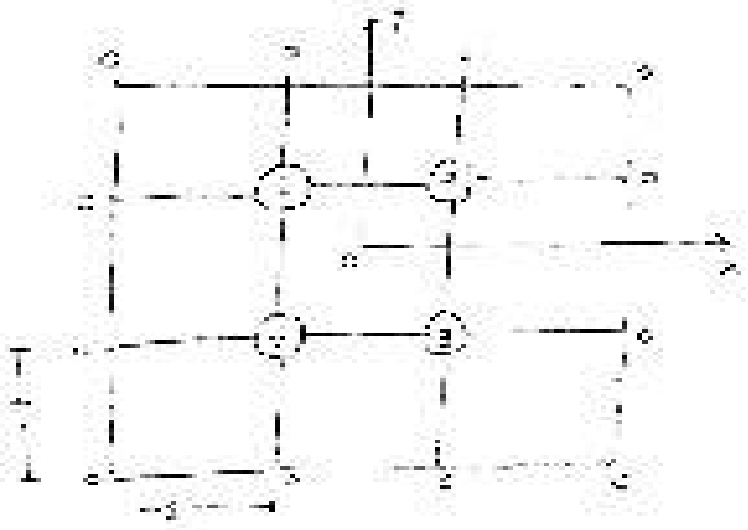
OR

6. a) Use modified Euler's method to solve the equation $\frac{dy}{dx}=1+xy$ with x = 0, y = 1, calculate y at x = 0.1 and x = 0.2. **8**

b) Solve the equation

$$\frac{\partial^2 f}{\partial x^2}+2\frac{\partial^2 f}{\partial y^2}=\frac{1}{xy}$$

corresponding to the grid shown in the figure



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SECTION – II

7. a) Fluctuations in the Aggregate of marks obtained by two groups of students are given below. Find out which of the two shows greater variability. **8**

Group A	518	519	530	530	544	542	518	550	527	527	531	550	550	529	528
Group B	825	830	830	819	814	814	844	842	842	826	832	835	835	840	840

b) Calculate the first four moments about the mean of the given distribution. Also find β_1 and β_2. **8**

x	2.0	2.5	3.0	3.5	4.0	4.5	5.0
f	4	36	60	90	70	40	10

OR

8. a) Suppose we print all five digit numbers on slips of paper with one number on each slip. Find how many minimum distinct slips one has to make up for all the five digit numbers. **5**

b) A can hit the target 1 out of 3 times. B can hit the target 2 out of 4 times. C can hit the target 3 out of 5 times. If they fire simultaneously, find the probability of atleast two score a hit. **5**

c) Following are the values of import of raw material and export of finished product in suitable units. **6**

Export	10	11	14	14	20	22	16	12	15	13
Import	12	14	15	16	21	26	21	15	16	14

Calculate the coefficient of correlation between the import values and export values.

9. a) An unbiased coin is thrown 10 times. Find the probability of getting exactly 6 heads, at least 6 heads. **5**

b) A manufacturer of cotter pins knows that 2% of his product is defective. If he sells cotterpins in boxes of 100 pins and guarantees that not more than 5 pins will be defective in a box, find the approximate probability that a box will fail to meet the guaranteed quality. **6**

c) Assuming that the diameters of 1000 brass plugs taken consequitirely from a machine form a normal distribution with mean 0.7515 cm and standard deviation 0.0020 cm. How many of the plugs are likely to be approved if the acceptable diameter is 0.752 ± 0.004 cm ? **6**

[z = 2.25, A = 0.4878, z = 1.75, A = 0.4599]

OR

10. a) Among 64 offsprings of a certain cross between guinea pigs 34 were red, 10 were black and 20 were white. According to a genetic model, these numbers should be in the ratio 9 : 3 : 4.

Is this data consistent with the model at 5% level ? **6**
$[\psi^2_{2:0.05} = 5.991]$

b) The mean and variance of Binomial distribution are 6 and 2 respectively. Find p ($r \geq 3$). **5**

c) Find the unique fixed probability vector $\bar{t}$ of the regular stochastic matrix **6**

$$P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$$

11. a) If A_r^{pq} and B_r^{pq} are tensors, prove that their sum and difference are tensors. **6**

b) Show that $\frac{\partial A_p}{\partial x^q}$ is not a tensor even though A_p is a covariant tensor of rank one. **5**

c) A covariant tensor has components x^2y, y in two dimentional rectangular system. Find its covariant components in Polar system. **6**

OR

12. a) Determine the metric tensor in **5**
   i) Cylindrical coordinates
   ii) Spherical coordinates.

b) Prove that $[pq, r] = g_{rs} \begin{Bmatrix} s \\ pq \end{Bmatrix}$ **6**

c) A covariant tensor has components xy, y^2z, zx – y in three dimensional rectangular system. Find its covariant components in cylindrical coordinates. **6**

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T.E. (Polymer) (Semester – I) Examination, 2011
POLYMER MATERIALS – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Black** figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) What is the difference between commodity, engineering and high performance polymers ? Give two example of each type. **5**

   b) Why does polystyrene require modification ? State its modified forms. Give two applications of each form. **6**

   c) How is k-value calculated w.r.t PVC ? What is its significance ? What is the range of k-values for commercial PVC ? **5**

   d) Write the repeat units of the following polymer : **2**
   i) PVC
   ii) PMMA
   iii) Polystyrene
   iv) Polypropylene.

OR

2. a) With the help of a neat sketch explain the continuous process for manufacturing or PMMA sheets. **5**

   b) Explain giving composition the difference between plastisols, rigisols and organosols w.r.t. PVC. **6**

   c) Give 2 outstanding properties of the following :
   i) PP ii) PMMA. **4**

   d) Class transition temperature of PE is – 120° C, yet it does not exhibit rubbery characteristics. Why ? **3**

P.T.O.

3. a) Write the structure of cellulose acetate. List its important properties and applications. **5**
   b) Why does polyvinylacetate exhibit cold flow ? **3**
   c) How is polyvinylalcohol prepared ? Why ? **4**
   d) Why does cellulose need to be converted to cellulose acetate ? How it is done ? **4**

OR

4. a) Discuss the different grades of polyvinylalcohol. **5**
   b) Explain as to why polyvinylacetate does not crystallize, but polyvinylalcohol crystallizes. **4**
   c) Give 2 important properties and 2 applications of each of the following : **7**
      i) Polyvinylalcohol
      ii) Cellulose nitrate and
      iii) Polyvinylacetate.

5. Explain the following additives w.r.t. need of addition, level of addition, mechanism of functioning and 2 examples of each : **16**
   i) Lubricants
   ii) Fillers
   iii) Heat stabilisers.

OR

6. Explain the following additives w.r.t. need of addition, level of addition, mechanism of functioning and 2 examples of each : **16**
   i) Antioxidants
   ii) Impact modifiers
   iii) Blowing agents with kickers.

SECTION – II

7. a) Arrange the following Nylons with increasing water absorption : **5**
   Nylon 6, 6, Nylon 6, Nylon 6, 10. Explain.
   b) Compare properties of polyacetals with that of Nylons. **5**
   c) What are the precautions to be taken in processing polyacetals ? **4**
   d) Discuss processing characteristics of polycarbonate. **4**

OR

8. a) Give the additives used with polycarbonates. Give 2 applications of polycarbonates. **6**

   b) Write the repeat unit of each of the following :

      i) Polyacetal

      ii) Polycarbonate

      iii) Nylon 6

      iv) Nylon 6, 6. **4**

   c) Equipments used for polycarbonate should be purged with polyethylene after processing. Why ? **4**

   d) Name any four transparent polymers. **4**

9. a) Give 2 properties and 2 applications of polyetherimide . Give its structure. **5**

   b) Discuss the processing of PTFE. **5**

   c) Explain the process for manufacture of PET bottles. **4**

   d) Write the repeat unit of the following :

      i) PET

      ii) PTFE. **2**

OR

10. a) Give 2 properties and 2 applications of each of the following : **6**

      i) PET

      ii) PBT

      iii) PTFE.

   b) Why P.B.T. is preferred over PET as an engineering polymer ? **4**

   c) PTFE is chemically inert. Why ? **3**

   d) PTFE is used in non-stick cookware. Why ? **3**

11. a) Explain the details about processing of PEEK. **4**

    b) Compare PPS and PPO. **5**

    c) Give the structure of :

    i) PPO

    ii) PEEK

    iii) PPS. **3**

    d) Give the outstanding properties of polysulphones and draw its repeat unit. **4**

OR

12. a) Why is PPO mainly sold as a blend under the trade name “Noryl” ? Give 2 applications of PPO. **5**

    b) What are polysulphones ? What are the points to be borne in mind while processing polysulphones ? **5**

    c) State 2 applications each of :

    i) PEEK

    ii) PPS

    iii) Polyethersulfone. **6**

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T.E. (Polymer) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING OPERATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Draw **neat** diagrams **wherever** necessary.*
*3) Numbers to the **right** indicate **full** marks.*
*4) Assume **suitable** data if **necessary**.*
*5) **Use** of Logarithmic Table, Electronic Pocket Calculators is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Write short note on 'importance of mass transfer operations in chemical engineering field'. **8**
   b) Discuss Eddy diffusion. **8**

OR

2. a) Derive the expression for steady state diffusion of gas A through non-diffusing gas B. **8**
   b) Write classification of mass transfer operations. **8**
3. a) Write short note on ideal solutions. **8**
   b) Discuss the term equilibrium with example. **8**

OR

4. Differentiate between tray tower and packed tower. Draw fig. of both. **16**
5. a) List out the different dryers and discuss any 2 of them in detail. **10**
   b) Write short note on 'psychrometric-chart'. **8**

OR

6. a) Discuss about the diffusion of mass through porous solid. **10**
   b) Differentiate between humidification and dehumidification. **8**

P.T.O.

SECTION – II

7. Write short note on ‘rate of mixing’ and ‘mixing effectiveness’. **18**

OR

8. a) Discuss the importance of mixing index. **8**

   b) Describe various aspects of ‘Polymer mixing technologies’. **10**

9. a) With neat sketch discuss ‘Two Roll Mill’. **10**

   b) Discuss the mixing action of tubler blender. **6**

OR

10. Write short note on

    a) Planetary mixer

    b) Mixers for cohesive solids. **16**

11. Discuss in detail the compounding line for calendaring of PVC sheet. **16**

OR

12. a) Write short note on compounding of polymers. **8**

    b) Discuss the rubber compounding in detail. **8**

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
POLYMER CHEMISTRY – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) **All** questions are **compulsory**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain in detail various factors of polymer degradation. **9**

   b) Explain how free energy equation suits polymer dissolution process. **9**

OR

2. a) Explain why LMW polymers dissolve first in solvent as compared to HMW. **9**

   b) Discuss how hydrodynamic volume affects the polymer viscosity. **9**

3. a) Give in detail the monometallic mechanism for polymerization by Z-N catalyst. **8**

   b) Explain ditacticity in polymers. **8**

OR

4. a) Discuss the mechanism of coordination polymerization with suitable example. **8**

   b) Write a note on forces of stereo regulation in alkene polymerization. **8**

5. a) Derive copolymerization equation in terms of mole fraction. Explain its significance. **8**

   b) Write a note on Alfrey-Price equation. **8**

OR

6. a) Explain why copolymerization is important. Discuss how it is different from blending. **8**

   b) Discuss in detail any two commercially successful copolymers and their properties. **8**

P.T.O.

SECTION – II

7. Give the synthesis, reactions and commercial formulations of following resins
   i) Epoxy resins
   ii) Amino resins **18**

OR

8. Give the synthesis, reactions and commercial formulations of following resins
   i) Polyurethane resins
   ii) Phenolic resins. **18**

9. Explain how you will use the following polymer reactions to obtain products for different applications.
   i) Addition
   ii) Substitution **16**

OR

10. Explain in detail with suitable examples the following specific group reactions and site one example where it is used commercially.
   i) Amino
   ii) Hydroxyl **16**

11. a) Derive the kinetic expression for anionic polymerization with termination. **8**

   b) Discuss the kinetic equation for polycondensation. **8**

OR

12. a) Write a note on kinetics of copolymerization. **8**

   b) Explain kinetics of free radical chain polymerization. **8**

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T.E. (Computer) (Semester – II) Examination, 2011
COMPUTER NETWORKS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagram must be drawn **whenever** necessary.*
*4) Black figures to the **right** indicates **full** marks.*

SECTION – I

1. a) Explain the ATM protocol reference model. **8**

   b) What are the network design issues involved in designing a typical network ? **8**

OR

2. a) List two ways in which the OSI reference model and the TCP/IP reference model are the same and list in which they are different. **8**

   b) Draw the layer diagram of TCP/IP protocol suit and explain it briefly. **8**

3. a) Store and forward switches have an advantage over cut through switches with respect to damaged frames. Explain what is it. **8**

   b) Explain the working of PPP. Is it based closely on HDLC which uses bit stuffing to prevent accidental flag bytes within the payload from causing confusion ? Give the reason why PPP uses character stuffing instead. **8**

OR

4. a) Frames of 1000 bits are sent over a 1 Mbps satellite channel. Acknowledgement is always piggybacked onto data frames. The headers are very short. Three bit sequence number is used. What is the maximum channel utilization for **8**

   1) Stop and Wait 2) Go back N

   b) List out and explain any four different network hardware components. **8**

P.T.O.

5. a) What is a Bluetooth technology ? Discuss the different layers that Bluetooth uses. **9**

   b) What is the basic purpose of MAC layer protocol ? Explain function of Ethernet protocol. **9**

OR

6. a) Consider the delay of pure ALOHA versus slotted ALOHA at low load. Which one is less ? Explain your answer. **9**

   b) Explain the principle of limited contention protocol and operation of adaptive tree walk protocol. **9**

SECTION – II

7. a) A computer on 6 Mbps network is regulated by token bucket. The bucket is filled at the rate of 1 Mbps. It is initially filled to capacity with 8 megabits. How long can the computer transmit at the fill 6 Mbps ? **8**

   b) Explain in detail firewall operation. **8**

OR

8. a) What is choke packet ? How congestion is controlled over here ? **8**

   b) What is tunneling ? Can tunneling be used as datagram subnets ? If so how ? **8**

9. a) What is count to infinity problem ? Explain it with suitable example. **8**

   b) What is socket ? Explain the steps followed in socket programming with associated procedure. **8**

OR

10. a) What are the problems that the TCP may face with the emergency of high speed network and how can these be addressed ? **8**

    b) Explain three way handshakes in transport layer. **8**

11. a) Explain in details principal DNS resource record types. **9**

    b) Explain Email architecture and services. **9**

OR

12. a) What is an authoritative name server ? How can name server tell if a client wants a recursive query or not ? **6**

    b) Why do we need POP3 and IMAP4 for electronic mail ? **6**

    c) Explain : **6**

    a) TCP timer

    b) ICMP.

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[3963] – 147

T.E. (Information Technology) (Semester – II) Examination, 2011
MANAGEMENT INFORMATION SYSTEMS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** sheet.*
*2) **Use** of logarithmic tables, slide rules and electronic pocket calculator is **allowed**.*
*3) **Neat** diagram must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) "Management Information System is vital for modern day management". Do you agree with this statement ? Elaborate your view point with the help of suitable examples. **8**

   b) What are different levels of management ? How does manager deal with these levels ? **8**

OR

2. a) What is Management Information System ? State the factors to be considered for designing an effective Management Information System. **8**

   b) Explain planning function of a manager. Justify how MIS is used for Business Planning. **8**

3. a) Differentiate between service and product. Explain how MIS is applicable in Banking Services. **8**

   b) What is personal management ? Explain transaction documents, applications and reports required for personal management. **8**

OR

4. a) The pay section of Nilkamal Associates Company wants to compute the employee salary. Using employee details, attendance and all deductions. Design data entry screen for : **8**

   i) Attendance

   ii) Employee details

   iii) Also draw a report layout for payslip of employees

   b) List the different information systems required for marketing. Explain one of them in details. **8**

5. a) What is the scope of Business Process Outsourcing ? What are the challenges in BPO ? **8**

   b) Explain in detail the ERP Solution Structure. What are the sub modules of ERP ? Explain the basic features of ERP. **10**

OR

6. a) What do you mean by Business process ? What are the factors that cause delay in Business process ? **8**

   b) Explain Information Technology Architectures. Explain with suitable example. **10**

SECTION – II

7. a) What is organization change ? Explain why there is resistance from end users for adoption to change. **10**

   b) Explain any three secure electronic payment processes in e-commerce. **8**

OR

8. a) What is electronic commerce ? Explain various models used in e-commerce. Also explain various resources required for setting e-commerce firm. **10**

   b) Write the challenges and trends in Customer Relationship Management. **8**

9. a) Discuss the stages of Decision-making Process. How does MIS help in these stages ? **8**

   b) Discuss the importance of an Executive Information System, taking into perspective the recent business scenario. **8**

OR

10. a) What is Decision-Making ? Describe the support provided by MIS in decision making. **8**

    b) Describe benefits of Executive Information Systems. Also write how it is different from MIS ? **8**

11. a) What measures can be taken by the organization to prevent computer fraud ? **8**

    b) Describe several instances where the Internet is raising ethical issues. Clearly state the ethical issue or responsibility of business professionals. **8**

OR

12. a) There are a number of social, moral and ethical issues associated with the introduction and use, of IT systems. Explain. **8**

    b) "During computer processing the system might fail to detect erroneous input, input errors, or improperly distribute or disclose output". Discuss the control procedure to detect and prevent these errors and the system review and the test of control procedures employed by the auditor. **8**

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T.E. (Biotechnology) (Semester – II) Examination, 2011
COMPUTATIONAL TECHNIQUES AND PROCESS MODELLING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from Section **I** and **any three** from Section **II**.*

*2) Figures to the **right** indicate **full** marks.*

*3) Make **suitable** assumptions **wherever** necessary.*

SECTION – I

1. a) Solve by Guass Siedal method **10**

$10x + 2y + z = 9$

$2x + 20y - 2z = -44$

$-2x + 3y + 10z = 22.$

b) Find the a characteristic equation and eigen values of the matrix. **6**

$$\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$$

OR

2. a) Explain in detail the properties of Eigen values. **8**

b) Find the eigen values of the inverse of the matrix **8**

$$\begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$$

P.T.O.

3. a) Using method of least squares fit a relation of the form $y = ae^{bx}$ to the following data. **8**

x	0	2	4	6	8
y	150	63	28	12	56

b) Solve the equation $dy/dx = 2x + 3y$ and $y = 1$ at $x = 0$ by using Euler's method in four stages. Find the value of y at $x = 0.5$. **8**

OR

4. a) By using RK fourth order method solve $dy/dx = (y^2 – 2x)/(y^2 + x)$ for $y(0) = 1$, find y at $x = 0.1, 0.2, 0.3, 0.4, 0.5$. **10**

b) Evaluate by using trapezoidal rule using six intervals $\int e^x dx$ from 0 to 0.6. **6**

5. a) Evaluate $\Delta^2(x + \cos x)$ the interval of differencing being 2. **9**

b) Find the polynomial of degree 4 by using Newton's backward difference table for the data. **9**

x	1	2	3	4	5
y	1	–1	1	–1	1

OR

6. a) Given the data, find the fifth and the tenth term of the series. **9**

x	3	4	5	6	7	8	9
y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

b) The area of a circle of diameter d is given for the following values. Calculate the area of a circle of diameter 105. **9**

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

SECTION – II

7. Define Process modeling. How is it useful in biotechnology industries ? **16**

OR

8. Explain in detail the principles of formulation for mathematical models. **16**

9. Derive the modeling equations for a Multicomponent Batch distillation column and prove that the system is critically specified. Give necessary assumptions wherever required. **16**

OR

10. Write the material balance equations for three series of CSTR'S in series for the following set of equations and show that the system is correctly specified. **16**

    i) Parallel reactions

    ii) Reversible reactions.

11. Give short notes on : **18**

    i) Cybernetic models

    ii) Suspended growth reactors.

OR

12. Write the modeling equations for Turbidostats for unlimited growth reactors with neat sketches and necessary assumptions. **18**

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[3963] – 16

T.E. Mechanical (Semester – II) Examination, 2011
TRANSMISSION SYSTEM DESIGN
(2003 Course)

Time : 4 Hours Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** books.*

*2) Neat diagrams must be drawn **wherever** necessary.*

*3) Black figures to the **right** indicate **full** marks.*

4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

*5) Assume suitable data, if **necessary**.*

SECTION – I

Unit – I

1. a) Discuss bearing selection procedure from manufacturer's catalogue. **6**

   b) A 22 kW, 1440 rpm electric motor is directly coupled to a shaft which is supported by two cylindrical roller bearings. The shaft transmits power to another line shaft through a flat pulley of diameter 300 mm placed midway the bearings. Coefficient of friction at belt is 0.3 and angle of wrap is 180°. Belt is horizontal and service factor is 1.5. Expected life is 50000 hours.

   Select a bearing from manufacturer's catalogue using following information. **12**

Bearing	**C kN**
NU 2205	15.99
NU 2305	31.39

OR

2. a) Discuss different types of bearings. **4**

   b) Radial force on a ball bearing varies in a sinusoidal form given by $P = \frac{P_{max}}{2}(1 - \cos\theta)$ where P_{max} = 1350 N. If speed of rotation is 740 rpm and expected life is 10305 hours find basic dynamic load rating capacity of the bearing required for such application. **14**

Unit – II

3. a) Derive relation for Torque Transmitting Capacity of single plate clutch. **4**

   b) A cone clutch is used to transmit 28.75 kW at 1395 rpm. Coefficient of friction is 0.183 and allowable pressure is 0.15 N/mm^2. Semi-cone angle is 12.5° and mean radius is twice the face-width. Assuming uniform pressure condition. Find :

      1) Dimensions of cone

      2) Force required for engaging the clutch. **12**

OR

4. a) Discuss energy consideration in Brakes. **4**

   b) A pivoted double block brake as shown in figure 1 has a face width of 50 mm and coefficient of friction as 0.25. The pivot of each shoe is located such that the moment of friction forces on shoe about the pivot is zero. If the brake drum rotates at 600 rpm calculate **12**

      i) Maximum intensity of pressure on each shoe

      ii) Braking torque capacity of the brake

iii) Rate of heat generation at begining of braking.

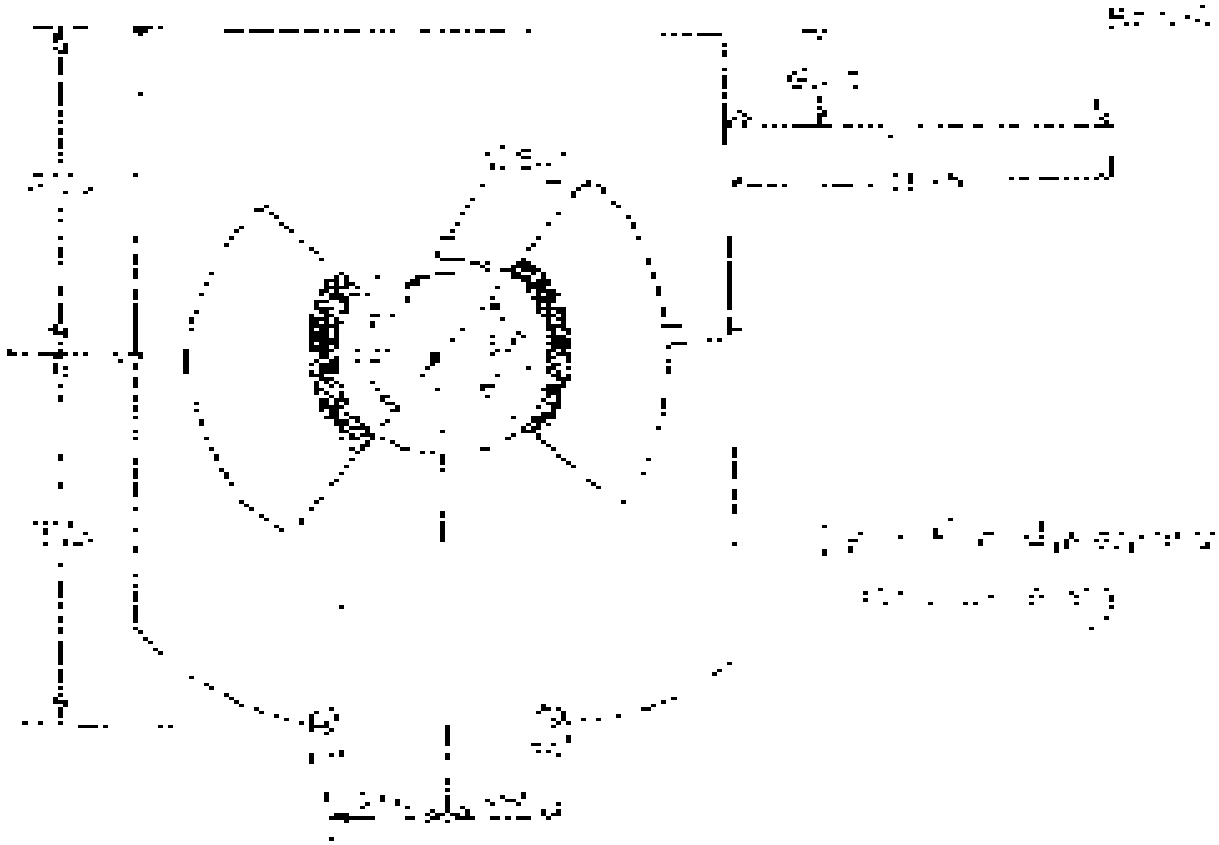

Figure 1 [Q. 4 (b)]

Unit – III

5. a) List out advantages and limitations of Belt drive. **4**

b) The following data is given for an open flat belt drive used to transmit 22 kW power from an electric motor to an exhaust fan

	Motor Pulley	**Fan Pulley**
Diameter (mm)	300	1200
Angle of contact (rad)	2.5	3.78
Coefficient of friction	0.3	0.25
Speed (rpm)	900	

The permissible tensile stress for the belt material is 2 N/mm^2 and the density of the belt material is 0.97 gm/cc. The belt is 6 mm thick. Determine :

i) Which pulley governs the drive design and why ?

ii) What width of the belt should be used ? **12**

OR

6. a) Discuss advantages and limitations of chain drive. **4**

b) A rope drive is used to transmit 260 kW power from a 300 mm pitch diameter pulley rotating at 1000 rpm to a 600 mm pitch diameter pulley. The pulley groove angle is 45° and the central distance is 6 m. The mass of the rope is 1.3 kg per meter and the coefficient of friction between the rope and pulley is 0.3. If the permissible pull for each rope is 2200 N, determine the number of ropes required. **12**

SECTION – II

Unit – IV

7. a) Derive Lewis equation for beam strength. **6**

b) For a spur gear pair using following data calculate beam and wear strength of gear teeth rated power the pair can transmit and maximum static load on gear.

Number of teeth on pinion = 18

Number of teeth on gear = 36

Ultimate tensile strength of pinion material 660 MPa

Ultimate tensile strength of gear material 510 MPa

Module 5 mm

Face width 50 mm

Surface hardness of pinion 330 BHN

Surface hardness of gear 280 BHN

Velocity factor is given by $\frac{5.6}{5.6+\sqrt{V}}$

Service factor 1.5

Factor of safety 2

Pinion speed 1440 rpm

Lewis form factor is given by $Y = 0.484 - \frac{2.87}{Z}$. **12**

OR

8. a) Discuss estimation of dynamic load in design of gears. **6**

   b) A spur gear pair with 20° full depth involute teeth consist of 21 teeth pinion meshing with 40 teeth gear. Pinion and gear are made of steel with 600 MPa and 400 MPa ultimate tensile strength respectively.

   The pinion shaft receives 5 kW at 720 rpm. Service factor is 1.25 and factor of safety is 2. Assume load concentration factor as 1.6. Design the gear pair and specify the surface hardness. Using following data :

   Velocity factor $C_v = \frac{6}{6+V}$

   Form factor for pinion 0.326

   Form factor for gear 0.389

   Assume velocity V = 5 m/s while calculating the module.

   Standard module series

   1, 1.25, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8, 10, ... **12**

Unit – V

9. A helical pinion having 14 teeth and made of steel (S_{ut} = 800 MPa) has to mesh with gear made of steel (S_{ut} = 720 MPa). The gear pair is required to transmit 30 kW and pinion speed is 720 rpm. The gear is rotating at 225 rpm. The application factor and load concentration factor are 1.3 and 1.1 respectively. The required factor of safety is 2.0. The face width is ten times the normal module. Helix angle is 25°. The gear pair is machined to meet grade 7. The deformation factor is (11000 e) N/mm. Design the pair and suggest the surface hardness.

   Use following data :

   Velocity factor = $\frac{5.6}{5.6+\sqrt{V}}$

   Lewis factor = $0.484 - \frac{2.87}{Z'}$

   For grade 7 $e = 11 + 0.9[m_n + 0.25\sqrt{d}]$

   Dynamic load = $\frac{21V + (bc\cos^2\psi + P_{t\max})}{21V + \sqrt{bc\cos^2\psi + P_{t\max}}}\cos\psi$

   Standard module series is ... 3, 4, 5, 6, 8, 10, ... **16**

   OR

10. a) Derive an expression for formative number of teeth of Bevel gear. **4**

b) A straight bevel pinion made of steel (S_{ut} = 800 MPa) mesh with gear made of same material. The axis of pinion and gear intersect at right angle. The pinion is rotating at 600 rpm whereas gear rotates at 300 rpm. The power transmitted is 15 kW. Service factor is 1.1 and factor of safety is 1.75. The pair members are made to Grade 6 and they have surface hardness of 350 BHN. The deformation factor is 11000 × e. Design the pair using following information :

No. of teeth on pinion = 21

Lewis factor = $0.484 - \frac{2.87}{Z'}$

For grade 6 $e = 8 + 0.63\left[m + 0.25\sqrt{2rm}\right]$

Velocity factor = $\frac{6}{6 + V}$

Dynamic load, $P_d = \frac{21V\,(bc + P_{t\,max})}{21V + \sqrt{bc + P_{t\,max}}}$

Standard module in mm

1, 1.25, 1.5, 2, 3, 4, 5, 6, 8, 10, 12, ... **12**

Unit – VI

11. a) Why worm gear always governs the design in worm gear pair design ? **4**

b) A worm gear pair 2/30/10/8 consist of worm gear made of phosphur bronze with S_{ut} = 245 MPa and worm made of case hardened steel with S_{ut} = 700 MPa. The coefficient of friction between the worm and worm gear is 0.04 while normal pressure angle is 20°. The wear factor of worm gear teeth is 0.825 MPa. For the gear box overall heat transfer coefficient is 22 W/m^2 °C. The permissible temperature rise for the lubricating oil above the atmospheric temperature is 45° C. The worm rotates at 720 rpm. Assuming service factor 1.25. Determine the input power rating based on

1) Beam strength
2) Wear strength
3) Thermal consideration.

Suggest the input power that the worm can take. Use following data :

Lewis form factor = $0.484 - \frac{2.87}{Z_g}$

Velocity factor = $\frac{6}{6 + V_g}$

Surface area of housing $A = 1.14 \times 10^{-4} \times a^{1.7}$ ... m^2

where a is central distance in mm. **12**

OR

12. a) Discuss force analysis for worm gear pair. **6**

b) A worm gear drive 4/40/10/4 is used to transmit 10 kW power. The worm is having left hand helix and it is rotating at 1440 rpm in anticlockwise sense as viewed from right side. The coefficient of friction is 0.04 and normal pressure angle is 20°. Determine and show different force components acting on the worm and worm-gear. Assume worm is located below the worm-gear. Also find efficiency and power lost in friction. **10**

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T.E. (Mechanical) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
2) Figures to the ***right*** *indicate* ***full*** *marks.*
3) Assume ***suitable*** *data if* ***necessary****.*
4) Answer to the Sections ***I*** *and* ***II*** *should be written* ***separately****.*

SECTION – I

1. a) Compare the end standard and line standard. **6**

   b) Define straightness and flatness. Explain with neat sketch method of checking straightness of straight edge by wedge method. **10**

OR

1. a) Describe with neat sketch the principle of working of an autocollimator and state its application. **8**

   b) Design a 'workshop' type GO and NOGO gauge suitable for 25 H_7 the value of IT7 = 16 i and the diameter step 18 and 30. **8**

2. a) Explain with pneumatic circuit diagram the solex pneumatic comparator. Explain advantages and limitations of pneumatic comparator. **8**

   b) Explain sigma mechanical comparator. **8**

OR

2. a) Explain the difference between primary texture and secondary texture. **4**

   b) Write short note on : **8**

      1) Constant deviation prism

      2) Angle dekor.

   c) A 1.45 mm slipgauge is being measured on a gauge length interferometer using a cadmium lamp. The Red and Blue wavelength emitted by this lamp are 0.643850537 μm and 0.47999360 μm. Calculate the nominal fractions expected for the gauge for Red and Blue wavelength. **4**

P.T.O.

3. a) Derive the relation for width W and depth h by const. chord method.

   Calculate chord length and its distance below tooth tip for a gear of module 5 mm and pressure angle 20°. **8**

   b) Derive an expression for best wire size for measuring effective diameter. Calculate diameter of best size of wire for $M_{20} \times 2.5$ screw.

   Explain Rack correction and compression correction. **10**

OR

3. Write short notes **(any three)** : **18**

   1) Co-ordinate measuring machine

   2) Parkinson's gear roller tester

   3) Tomlinson's surface meter

   4) Types of Pitch errors in screw thread.

SECTION – II

4. a) Differentiate between : **8**

      i) Vendor rating and vendor quality rating

      ii) Quality Control and Quality Assurance.

   b) Explain the concept of quality defined by Juran, Crosby, Deming and Taguchi. **8**

OR

   a) Explain Quality Policy. **5**

   b) The balance between cost of quality and value of quality gives optimum quality of design. Discuss. **6**

   c) Explain spiral progress in quality system. **5**

5. a) Differentiate between chance cause and Assignable causes. **6**

   b) A manufacturer purchases small bolts in Cartons that usually contain several thousands bolts. Each shipment consists of number of canons, as a part of the acceptance procedure for these bolts, 400 bolts are selected at random from each Carton and are subjected to visual inspection for certain defects. In a shipment of 10 Cartons the respective percentages of defectives in the sample from each carton are 0, 0, 0, 5, 0.75, 0, 2, 0.25, 0.25 and 1.25. Does the shipment of bolts appear to exhibit stastical control ? **6**

   c) Distinguish between P-chart and C-chart. **4**

OR

5. a) Explain the following OC curve characteristic : **8**

   1) Changing of lot size

   2) Changing sample size

   3) Change of acceptance number

   4) Change of sample size.

   b) For the following data, calculate sample size and AOQ for single sampling plan,

   1) Probability of acceptance for 0.6% defectives is 0.9397

   2) Lot size N = 10,000

   3) np = 2.5

   Defectives found in sample are not to be replaced. **8**

6. Write short notes **(any three)** : **18**

   a) Quality Audit

   b) TS 16949

   c) Process Capability Index

   d) DMAIC.

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T.E. (Civil) (Semester – I) Examination, 2011
FLUID MECHANICS – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*

SECTION – I

1. a) A rigid pipe conveying water is 3.60 km long. The velocity of flow is 1.10 m/s. Calculate the rise to pressure behind a valve at the lower end of if it is closed (i) in 20 seconds (ii) in 3 seconds. Take bulk modulus of water equal to 2000 N/mm^2. **8**

   b) Explain Magnus effect. **6**

   c) Describe polar diagram of an airfoil. **4**

OR

2. a) A man weighing 980 N descends to the ground from an aeroplane with the help of a parachute against the resistance of air. The shape of the parachute is hemispherical of 2.5 m diameter. Find the velocity of the parachute with which it comes down. Assume $C_d = 0.6$ and density of air = 1.25 kg/m^3. **6**

   b) Derive an equation for time required to empty a hemispherical tank through an orifice situated at the base of the tank with no inflow into the tank. **8**

   c) What is gradual and rapid closure of valve in pipe flow ? What is its significance ? **4**

P.T.O.

3. a) A jet of water moving at 12 m/sec impinges on a concave vane shaped to deflect the jet through 120° when stationary. If the vane is moving at 5 m/sec find the angle of the jet so that there is no shock at inlet. What is the absolute velocity of the jet at exit in magnitude and direction ? Assume that the vane is smooth. **8**

   b) Why priming is necessary for a centrifugal pump ? What are the various methods of priming ? **8**

OR

4. a) The following are the results of tests conducted on a centrifugal pump. **8**

   Negative pressure head in suction pipe close to pump = 260 mm of mercury

   Pressure intensity in delivery pipe close to pump = 0.16 N/mm^2

   Difference of level between the two gauges = 0.53 m

   Shaft power of the electric motor = 22 kW

   Rate of discharge = 0.095 m^3/s

   Diameter of suction pipe = 200 mm

   Diameter of delivery pipe = 150 mm

   Calculate overall efficiency of the pump.

   b) Derive an expression for the force exerted by the jet of water on a stationary flat plate held normal to the plate. **8**

5. a) A Pelton wheel works under a net head of 300 meters at a speed of 550 rpm developing 5890 kW of shaft power. The overall efficiency of the turbine is 80%. The ratio of jet diameter to the mean bucket circle diameter is 1/10. Find the number of jets, their diameter, the diameter of the turbine and the quantity of water supplied to the turbine. Assume C_v = 0.97 and bucket speed = 0.47 jet speed. **8**

   b) Define Unit discharge, Unit speed, Unit power and Specific speed of a turbine. **8**

OR

6. a) Explain the hydraulic functions of scroll casing, wicket gates, runner and draft tubes in case of reaction turbine. **8**

   b) A turbine is to operate under a head of 28 m at 200 rpm. The discharge is 9 m^3/s. If the efficiency is 90% determine : **8**

      a) Specific speed of the machine

      b) Power generated

      c) Type of turbine

      d) Performance under a head of 20 meters.

SECTION – II

7. a) Explain Steady-Unsteady, Uniform and Non-Uniform, Laminar-Turbulent flows in case of open channels. **6**

   b) What is the difference between pipe flow and open channel flow ? **4**

   c) A trapezoidal channel is 10 m wide and has a side slope of 1.25 H : 1 V. The bed slope is 0.00030. The channel is lined with smooth concrete with n = 0.011. Compute the mean velocity and discharge for a depth of flow of 3.5 m. **8**

OR

8. a) Work out, area of flow, wetted perimeter and hydraulic radius for : **6**

      i) Triangular section with side slope 1.5 V : 1.5 H and depth of flow 3 m.

      ii) Trapezoidal section with base width 5 m, depth of flow 2.5 m and side slope 1 V : 2 H.

   b) Derive Chezy's formula for uniform flow in an open channel. State the assumptions made in. **6**

   c) What do you understand by 'Economic section' or 'Hydraulically most efficient section' of the channel ? **6**

9. a) Explain transition with reduction in width in a rectangular channel. **8**

   b) The depths of flow before and after the jump in a 8 m wide rectangular channel are 0.8 m and 5 m respectively. Find the energy loss due to jump in kW. **8**

OR

10. a) Find the critical flow discharge per meter width of a wide rectangular channel, when the specific energy of flow is 3.0 m. **8**

    b) Define 'Hydraulic jump' and state its applications. **4**

    c) Derive the relation between sequent depths y_1 and y_2 in a hydraulic jump. **4**

11. a) What do you mean by GVF profile ? Draw M_1, M_2, S_1, S_2 profiles and explain them in detail. **8**

    b) A wide rectangular channel carries a discharge of 2.0 $m^3/s/m$. At a section, the depth of flow is 1.9 m. How far upstream or downstream of this section, the depth will be within 5% of the normal depth of flow ? Bed slope of channel is 1 : 8000 and Manning's coefficient is 0.025. Use step method and take two steps only. **8**

OR

12. a) A rectangular channel has a bed width of 15 m and slope of 1 : 4000, Manning's n = 0.02 and a uniform depth of 2 m. Find slope of water surface with respect to horizontal at a section where depth of flow is raised by 0.80 cm due to an obstruction downstream. **8**

    b) State various methods of computation of GVF in prismatic channel and explain any one in detail. **5**

    c) What is a control section ? Give its significance. **3**

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T.E. (Civil) (Semester – I) Examination, 2011
ADVANCED SURVEYING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Write **two** Sections in **separate** sheet.*
*2) Solve any **3** from Section **I** and **3** from Section **II**.*

SECTION – I

1. a) State which triangulation figure shall be preferred under following situation. Justify your answer. **18**
   i) A large piece of land having hilly terrain
   ii) A large area having flat terrain
   iii) A long strip of land having comparatively less width.
   b) State any five advantages of space based positioning systems.
   c) Differentiate between Plane surveying and Geodetic surveying (any four points).

OR

2. a) Define differential positioning. Explain in brief various techniques of differential positioning. **18**
   b) Explain with a neat sketches, commonly used layouts of triangulation systems.
   c) Two triangulation stations A and B, 60 km apart, have elevations of 265 m and 282 m, respectively. The intervening ground may be assumed to have a uniform elevation of 220 m. Find the minimum height of signal at B so that the line of sight may not pass near the ground less than 3 m.

3. a) Explain the following terms : **16**
   i) Residual error
   ii) True error
   iii) Indirect observation
   iv) Accidental error

P.T.O.

b) On a station O, three horizontal angles, closing the horizon were measured as follows :

$\angle A = 34° 10' 20'' \pm 3''$ $\angle B = 176° 40' 32'' \pm 4''$

$\angle C = 149° 09' 04'' \pm 5''$ calculate the corrected angles.

c) Differentiate between :

i) Direct observation and indirect observation

ii) Independent quantity and conditioned quantity.

OR

4. a) Explain clearly what is meant by side equation. How would you adjust a geodetic quadrilateral (without central station). **16**

b) Angles were measured on a station and the observations were recorded as follows :

Angle	**Value**	**Weight**
A	$45° 30' 10''$	2
B	$40° 20' 20''$	3
A + B	$85° 50' 10''$	1

Find the most probable values of the angles A and B (Use Normal Equation Method).

c) Explain in brief angle adjustment of a quadrilateral by taking suitable example.

5. a) What do you understand by setting out works ? What important factors to be considered while setting out works ? **16**

b) Explain with a neat sketch setting out of isolated column footing.

c) A vertical angle of elevation was observed from a station P as $2° 32' 25''$. Determine its true value if the height of instrument at P is 1.2 m and height of signal at other station Q is 5.2 m. The two stations P and Q are 5200 m apart. Take the value of $R \sin 1''$ as 30.88 m.

OR

6. a) Describe in brief how location survey for pier of a bridge is carried out at site. **16**

   b) Two triangulation stations A and B are 3200.65 m apart. Find the difference of elevation of the two stations for the following data :

   Angle of depression at B to A = $2°18'16''$

   Height of instrument at B = 1.24 m

   Coefficient of refraction at B = 0.07

   $R \sin 1'' = 30.88$

   R.L. of B = 242.6 m.

SECTION – II

7. a) Define the following terms : **18**

   1) Air base distance
   2) Relief displacement
   3) Oblique photograph
   4) Crab
   5) Mosaic
   6) Principal point.

   b) Define Ground Control Points, state their role in photogrammetry and bring out difference between premarked and post marked Ground Control Points (GCP).

OR

8. a) Define relief displacement. Derive an equation to determine the height of an object above its foot from aerial photograph with the help of relief displacement. **18**

   b) The scale of aerial photograph is 1 : 10000, effective at an average elevation of terrain of 500 m. The size of aerial photograph is $230 \text{ mm} \times 230 \text{ mm}$. Focal length of camera lens is 20 cm. Speed of aircraft is 180 kmph, longitudinal overlap is 60% and side overlap is 30%. Determine the number of photographs required to cover an area of $30 \text{ km} \times 22.5 \text{ km}$. Also determine exposure interval and flying height.

9. a) Define remote sensing. State importance of remote sensing. **16**

   b) State and explain fundamental equation for conceptual design of remote sensing.

   c) What is projection ? Comment in brief on choice and limitations of projections ?

OR

10. a) Enlist various GIS tasks/functions and discuss in brief. **16**

    b) Discuss in brief the various data sources to build GIS for civil engineering applications such as watershed development.

    c) Enlist advantages and limitations of remote sensing.

11. a) What is hydrographic survey ? Explain in brief the process of shore line survey. **16**

    b) Enumerate equipments required for hydrographic surveying for ocean sounding to be carried out for preparation of navigational chart.

    c) What is sounding ? Enlist the different methods to locate the position of sounding station in plan.

OR

12. a) Explain the principle of nautical sextant and describe in brief the procedure of measurement of horizontal angle with a nautical sextant. **16**

    b) What is tidal gauge ? Enlist the different types of tidal gauges and explain any one in brief.

    c) Write a short note on Echo sounder.

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T.E. (Mechanical) (Semester – I) Examination, 2011
INDUSTRIAL ENGINEERING AND TECHNOLOGY MANAGEMENT
(New) (2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) What do you mean by scientific management ? Explain the change over taken place in management style today, since from F.W. Taylor. **8**

   b) Define plant layout. What are various factors involved in selection of site for good plant layout ? **8**

OR

2. a) Explain in brief concept and functions of management. **8**

   b) List out and explain in brief various principles of material handling. **8**

3. a) Define method study. What are its objectives ? **6**

   b) Describe with suitable example : **6**

      1) Operation process chart

      2) Multiple activity chart.

   c) Explain the term productivity. **4**

OR

4. a) State and explain various function involved in production planning and control. **6**

   b) A company is requiring 10,000 units of raw material per annum. The cost per order is estimated to be Rs. 50. The storage cost estimated is Rs. 5/- per unit of average inventory. What quantity should be ordered so that the total cost is minimum ? Also find total minimum cost. **6**

   c) What do you mean by job evaluation ? Explain advantages and limitations of it. **4**

5. a) What are various types of forecasts ? Explain in brief. **6**

   b) Define standard cost. State various steps involved in standard costing. **6**

   c) The activities involved in a small project are given below. Construct a network and findout the critical path. Find out floats for each activity. **6**

Activity	1 – 2	1 – 3	2 – 3	2 – 4	3 – 4	4 – 5
Duration	20	25	10	12	6	10

OR

6. Write short note on following **(any three)** : **18**

   1) Maslow's hierarchy of needs

   2) Zero based budgeting

   3) ABC

   4) Exponential smoothing

   5) Merit rating.

SECTION – II

7. a) Define "Management of Technology" and explain its significance. **6**

   b) Explain the role of Government in the development of Technology. **6**

   c) Differentiate between "Product Technology" and "Process Technology". **4**

OR

8. a) Define "Technology". Discuss impact of "Technology Development" on the business and society. **6**

   b) What is meant by "Competitive Advantage" ? Explain how the new technology help the firm to achieve it. **6**

   c) Draw and explain the "S-curve" for the "Technology Development". **4**

9. a) What do you understand by "Technology Forecasting" ? Explain its importance for the industry. **4**

   b) Discuss various techniques used in "Technology Forecasting". **6**

   c) What is meant by "Technology Monitoring" ? Why it is required to be carried out in the industry. **3**

   d) Write short note on "Technology Choice". **3**

OR

10. a) Explain with example "Technological Leadership and Followership". **6**

    b) Explain the term "Technology Acquisition" and describe the methods of Acquisition of Technology. **4**

    c) Differentiate between "Invention" and "Innovation". **3**

    d) What is "creativity" ? **3**

11. a) Explain the principles for developing "Technology Strategy". **6**

    b) What do you understand "Technology Diffusion" and "Technology Absorption" ? **6**

    c) Write a short note on : **6**

       i) "SWOT analysis"

       ii) "Technology transfer process".

OR

12. a) Discuss the management of "Technology Adoption and Implementation of new technology". **6**

    b) Explain the challenges of globalization. **6**

    c) Write short note on : **6**

       "Rate of diffusion of Technology" and "Speed of diffusion of Technology".

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T.E. (Mechanical) (Semester – I) Examination, 2011
COMPUTER ORIENTED NUMERICAL METHODS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, if **necessary**.*
*6) Answer **three** questions from **each** Section. Section **I** : (Q. **1** or Q. **2**), (Q. **3** or Q. **4**), (Q. **5** or Q. **6**), Section **II** : (Q. **7** or Q. **8**), (Q. **9** or Q. **10**), (Q. **11** or Q. **12**)*

SECTION – I

1. a) Solve equation $\sin x - x \cos x = 0$ using modified Newton Raphson method, with accuracy of 0.0005. You may take initial guess as 0.2. Check whether with this initial guess, the solution converges. **6**

   b) Draw a flow chart for modified Newton Raphson method. **6**

   c) Using Gauss-Legendre three point method find $\int (x^2 - 5x + 2)\,dx$ in the limits 3 to 5. **6**

OR

2. a) The data listed in table gives measurements of heat flux q at the surface of a solar collector. Estimate the total heat absorbed by a 2×10^5 cm^2 collector panel during 14 hr period. The panel has an absorption efficiency $\varepsilon = 42\%$. The total heat absorbed is given by

$$H = \varepsilon \int_0^t q\, A\, dt$$

where A is area, q is heat flux and t is time.

t (hr)	0	1	2	3	4	6	8	11	14
q (cal/cm². hr)	0.05	1.72	5.23	6.38	7.86	8.05	8.03	5.82	0.24

Use Simpson's $1/3^{rd}$ Rule. **10**

P.T.O.

b) Draw flow chart for Simpson's $3/8^{th}$ Rule. **6**

c) Identify the differences between Newton Raphson and modified Newton Raphson methods. **2**

3. a) Solve the following equations using Gauss-elimination method.

$3x + 6y + z = 16$

$2x + 4y + 3z = 13$

$x + 3y + 2z = 9$ **8**

b) Find dy/dx and d^2y/dx^2 at x = 2 for the following data : **8**

x	1	3	5	7
y	2	6	14	24

OR

4. a) Using Gauss Seidel iteration method solve following simultaneous equations (five iterations only).

$4x_1 + 2x_3 = 4$

$5x_2 + 2x_3 = 3$

$5x_1 + 4x_2 + 10x_3 = 2$ **8**

b) Find dy/dx and d^2y/dx^2 at x = 4 for the following data : **8**

x	1	2	3	4	5	6	7
y	0	0.693	1.093	1.386	1.609	1.791	1.947

5. a) Explain partial pivoting and full pivoting. **2**

b) Find value of y for x = 0.5 for the following table of x – y values using Newton's forward difference formula : **8**

x	0	1	2	3	4
y	1	5	25	100	250

c) Write flow chart for back substitution. **6**

OR

6. a) Find double integral of $f(x, y) = x^2 + y^2 + 5$ for x = 0 to 2 and y = 0 to 2 taking increments in both x and y as 0.5. **10**

   b) Write a flow chart to write a Newton's forward table. **6**

SECTION – II

7. a) The variation of refractive index (n) of a polished brass specimen can be modelled as $R = a\lambda^2 + b\lambda + c$, where λ is the length of the incident light ray wave. Calculate the values of a, b and c from the following table :

λ (nm)	300	350	400	450	500
R (unit less) for brass specimen surface	0.913	0.929	0.922	0.918	0.909

10

   b) Write a flow chart for curve fitting (straight line) using least square technique. **6**

OR

8. a) Evaluate error in the calculation of volume V of a tank, given by $V = \frac{\pi}{4} d^2 l$, at d = 1 m and l = 2 m, if error in measurement of diameter d and length L is 0.01 m. **6**

   b) Growth of bacteria (N) in a culture after 1 hr is given in following table :

t	0	1	2	3	4	5	6
N	32	47	65	92	132	190	275

Fit a curve of the form $N = ab^t$ and estimate N, when t = 7. **10**

9. a) A body of mass of 5 kg is attached to a spring with stiffness of 12. The differential equation governing the displacement of the body (x) and time (t) is given by

$$\frac{d^2x}{dt^2} + 5\frac{dx}{dt} - 12x = 0$$

Find the displacement (x) at time, t = 2, given that x(0) = 4 and $\dot{y}(0) = -5$. Use Runge Kutta second order method. **10**

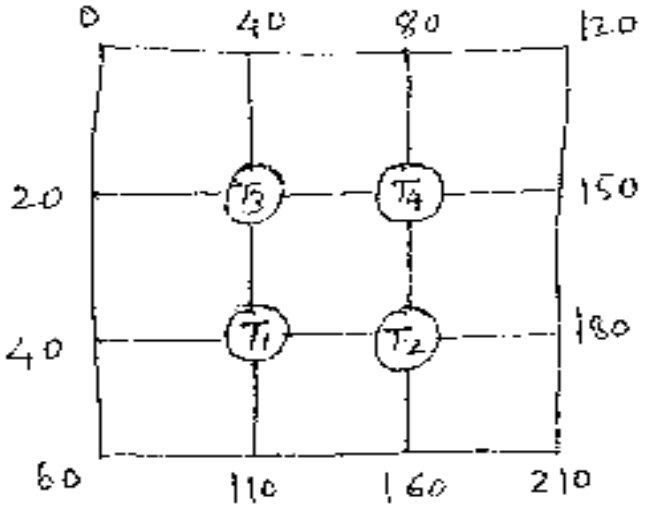
   b) Draw a flow chart for Euler's method. **8**

OR

10. a) Solve $dy/dx = x + y$; $y(0) = 1$ by Euler's method and estimate $y(1)$ with $h = 0.5$ and $h = 0.25$. Compare the error and comment on it if analytical solution is given by $y(x) = 2e^x - x - 1$. Also estimate $y(0.5)$ with $h = 0.25$ by suitable Runge-Kutta method. **10**

b) Draw a flow chart for Runge-Kutta second order method. **8**

11. a) Solve the Laplace equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$ with respect to the grid and boundary conditions as shown in figure. Calculate temperatures T_1, T_2, T_3 and T_4. If required assume suitable accuracy. **12**



Figure

b) Write short note on :

'Taylor series representation and its application to solution of differential equations'. **4**

OR

12. a) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ for the following conditions using explicit finite difference scheme

at $t = 0$, $u = \sin \pi x$

at $x = 0$ and $x = 1$, $u = 0$ for all values of t.

Taking increment in t as 0.002 and increment in x as 0.2, tabulate values of u for $t = 0$ to 0.006 and $x = 0$ to 1. **10**

b) Draw flow chart for the above problem. **6**

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T.E. (Mechanical) (Semester – II) Examination, 2011
METROLOGY AND QUALITY CONTROL
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Black figures to the **right** indicate **full** marks.*
*3) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*4) Attempt **any one** question in **each** Unit.*
*5) Assume **suitable** data.*
*6) Answer to the Sections **I** and **II** should be written **separately**.*
*7) Answer **1** or **2**, **3** or **4**, **5** or **6**, **7** or **8**, **9** or **10**, **11** or **12**.*

SECTION – I

Unit – 1

1. a) Differentiate between :
   i) Systematic errors and Random error, **3**
   ii) Accuracy and Precision. **3**

   b) What is the difference between Alignment Test and Performance Test ? Explain with neat sketches any four such tests on a Lathe machine. **10**

OR

2. a) Enumerate types of errors and sources of errors in dimension measurements and discuss Cosine and Parallax error with suitable example. **6**

   b) Differentiate between Mechanical and Pneumatic comparator. Explain with sketch the principle and working of Sigma Comparator. **10**

Unit – 2

3. a) A shaft of 35 $\pm$ 0.004 mm is to be checked by means of GO – NO GO gauge. Design the required dimensions for gauge. Draw the diagrammatic representation. **10**

   b) Describe with neat sketch the optical arrangement of NPL Gauge Length Interferometer and explain how it is used to compute the thickness of slip gauge. **8**

OR

P.T.O.

4. a) Design and make drawing of general purpose Go – NO GO Ring Gauge for inspection of a shaft of 30 f8. Given data with usual notations : **10**

   Tolerance unit = $i = 0.45 \sqrt{D} + 0.001 D$,

   Fundamental deviation for shaft 'f' = $-5.5D^{0.41}$,

   The value of tolerance for IT8 = 25i, IT9 = 40i, Dia. Step = 18 – 30.

   b) Define terms : Primary and Secondary Textures and describe with neat sketch Taylor Hobson Surface Meter. **8**

Unit – 3

5. a) Show that the best wire size for measuring effective diameter of thread is given by $d = (p/2) \sec(\theta/2)$. (where, p = pitch of the thread). **6**

   b) Sketch and describe a Gear Tooth Vernier Caliper. **4**

   c) Write a short note on : Computer controlled Co-ordinate Measuring Machine. **6**

OR

6. a) Describe use of Devid Brown Tangent Comparator instrument for gear measurement. Calculate the dimension of the Base Tangent Length over 5 teeth, when gear under inspection has following specifications : No. of teeth = 30, Module = 4, Pressure angle = 20, The shift of the tool in the gear to provide backlash = 0.03 mm. **8**

   b) Discuss various types of pitch errors in screw threads. **4**

   c) Explain use of Lasers in Metrology. **4**

SECTION – II

Unit – 4

7. a) Explain following Tools and techniques used for problem solving in quality circles. **12**

   1) Brain storming

   2) Cause and effect diagram

   3) Pareto analysis.

   b) Draw a neat sketch of House of quality and show various steps in QFD process. **4**

OR

8. a) Explain to make up the award criteria for Malcolm Balbrige national quality award. **5**

   b) Explain basic elements of just in time. **6**

   c) Explain Juran triology diagram. **5**

Unit – 5

9. a) Explain POKA-YOKE method developed by Shiego Shingo. **5**

   b) Explain purpose of Quality Audit. **5**

   c) What are the implementation methodologies and limitations/difficulties in achieving ISO registration ? **6**

OR

10. a) Explain contribution of Demings fourteen point towards quality improvement. **6**

    b) Explain : **10**

    i) FMECA ii) FTA

Unit – 6

11. a) Differentiate between single sampling, double sampling and sequential sampling plan. **9**

    b) Define following elements and show quality region on OC curve : **5**

    1) α – Risk 2) β Risk 3) AOQ

    c) Draw characteristics of OC curve. **4**

OR

12. a) Calculate process capability and show the six-sigma and specified tolerance on normal distribution curve and comment specification of item 500 ± 5, n = 5, N = 20, $A_2 = 0.58$, $D_3 = 0$, $D_4 = 2.11$, (Use Table No. 1) Plot the chart and comment. **10**

Table No. 1

Batch	1	2	3	4	5	6	7	8	9	10
$\overline{\mathbf{X}}$	501	498	500	503	501	500	497	502	503	496
R	3	4	2	4	3	5	4	2	6	4

    b) Draw the flow chart for double sampling plan when N = 1500 **4**

    $n_1 = 100$ $c_1 = 2$

    $n_2 = 50$ $c_2 = 4$

    c) Calculate AOQ for single sampling plan N = 10,000, C = 1, P = 0.004, Pa = 0.558. **4**

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T.E. (Mechanical) (Semester – II) Examination, 2011
(Common to Sandwich)
TURBO MACHINES (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of Logarithmic Tables, Slids Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*5) Assume **suitable** data, **if necessary**.*
*6) Answer **three** questions from **each** Section.*
*Section **I** – (Q. **1** or Q. **2**), (Q. **3** or Q. **4**), (Q. **5** or Q. **6**)*
*Section **II** – (Q. **7** or Q. **8**), (Q. **9** or Q. **10**), (Q. **11** or Q. **12**).*

SECTION – I

1. a) A rectangular plate, weighing 60 N is suspended vertically by a hinge on the top horizontal edge. The C.G. of the plate is 100 mm from the hinge. A horizontal jet of water 20 mm diameter, whose axis is 150 mm below the hinge impinges normally on the plate with a velocity of 5 m/s, calculate,

   i) The horizontal force applied at the C.G. to maintain the plate in its vertical portion.

   ii) The corresponding velocity of the jet, if the plate is deflected through 30° and the same force continues to act at the C.G. of the plate. **10**

   b) How do you classify water turbines ? What is the difference between the impulse and reaction turbines ? **8**

OR

2. a) Show that, the maximum efficiency of the Pelton wheel is given by

$$\frac{1+k\cos\beta}{2}$$

where k = Bucket friction factor

β = Bucket outlet angle. **8**

b) A twin jet Pelton wheel is required to generate 7500 kW when the available head at the nozzle is 400 m. Assuming

i) Generator efficiency = 95%

ii) Overall wheel efficiency = 80%

iii) Coefficient of velocity = 0.98

iv) Speed Ratio = 0.46

v) Reduction in relative velocity while passing through bucket 15%

vi) Jet Ratio = 10.

Find :

i) The diameter of each jet

ii) Total flow in LPS

iii) Force exerted by the jet on the bucket in the direction tangential to the wheel.

iv) Synchronous speed at 50 cycles/second. **10**

3. a) Describe with help of neat sketch the main components of Francis turbine. **5**

   b) Compare Francis Turbine and Kaplan Turbine. **3**

   c) A Kaplan turbine has a hydraulic efficiency of 90% and a mechanical efficiency of 95% with a runner diameter of 6 m and a boss diameter of 1.8 m. If the discharge of turbine is 180 m^3/s, calculate the head on the turbine and the power of the turbine. Assume that there is no whirl at outlet and the discharge is free. Neglect losses in the turbine. **8**

OR

4. a) In an inward flow reaction turbine the head on the turbine is 32 m. The external and internal diameters are 1.44 m and 0.72 m. The velocity of flow through the runner is constant and equal to 3 m/s. The guide blade angle is 10° and the runner vanes are rigid at inlet. If the discharge at outlet is radial, determine :

      i) The speed of the turbine

      ii) The vane angle at outlet of the runner and

      iii) Hydraulic efficiency. **10**

   b) Explain the terms unit speed, unit discharge and unit power and derive the expressions for the same. **6**

5. a) Explain the classification of steam turbine. What is compounding in steam turbine ? **6**

   b) The mean diameter of the blades of an impulse turbine with a single row turbine is 1.05 m and the speed is 3000 rpm. The nozzle angle is 18°, the ratio of blade velocity to steam velocity is 0.42 and the ratio of relative velocity at outlet from the blades to that at inlet is 0.84. The outlet angle of blade is to be made 3° less than inlet blade angle. Steam flow is 8 kg/s. Draw velocity diagram and find resultant thrust on blades, tangential thrust, axial thrust, power developed and blade efficiency. **10**

OR

6. a) Explain the following related to steam turbine i) Preheat factor ii) Throttle governing. **8**

   b) A 120 MW power plant is supplied with steam at 100 bar and 550°C and the condenser pressure is maintained at 0.1 bar. At full load the steam flow rate is 4,80,000 kg/hr, while at no load the steam flow rate is 24,000 kg/hr. Find the specific steam consumption in kg/kWh at 25%, 50% and 75% loads. Assume that the plant uses throttle governing. **8**

SECTION – II

7. a) Test on a single centrifugal pump running at constant speed gave the following results :

Q(LPM)	0	225	455	680	910	1135
H(m)	12.7	12.5	11.9	10.4	7.3	3.7
η(%)	0	48	68	76	70	50

Two such pumps are installed to run in parallel with common suction and delivery pipes for a static head of 6.4 m. The friction and other losses are given by 2.02 $Q^2 \times 10^{-6}$m, where Q is in LPM. Calculate the discharge and power required when i) only one pump is used ii) two pumps are used in parallel. **12**

b) Explain the terms 'NPSH available' and 'NPSH required'. **6**

OR

8. a) A three stage centrifugal pump has impeller 400 mm in diameter and 20 mm wide. The blade angle at outlet is 45° and the area occupied by the thickness of the vanes may be assumed 8% of the outlet area of the pump delivers 3.6 m^3/min, when running at 920 rpm, find :

i) Power of the pump

ii) Manometer head

iii) Specific speed.

Assume mechanical efficiency as 88% and manometric efficiency as 77%. **12**

b) Discuss the performance characteristics of the centrifugal pump. How the vane angle at exit influence the work done/discharge characteristics ? **6**

9. a) Represent and explain the processes involved in a centrifugal compressor on (T-S) diagram and derive the expression for isentropic efficiency based on total values. **8**

b) A centrifugal compressor used as a supercharger for aero-engines handles 150 kg/min of air. The suction pressure and temperature are 1 bar and 290 K. The suction velocity is 80 m/s. After compression in the impeller the conditions are 1.5 bar, 345 k and 220 m/s, calculate,

i) Isentropic efficiency

ii) Power required to drive the compressor

iii) The overall efficiency of the unit.

It may be assumed that Kinetic Energy of air gained in the impeller is entirely converted into pressure in the diffuser. **8**

OR

10. a) Explain the construction and working of an axial flow compressors. **5**

b) Explain the terms surging and chocking in a rotary compressor. **5**

c) Define slip coefficient, work factor and pressure coefficient. **6**

11. a) Explain the following :

i) Comparison between gas turbines and I.C. Engines.

ii) Ramjet engine. **6**

b) A turbojet engine draws air at the rate of 1 kg/s while flying at a speed of 900 km/hr. The velocity of gases at the exit of nozzle is 620 m/s. The engine uses fuel at the rate of 0.0125 kg/s calorific value 45,000 KJ/kg, find,

i) Fuel air ratio

ii) Fuel consumption in kg/hr

iii) Thrust, thrust power and TSFC

iv) Propulsive power and propulsive efficiency

v) Thermal and overall efficiency of turbojet. **10**

OR

12. a) Explain thermodynamic analysis of turbojet engine with the help of T-S diagram. Also draw their performance curves. **8**

b) A gas turbine power plant operates between the temperature limits of 295 K and 1085 K. Determine the following :

i) The optimum pressure ratio for the cycle if the plant is to be operated for maximum power output.

ii) Turbine work, compressor work, shaft work and work ratio

iii) Plant efficiency

iv) Power output if mass flow rate of air is 22 kg/s

Assume, $\gamma = 1.4$, Cp = 1.005 kJ/kg.K. **8**

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T.E. (Mechanical Sandwich) (Semester – I) Examination, 2011
Elective – I : C) WELDING TECHNOLOGY (New)
(2008 Pattern) (Self Study)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **one** question of **each** Unit from Section – **I** and Section – **II**.*
*2) Answer to the questions should be written on **separate** books.*
*3) Draw **neat** diagram **wherever** necessary.*
*4) Assume **suitable** data if **required**.*

SECTION – I

Unit – I

1. a) Draw neat sketches and state different characteristics for different flames used in gas welding. **8**

   b) Explain heat affected zone in welding. **8**

OR

2. a) Explain different steps to be carried out while welding by gas welding process. **8**

   b) Explain single stage and two stage oxygen and acetylene pressure regulators. **8**

Unit – II

3. a) What is the principle of operation of Electric arc welding ? Explain MIG with its advantages, limitations and applications. **9**

   b) Explain with neat sketch the electroslag welding. Also write advantages, limitations and applications. **9**

OR

4. a) Explain the following things related to electrode used in arc welding
   i) coating, ii) designation as per IS code. **9**

   b) Explain with neat sketch the percussion welding and state its advantages and limitations. **9**

P.T.O.

Unit – III

5. a) Describe the principle, process and application of resistance tube welding. **8**

   b) Explain with neat sketch flash butt welding process along with advantages and disadvantages. **8**

OR

6. a) Draw neat sketch of resistance welding process. Explain various parameters which control the quality of resistance welding. **8**

   b) Write a short note on : **8**

      i) Projection resistance welding

      ii) Resistance (up butt) welding.

SECTION – II

Unit – IV

7. a) Explain with neat sketch electron beam welding process and effect of vacuum of penetration. **8**

   b) Write a short note on : **8**

      i) Ultrasonic welding methods

      ii) Laser beam welding.

OR

8. a) Explain explosive welding along with advantages, limitations and applications. **8**

   b) Explain forge welding along with advantages, limitations and applications. **8**

Unit – V

9. a) Explain Torch brazing, process and give various filler metals used in brazing. **9**

   b) Mention the filler metal requirements, their types used in soldering, compare soldering and brazing. **9**

OR

10. a) Discuss the various steps involved while soldering metal. **9**

    b) What are the properties of Adhesive bonding material ? State different Adhesive bonding material and their selection. **9**

Unit – VI

11. a) Explain following defects in welding along with their remedies. **8**

    i) porosity ii) slag inclusion

    iii) cracks iv) incomplete fusion

    b) What are discontinuities in weld ? State their causes and remedies. **8**

OR

12. a) Explain the concept of quality control in welding. **8**

    b) Discuss the basic costing procedure for gas welding. **8**

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T.E. (Production) (Semester – I) Examination, 2011
PRODUCTION MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Use** of the Logarithmic Tables, Slides Rule, Mollier Charts, Electronics Pockets Calculator and Steam Tables is **allowed**.*
*5) Assume **suitable** data if **necessary**.*

SECTION – I

Unit – I

1. a) Define Production and discuss the types of Production Systems. **9**

   b) Draw the organizational chart for Production Management. **9**

OR

2. a) Discuss the scope and objectives of Production Management. **9**

   b) With the help of block diagram, explain the process of Production Management. **9**

Unit – II

3. a) What is integrated approach towards Production Planning and Control ? **8**

   b) Define Production Planning and Control. State the objectives of Production Planning and Control. **8**

OR

4. a) Differentiate between Production Planning and Production Control. **8**

   b) Explain with the help of block diagram functions of Production Planning and Control. **8**

P.T.O.

Unit – III

5. a) Define Plant Layout. Explain the objectives of good plant layout. **8**

   b) Consider a following assembly network relationship of a product. The number of shift per day is one and the number of the working hours per shift is 8.Bajaj Auto Ltd. company aims to produce 40 units of the product per shift. **8**

Operation No.	Immediate Preceding Task	Duration (Min)
1	–	8
2	1	3
3	1	2
4	1	4
5	1	7
6	3, 7	4
7	2	5
8	4, 5	6
9	6	8
10	7, 8, 9	8

   i) Draw the precedence diagram

   ii) What is the desired cycle time ?

   iii) What is the theoretical number of workstation ?

   iv) What are the efficiency and balance delay of the solution obtained ?

OR

6. a) Define Material Handling System and state the relationship between good plant layout and material handling system. **8**

   b) Explain different types of material handling equipments with its applications. **8**

SECTION – II

Unit – IV

7. a) Define sales forecasting. Explain why there is a need of sales forecasting. **9**

   b) The following data contains sales of a particular product for 6 weeks and forecast of 1st week is given : **9**

Week	1	2	3	4	5	6
Actual Demand	85	88	82	83	89	88
Forecast	82					

   i) Calculate forecast for remaining six weeks using single exponential smoothing with $\alpha = 0.2$

   ii) Calculate MAD (Mean Absolute Deviation) and BIAS for the forecast.

OR

8. a) Explain various demand patterns used in sales forecasting. **9**

   b) There is a correlation between population of the city and Maruti SX4 sold. This relation is shown in the following table. **9**

Population in lakhs	4	7	9	12	16	19
No. of Maruti SX4 sold in thousands	2	3	4	5	6	7

   Estimate the sales of Maruti SX4 with population 20 and 24 lakhs.

Unit – V

9. a) Define critical ratio scheduling; explain the steps of critical ratio scheduling. **8**

   b) There are seven jobs each of which has to go through the machines M1 and M2 in the order of M1M2. Processing time in hours are given as : **8**

Jobs	1	2	3	4	5	6	7
Machine M1	4	13	16	7	11	12	10
Machine M2	9	11	11	7	13	2	4

   Determine a sequence of these jobs that will minimize the total elapsed time.

OR

10. a) Explain forward and backward scheduling. **8**

    b) Explain in brief : **8**

       i) Finite loading

       ii) Uses of Critical Path Method.

Unit – VI

11. a) Explain how Just-in Time (JIT) system is used in mass production organization. **8**

    b) Write the short note on Energy Audit. **8**

OR

12. a) Explain the basic concept of World Class Manufacturing. **8**

    b) List and explain and two advanced manufacturing philosophies. **8**

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T.E. (Production) (Semester – II) Examination, 2011
MACHINE TOOL ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours | Max. Marks : 100

Instructions : *1) Attempt **one** question from **each** Unit in Section **I** and Section **II**.*
*2) Answer to the Sections should be written on **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*

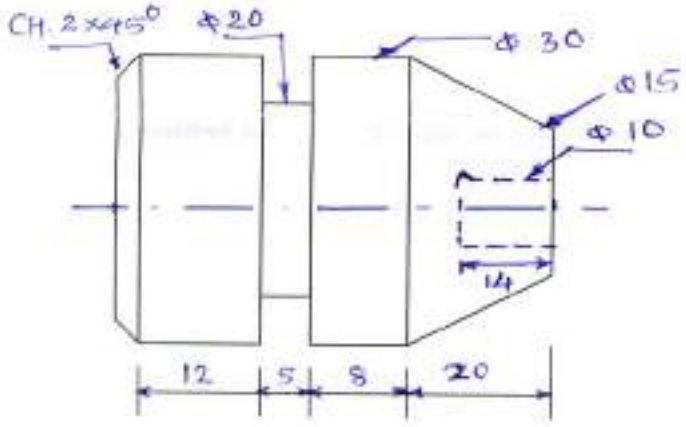
SECTION – I

Unit – I

1. a) Design and draw cam profile for the component shown in figure below. Also work out the following requirements.
   a) Sequence of operation
   b) Table for cam angle and cycle time
   c) Cam profile for turret operation. **20**

Data given :

Operation	Speed	Feed
Turning	30 M/min	0.2 mm/rev.
Drilling	20 M/min	0.1 mm/rev.
Grooving	15/min	0.1 mm/rev.



OR

2. a) Explain with a figure the rotary type transfer machine. **8**

   b) Explain progressive action automate with multispindle automate. **6**

   c) What are the rules for laying out cam profile ? **6**

Unit – II

3. a) Explain tool motion in CNC machining. **7**

   b) Write down use of G and M code in CNC. Write down the meaning for following

   N001 G00 X25 Y30 S3000 F0.5 T0102 M04

   N002 G03 X-15 Y-20 R5 S1000 F0.5 M30 **8**

   OR

4. a) Explain difference between NC, CNC, DNC. **7**

   b) Write a short note on :

   i) Encoders used in Nc/CNC machine,

   ii) Machining centre. **8**

Unit – III

5. a) The system is capable of making 50 delivers / hr. The following specifies the performance characteristics of the system **7**

Average distance traveled/delivery	=	160 m
Vehicle velocity	=	60 m/min
Pick up time	=	50 Sec
Drop off time	=	50 Sec
Average distance travelling empty	=	110 m
Traffic factor	=	0.90

   Determine the number of vehicles required to satisfy the delivery demand. Also determine the handling system efficiency.

   b) Write a short note on :

   i) Automated Guided Vehicle,

   ii) Automatic Storage and Retrieval System. **8**

   OR

6. a) Give classification of Automated material handling equipments. **4**

   b) Explain with a neat sketch use of machine vision system in material handling system. What are its advantages ? **6**

   c) Explain in brief different guiding system in AGV. **5**

SECTION – II

Unit – IV

7. a) Explain with graph the effect of following parameters on MRR in USM - Work / Tool hardness, Abrasive concentration, viscosity. **6**

   b) Explain the RC circuit used in EDM machine. **6**

   c) Discuss with block diagram wire cut EDM. **6**

OR

8. a) Explain the principle of working of AJM process in comparison to WJM. **6**

   b) Explain with neat sketch IBM. **6**

   c) What are the different elements of ECM process ? If Iron is being machined using NaCl solution. Explain different chemical reaction those will take place on anode and cathode. **6**

Unit – V

9. a) Discuss various factors considered while designing the foundation of machine tool. Explain the method of vibration isolation. **8**

   b) Explain the maintenance policy, procedure adopted for CNC machine tool. **8**

OR

10. a) Write a short note on Reliability analysis of machine tool. **4**

    b) How do you select a new machine tool for purchase. **4**

    c) What types of adaptive controls are employed on NC machine ? Explain with neat diagram any one of them. **8**

Unit – VI

11. a) Explain with neat sketch bevel gear manufacturing by generation method. **8**

    b) Explain with neat sketch any two gear finishing processes used for spur gear. **8**

OR

12. a) Explain helical gear machining by using left hand/right hand hob. **4**

    b) A cutter of 80 teeth is manufacturing a gear of 100 teeth of having face width of 12 mm. The cutter is rotating at a rpm of 40. Feed used is 0.3 mm/rev. Calculate machining time for gear machining. **6**

    c) Explain with neat sketch gear shaping process. **6**

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T.E. (Production S/W) (Semester – I) Examination, 2011
MANUFACTURING TECHNOLOGY (Self Study)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
5) Assume suitable data, if necessary.
*6) **All** questions are **compulsory**.*

SECTION – I

1. a) Estimate the material removal rate in AJM of a brittle material with flow strength of 4 GPa. The abrasive flow rate is 2 gm/min, velocity is 200 m/s and density of abrasive is 3 gm/cc. **6**

   b) For abrasive jet machining enlist process parameters and with the help of performance curves explain effect of process parameters on MRR. **10**

OR

1. Describe the basic mechanism of material removal in **(any two)** : **16**

   1) Ultrasonic machining
   2) Electro-discharge machining
   3) Wire-cut EDM
   4) Electrochemical machining

   Also identify process parameters.

2. Explain following for plastic processing : **16**

   1) Elastomers
   2) Calendaring
   3) Thermoforming
   4) Molding processes for plastics.

OR

2. i) Explain casting, laminating and reinforcing for plastic processing. **8**

   ii) Explain various design considerations in plastic processing. **8**

3. a) Explain importance of Micro Electro Mechanical Systems (MEMS). Enumerate various considerations in fabrication of micro electronic devices. **14**

   b) Explain lithography and etching for fabrication of micro-electronic devices. **4**

OR

3. Write short notes on following **(any three)** : **18**

   i) Nano-Technology

   ii) Nano-fabrication

   iii) Top down and bottom up manufacturing

   iv) Yield and reliability in MEMS fabrication.

SECTION – II

4. a) Explain with neat sketch working mechanism of dial indicator. **12**

   b) Draw sketch showing principle of optical comparator (only sketch) . **4**

OR

4. Explain following for measurements by light wave interference : **16**

   i) Optical flat

   ii) Fringe patterns and their interpretation

   iii) NPL flatness interferometer

   iv) Convex and irregular surfaces.

5. a) Explain principle and applications of measuring instruments of optical protractor and sine bar. **12**

   b) Draw only sketch showing principle of operation of spirit level. **4**

OR

5. Explain **any two** of following : **16**

   i) Angle Gauges

   ii) Clinometer

   iii) Autocollimator.

6. a) Explain objectives and functions of cost estimating. Also discuss principle factors in estimating. **10**

   b) In regard with estimation of weights and materials, discuss the need of scrap and provision of scrap in manufacturing. **8**

OR

6. Write short notes on following **(any three)** : **18**

   i) Methods of depreciation

   ii) Replacement techniques

   iii) Time value of money

   iv) Densities of metals.

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T.E. (Electrical) (Semester – I) Examination, 2011
MICROCONTROLLER AND ITS APPLICATIONS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain in detail classification of microcontrollers based on various factors. **8**

   b) Explain RAM organisation of 8051 microcontroller. **8**

   OR

2. a) With the help of block diagram of 8051 microcontroller explain function of each block. **10**

   b) With the help of status flag register explain various status flags of 8051 microcontroller. **6**

3. a) Explain various interrupts of 8051, default priority, flag used for each interrupt with vector location address. **8**

   b) Write an assembly language program to add two 32 bit hexadecimal numbers stored at following interval

   RAM

40 H – byte 1 of Number 1	50 H – byte 1 of Number 2
41 H – byte 2 of Number 1	51 H – byte 2 of Number 2
42 H – byte 3 of Number 1	52 H – byte 3 of Number 3
43 H – byte 4 of Number 1	53 H – byte 4 of Number 4

   Store result at 60 H onwards. **8**

   OR

P.T.O.

4. a) Explain various modes of timer of 8051. **8**

   b) Write an assembly language program to add two arrays starting from 40 H onwards and 50 H onwards in internal RAM. Store the result in third array with starting address of 60 H. The length of array is of H. **8**

5. a) What is difference between RET and RETI instructions ? Explain why we cannot use RET instruction instead of RETI instruction in ISR. **9**

   b) Write an assembly language programme to find smaller number out of two numbers stored in external RAM A000H and A001H. Store smaller number at external RAM location B000H. **9**

OR

6. a) Explain bit level and byte level jump instructions. **8**

   b) Write an assembly language program to perform logical AND operations on p 1.0 and p 1.1 and output the result of logical AND operation on p 1.2. **4**

   c) Write an assembly language program to search a byte A0 from a array of 4 numbers and store location address (internal RAM) at external memory location C000H. **6**

SECTION – II

7. a) Explain the salient features of members of MCS-51 family. **8**

   b) Explain steps to transfer data serially in 8051 and receive data serially. **8**

OR

8. a) Write a short notes on simulator, emulator, assembler and compiler used for 8051. **8**

   b) Explain 8051 communication with computer through RS 232. **8**

9. a) Draw the interfacing diagram and explain control of stepper motor with 8051 microcontroller. **8**

   b) Draw and explain interfacing diagram of 8051 to control DC motor. **8**

OR

10. a) With the help of block diagram explain temperature measurement scheme using 8051 microcontroller. **8**

    b) With the help of block diagram explain flow measurement scheme using 8051 microcontroller. **8**

11. Explain interfacing diagram for measurement of following electrical parameters with the help of 8051 i) measurement of frequency ii) measurement of apparent power. **18**

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T.E. (Electrical) (Semester – I) Examination, 2011
ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING
(New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any one** question from **each** Unit.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

Unit – I

1. a) Classify different supply systems and compare the relative amount of material required, assuming maximum voltage to earth in the following cases :

   i) ac, 1 phase, 2 wire overhead system

   ii) ac, 3 phase, 4 wire overhead system.

   State the assumptions made in comparison. **10**

   b) Compare overhead and underground supply system stating their advantages and disadvantages. **8**

OR

2. a) Explain the terms feeder and distributor and discuss the factors to be considered in designing the overhead feeder and distributor. **10**

   b) A single phase ac distributor ABC is 400 meter long and AB = BC. It is fed from end A and loaded as i) 80 Ampere at 0.707 p.f. lag at B and ii) 150 Ampere at 0.8 p.f. lag at C.

   The resistance and reactance of distributor is 0.2 ohm and 0.1 ohm per km. respectively. The load power factors are with respect to voltage at C. Calculate the magnitude of total voltage drop in the distributor. **8**

P.T.O.

Unit – II

3. a) Draw the single line diagram of typical 11 KV outdoor substation. State and explain the various equipments used in the substation. **10**

   b) State the various bus bar systems and with neat sketch explain the single bus bar arrangement with sectionalization. **6**

OR

4. a) Define and explain the terms i) touch voltage ii) step voltage. Explain how the tolerable values of touch voltage and step voltage are to be calculated. **9**

   b) State the objectives of substation grounding. State and explain the factors which affect the soil resistivity. **7**

Unit – III

5. a) Explain the preventive maintenance activities of induction motor which can be performed without actually dismantling the motor completely. **8**

   b) Explain the breakdown maintenance and preventive maintenance strategies. **4**

   c) Explain the effect of magnitude of test voltage in the measurement of insulation resistance. **4**

OR

6. a) State the basic causes of insulation degradation and explain how they affect the quality of insulation. **10**

   b) In connection with insulation resistance measurement, explain the term polarization index and its use to judge the quality of insulation. **6**

SECTION – II

Unit – IV

7. a) Describe various failure modes of transformer. **8**

   b) Explain the following in detail : **10**

      i) Dissolved gas analysis ii) Degree of polymerization.

OR

8. a) Explain with neat block diagram filtration of transformer oil. **8**

   b) Explain partial discharge in transformer. Also give details of various methods of measuring partial discharge in transformer. **10**

Unit – V

9. a) What is thermography ? Write its applications for condition monitoring of Electrical equipments. **8**

   b) Explain various abnormal conditions and causes of failure of induction motor. **8**

OR

10. a) Describe the various failure modes of power cable. Also explain various tests conducted on power cables. **8**

    b) Write short notes on : **8**

       i) Signature Analysis

       ii) Tan Delta measurement.

Unit – VI

11. Explain working principle, trouble shooting and maintenance of : **16**

    i) Electric fan

    ii) Washing machine.

OR

12. Describe in detail trouble shooting and maintenance of : **16**

    i) Electric mixer ii) Refrigerator

    iii) Electric Oven iv) Microwave Oven

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T.E. (Electrical) (Semester – II) Examination, 2011
POWER SYSTEM – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) What do you mean by receiving end circle diagram ? **2**

   b) Explain the procedure of drawing the receiving end circle diagram. **6**

   c) A 275 kV, three phase line has the following line parameters :

   $A = 0.93 \angle 1.5^\circ, \quad B = 115 \angle 77^\circ$

   If the receiving end voltage is 275 kV determine :

   i) Sending end voltage required, if a load 250 MW at 0.85 p.f. (lagging) is being delivered at receiving end.

   ii) The maximum power that can be delivered if the sending end voltage is held at 295 kV. **8**

OR

2. a) Explain 'Surge Impedance Loading' and methods to improve it. **8**

   b) Explain the following concepts used in power system :

   i) Compensation

   ii) Complex power. **8**

P.T.O.

3. a) What are the advantages and drawbacks of EHV transmission ? **8**

   b) The power of 12000 MW is required to be transmitted over a distance of 1000 km at voltage level of 750 kV, at 50 Hz. The angle between receiving and sending end is 30°. The average values of line parameter :

   r Ω / phase / km = 0.0136

   X Ω / phase / km = 0.272

   Determine :

   i) Possible number of circuits required with equal magnitude of sending and receiving end voltage, with 30° phase difference.

   ii) The current transmitted per phase.

   iii) Total line loss in percentage of power handling capacity. **8**

OR

4. a) Explain the phenomena of 'corona' in E.H.V. A.C. transmission. **6**

   b) Explain in brief following terms : **4**

   i) Disruptive critical voltage

   ii) Visual critical voltage.

   c) In three phase overhead line the conductor have each diameter of 30 mm and arranged in the form of an equilateral triangle. Assuming fair weather conditions air density factor is 0.95 and irregularity factor 0.95. Find the minimum spacing between the conductors if the disruptive critical voltage is not to exceed 230 kV between the lines. Breakdown strength of air may be assumed to be 30 kV per cm (peak). **6**

5. a) Explain the use of impedance and reactance diagram in power system analysis with an illustration. **8**

   b) A 12 MVA, 15 kV, three phase alternator has a reactance of 12% and is connected through a $\Delta - Y$ transformer to a high voltage transmission line having a total reactance of 100Ω and voltage 138 kV. A load of 13.8 kV, 15 MVA with an impedance of (0.85 + j0.526) is connected at the end of line through Y – Y transformer. Both transformer banks are composed of three single phase transformers connected for three phase operation. Each transformer is rated 6.5 MVA, 13.8/138 kV with a reactance of 10%. Choose a base MVA as 15 MVA and base kV as 13.8 kV from load ckt. Draw the reactance diagram and determine the terminal voltage of generator. Neglect resistance of load. **10**

OR

6. a) Explain in detail the subtransient transient and steady, states at the 3 phase S.C. fault condition on an unloaded alternator, and explain how you will find subtransient, transient and steady state currents ? **10**

   b) A three phase T.L. operating at 11 kV and having a resistance at 0.8Ω and reactance at 2.4Ω is connected to generating station bus bar through 6 KVA transformer having a resistance of 5%. The bus bar is supplied by a 10 MVA alternator having 15% reactance. Calculate S.C. KVA fed to symmetrical fault between phases.

   If it occurs at

   i) Load end of T.L.

   ii) High voltage terminals of transformer.

   Consider transformer of transformation ratio = 1, base MVA = 10 MVA, base kV = 11 kV. **8**

SECTION – II

7. a) State **true** or **false** in case of the following statement with reasons.

   i) The zero sequence impedance of three phase transmission line is generally 2.5 times that of positive sequence impedance.

   ii) The negative sequence reactance is the average of direct and quadrature axis subtransient reactances.

   iii) The neutral grounding impedance Z_n appears as $3Z_n$ in the zero sequence equivalent circuit.

   iv) For a fault at the terminals of an alternator with solidly grounded neutral, a single line to ground fault is generally more severe than a three phase fault.

   v) It is possible to know the type of fault from the knowledge of the sequence components of fault current. **10**

   b) The original set of voltage phasors $V_a = 4$, $V_b = 3\angle -90^\circ$ and $V_c = 8\angle 143.1^\circ$ volts. Find all the voltage components for positive, negative and zero sequence systems. **8**

OR

8. a) Derive the expression for fault current in case of L-L-G fault through a fault impedance Z_f in terms of sequence. Draw the sequence network for this type of fault. **10**

b) A power system when subjected to different types of fault at a location where actual values were 30 MVA and 120 kV. The fault currents observed are :

Fault Type	Fault current in Amps
Three phase fault	988 A
L – G fault	1203 A
L – L fault	856 A

Find the p.u. value of equivalent positive, negative and zero sequence reactance at the fault point. Consider actual and base values of MVA and kV same, at fault pt. **8**

9. a) Explain with suitable example the method to express circuit equations in the form $[I]_{bus} = [Y]_{bus} [V]_{bus}$. Explain the significance and nature of elements of $[Y]_{bus}$ along with a simple method to form $[Y]_{bus}$ matrix for a power system. **8**

b) Explain the Newton-Raphson method for load flow analysis along with flow chart. **8**

OR

10. a) Write a general form of power flow equations for n-bus power system and explain
   i) Nature and characteristics of equations
   ii) Various constraints to be considered
   iii) Types of buses. **8**

b) An incomplete nodal admittance matrix for a four bus system with negligible charging admittance is given below. Find out the missing elements

$$\begin{bmatrix} 1.372 - j\,5.491 & -0.392 + j\,1.569 & -0.588 + j\,2.353 & Y_{14} \\ Y_{21} & Y_{22} & -1.176 + j\,4.706 & 0 \\ Y_{31} & Y_{32} & Y_{33} & -1.176 + j\,4.706 \\ Y_{41} & Y_{42} & Y_{43} & Y_{44} \end{bmatrix}$$

All values are in p.u. **8**

11. a) Explain with reasons in short :
   i) HVDC transmission is economical and preferable over HVAC transmission for long distance only.
   ii) Modern HVDC systems use 12 pulse converters.
   iii) HVDC transmission offers less corona loss.
   iv) Reliability of HVDC transmission is more. **8**

b) What are the recent development in HVDC transmission system ? Discuss future scope of HVDC transmission systems in India. **8**

OR

12. a) Explain constant current control method for HVDC transmission system. **8**

b) Explain the different types of HVDC links. Name any two HVDC systems in India. **8**

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T.E. (Electrical) (Semester – II) Examination, 2011
ENERGY AUDIT AND MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

Unit – I

1. a) Explain salient features of Electricity Act 2003. **8**

   b) Explain in detail long term policies of Govt. of India. **8**

   OR

2. a) Explain in detail various energy sources with examples : **8**
      i) Primary and secondary energy sources
      ii) Conventional and non-conventional energy sources.

   b) What do you mean by energy security ? Explain few strategies to ensure energy security of our country. **8**

Unit – II

3. a) Explain Demand Side Management concept with advantages and disadvantages. **8**

   b) Explain the duties of Energy Manager and Energy Auditor. **8**

   OR

P.T.O.

4. a) What is Demand Side Management ? What are the different areas of development ? And what are the barriers of Demand Side Management ? **8**

   b) Explain Energy Management term and general structure of Energy Management. **8**

Unit – III

5. a) Explain step wise procedure to carry out detailed energy audit. **8**

   b) Explain following techniques with their use for energy analysis :

      i) Sankey diagram

      ii) CUSUM technique. **10**

OR

6. a) Explain the difference between internal and external bench-marking. What are the benefits of bench-marking energy performance ? **8**

   b) Explain various instruments with function of each used to carry out energy audit. **10**

SECTION – II

Unit – IV

7. a) Explain following financial analysis terms : **8**

      i) Simple Pay Back Period

      ii) Return on Investment (ROI)

      iii) Internal Rate of Return (IRR)

      iv) Net Present Value (NPV).

   b) Write a short note on : **8**

      i) TOD Tariff

      ii) ABT Tariff.

OR

8. a) What are the objectives of carrying out sensitivity analysis ? And what are the different factors that are considered for the sensitivity analysis ? **8**

   b) Calculate simple pay back period and % Return on Investment (%ROI) for a project that cost Rs. 60 Lakhs and Rs. 5 Lakhs per year on an average to maintain and operate and is expected to save annually Rs. 20 lakhs. Comment on ROI whether to implement the project. **8**

Unit – V

9. a) Explain various energy conservation opportunities in illumination and pumping system. **8**

   b) Explain various heat recovery systems used in Boiler. **10**

OR

10. a) Explain with advantages and disadvantages of various cycles of co-generation. **8**

    b) Explain energy conservation opportunities in motive power applications. **10**

Unit – VI

11. Explain energy audit case studies in following sector with various energy saving opportunities :

    i) Sugar Industry

    ii) Municipal Corporation. **16**

OR

12. Explain energy audit case studies of following sector :

    1) T & D sector

    2) Agricultural sector. **16**

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T.E. (Electronics) (Semester – I) Examination, 2011
NETWORK SYNTHESIS AND FILTER DESIGN (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Black figures to the **right** indicate **full** marks.*

*4) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*

*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What is Hurwitz's polynomial ? State and explain properties of the same in details. **6**

   b) Test the following for positive real function (p.r.f.) **12**

   i) $F(s) = \dfrac{2s^3 + 2s^2 + 3s + 2}{s^2 + 1}$

   ii) $F(s) = \dfrac{s^4 + 3s^3 + s^2 + s + 2}{s^3 + s^2 + s + 1}$

OR

2. a) Explain in details the testing procedure for p.r.f. **6**

   b) Determine the range of 'k' so that polynomial F (s) = $s^3 + 3s^2 + 2s + k$ is Hurwitz. **6**

   c) Synthesize the following polynomial by removal of poles at $s = \infty$

   $$Z(s) = \frac{6s^3 + 3s^2 + 3s + 1}{6s^3 + 3s}$$ **6**

P.T.O.

3. a) State and explain the reactance curves for LC function. **4**

   b) Identify the following function as RC, RL and LC function and synthesize the same in either Foster – I or Cauer – I form **12**

   i) $F(s) = \dfrac{2(s+2)(s+4)}{(s+3)(s+6)}$

   ii) $F(s) = \dfrac{(s^2+1)(s^2+9)}{s(s^2+4)}$

   OR

4. a) What are the necessary properties for synthesis of a driving point RC impedance function ? **6**

   b) A designer requires a network with following data : **10**

   i) The impedance function has simple poles at -2 and -6

   ii) It has simple zeros at -3 and -7

   iii) $Z(0) = 20$ ohms

   Is it possible to synthesize $Z(s)$ as a passive network ? If possible realize $Z(s)$ in Cauer II and Foster II form.

5. a) What is zeros of transmission ? Explain the concept in detail. **6**

   b) Realize the following function : **10**

   i) $Z_{21} = \dfrac{s^3}{s^3+3s^2+4s+2}$

   ii) $\dfrac{V_2}{V_1} = \dfrac{s^2+1}{s^2+2s+1}$

   OR

6. a) If the lattice network is terminated in resistance R. What is the condition that it is a constant resistance network ? **6**

   b) Synthesize the following function : **10**

   i) $\dfrac{V_2}{V_1} = \dfrac{1}{2}\dfrac{(s-1)(s^2-2s+2)}{(s+1)(s^2+2s+2)}$

   ii) $\dfrac{V_2}{V_1} = \dfrac{Z_{21}}{Z_{11}} = \dfrac{k}{(s+2)(s+4)}$

SECTION – II

7. a) Write the properties of squared magnitude function. **4**

   b) What is frequency transformation ? Explain the concept with the help of LP to LP, LP to HP and LP to BP transformation. **6**

   c) Determine the transfer function for the design of an analog butterworth filter that has a -2 dB pass band attenuation at a frequency of 20 rad/sec and at least 10 dB stop band attenuation at 30 rad/sec. **8**

OR

8. a) Differentiate between passive and active filters. **4**

   b) Explain in details the properties of Chebyshev polynomial. **6**

   c) Design a passive third order Butterworth band pass filter for the following specifications. **8**

      1) Stop band, $\omega \leq 30$ k rad/sec and $\omega \geq 120$ k rad/sec

      2) Pass band, 50 k rad/sec $< \omega <$ 72 k rad/sec

9. a) Explain basic sallen and key structure used for second order filter. **4**

   b) Explain in detail cascade approach for active filter design. **4**

   c) Synthesize the second-order LPF to have a pole frequency of 10 KHz and a pole Q of 5 using Saraga design of Sallen and key circuit. **8**

OR

10. a) What are the different approaches for active filter design ? Explain direct realization approach in detail. **8**

    b) Synthesize the following transfer function using a positive feedback circuit.

$$H(s) = \frac{20000}{s^2 + 100s + 10000}$$ **8**

11. a) Explain the concept of w and Q sensitivity. **4**

b) What is the maximum frequency which can be applied without the slew rate distortion with maximum possible output voltage swing ? **4**

c) Prove the following sensitivity relationships. **8**

i) $S_x^{p^n} = nS_x^p$ ii) $S_{\sqrt{x}}^p = 2S_x^p$

iii) $S_x^{y+c} = \frac{y}{y+c} S_x^y$ iv) $S_{x^2}^p = \frac{1}{2} S_x^p$

OR

12. a) Explain in detail the effect of op-amp frequency on filter performance. **6**

b) Find the transfer function $\left(\frac{V_2}{V_1}\right)$ for a passive circuit as shown in Fig. (1).

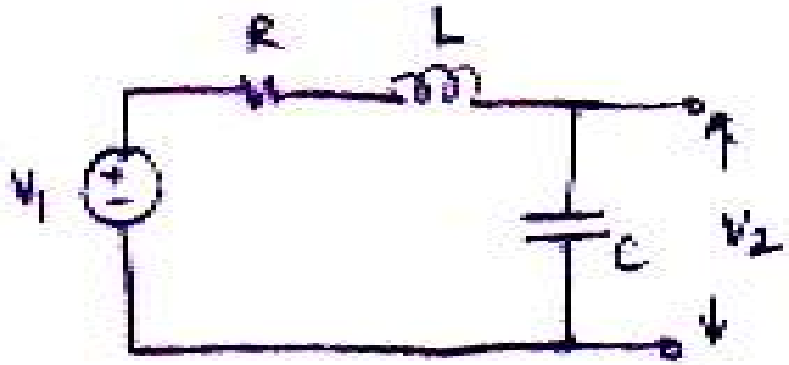

Fig. (1)

Compute the sensitivities of K_1 W_p and Q_p to the elements. **10**

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T.E. (Electronics and Telecommunication) (Semester – II) Examination, 2011
SIGNAL CODING AND ESTIMATION THEORY (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*

*ii) Answer to the **two** Sections should be written in **separate** answer books.*

*iii) **Neat** diagrams must be drawn **wherever** necessary.*

*iv) Assume suitable data if **necessary**.*

*v) Use of Electronic Pocket Calculator is **allowed**.*

*vi) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Describe LZW (Lempel-Ziv-Welch) algorithm to encode byte streams. **4**

b) A zero memory source emits six messages (m1, m2, m3, m4, m5, m6) with probabilities (0.30, 0.25, 0.15, 0.12, 0.10, 0.08) respectively. Find :

i) Huffman code. **3**

ii) Determine its average word length. **3**

iii) Find entropy of the source. **3**

iv) Determine its efficiency and redundancy. **3**

OR

2. a) Explain the Mutual Information. **4**

   b) A zero memory source emits six messages (N, I, R, K, A, T) with probabilities (0.30, 0.10, 0.02, 0.15, 0.40, 0.03) respectively. Given that 'A' is coded as '0'. Find :

      i) Entropy of source. **4**

      ii) Determine Shannon Fano Code and Tabulate them. **4**

      iii) What is the original symbol sequence of the Shannon Fano coded signal (110011110111111110100). **4**

3. a) Explain with the help of neat diagram JPEG algorithm. **6**

   b) For a Gaussian Channel

   $C = B.\log_2 ((1 + (E_b/N_0) (C/B))$

      i) Find Shannon limit.

      ii) Draw the bandwidth efficiency diagram with (E_b/N_0) dB on horizontal axis and (Rb/B) on vertical axis. Mark different regions and Shannon limit on the graph. **10**

OR

4. a) A voice grade channel of the telephone network has a bandwidth of 3.4 kHz. Calculate the information capacity of the telephone channel for SNR of 30 dB. **6**

   b) Find a generator polynomial g(x) for a systematic (7, 4) cyclic code and find the code vectors for the following data vectors : 1010, 1111, 0001 and 1000.

   Given that $x^7 + 1 = (x + 1) (x^3 + x + 1) (x^3 + x^2 + 1)$. **10**

5. For systematic rate $\frac{1}{2}$ convolutional code n = 2, k = 1 and constraint length K = 2; parity bit is generated by the mod-2 sum of the SR output as P = X + 1 that is g(1, 1) = (1 1).

   1) Draw the figure of convolutional encoder and decoder. **4**

   2) Find out the output for message string {10110...}. **4**

   3) Draw state diagram. **4**

   4) Explain Viterbi algorithm for decoding. **6**

OR

6. A convolutional encoder is rate $\frac{1}{2}$, constraint length K = 3, it uses two paths to generate multiplexed output. It consists of two mod-2 adder and two SR. The path 1 has $g^1(D) = (1 + D^2)$ and path 2 has $g^2(D) = (1 + D + D^2)$.

   1) Draw encoder diagram. **6**

   2) Draw the State diagram. **6**

   3) Find out the output for message input of (1 0 0 1 1). **6**

SECTION – II

7. Consider the decoding of (15, 5) error correcting BCH code with generator polynomial g(x) having $\alpha, \alpha^2, \alpha^3, \alpha^4, \alpha^5, \alpha^6$ as roots. The roots $\alpha, \alpha^2, \alpha^4$ have the same minimum polynomial

   $$\phi_1(X) = \phi_2(X) = \phi_4(X) = 1 + X + X^4 \ldots$$

   The roots α^3 and α^6 have same minimum polynomial

   $$\phi_3(X) = \phi_6(X) = 1 + X + X^2 + X^3 + X^4 \ldots$$

The minimum polynomial of α^5 is $\phi_5(X) = 1 + X + X^2$

i) Find g(x) as LCM $\{\phi_1(X), \phi_3(X), \phi_5(X)\}$. **6**

ii) Let the received word be (0 0 0 1 0 1 0 0 0 0 0 0 1 0 0) that is $r(x) = x^3 + x^5 + x^{12}$ find the syndrome components given that $1 + \alpha^6 + \alpha^9 = \alpha^{10}$ and $1 + \alpha^{12} + \alpha^{18} = \alpha^5$. **6**

iii) Through iterative procedure if the error location polynomial is $\sigma(x) = \sigma^6(x) = 1 + x + \alpha^5 x^3$ ... having roots $\alpha^3, \alpha^{10}, \alpha^{12}$ ... What are the error location number and error pattern e(x) ? **6**

OR

8. a) Write RSA algorithm for generating public key and private key for encryption and decryption of plain text. **6**

b) Plain text was encrypted using RSA key (Kp = 33, 3). English alphabets (A, B.. upto Z) are numbered as (1, 2.. upto 26) respectively. The encrypted Ciphertext (C) transmitted as (28, 21, 20, 1, 5, 5, 26). The received signals are decrypted using key (Ks = 33, 7). Find out the symbols i.e. alphabets after decryption. Given algorithm to avoid exponentation operation. **12**

C : = 1; begin for i = 1 to E do

C : = MOD (C . P, N); end. Where E is exponent ?

9. a) Let Y1, Y2, ..., Yk be the observed random variables, such that

Yk = a + bxk + Zk, k = 1, 2, ..., K

The constants xk, k = 1, 2, ..., K are known, while the constants a and b are not known. The random variables Zk, k = 1, 2, ..., K, are statistically independent, each with zero mean and variance σ^2 known. Obtain the ML estimate of (a, b). **10**

Given the likelihood function is :

$$L(a,b) = \frac{1}{\left(\sqrt{2\pi\sigma}\right)^k} \exp\left\{ -\frac{1}{2\sigma^2} \sum_{k=1}^{k} [y_k - (a + bx_k)]^2 \right\}$$

b) Let Y_1 and Y_2 be two statistically independent Gaussian random variables, such that $E[Y_1] = m$, $E[Y_2] = 3m$, and $var[Y_1] = var[Y_2] = 1$; m is unknown. Obtain the ML estimates of m. **6**

OR

10. a) Consider the problem where the observation is given by Y = *l*n X + N, where X is the parameter to be estimated. X is uniformly distributed over the interval [0, 1] and N has an exponential distribution given by

$f_N(n) = e^{-n}$, $n \geq 0$

$= 0$, otherwise

Obtain the mean-square estimate, x^ms. **10**

b) Let Y1, Y2, ..., Yk be K independent variables with P(Yk = 1) = p and P(Yk = 0) = 1 – p, where p, $0 \leq p < 1$ is unknown

Determine the lower bound on the variance of the estimator, assuming that the estimator is unbiased. Given that : **6**

$$L(p) = f_{T|p}(y \mid p) = \prod_{k=1}^{K} f(y_k \mid p) = \begin{cases} \prod_{k=1}^{K} p^{1/k} (1-p)^{k-yk}, 1/k = 0, 1 \text{ and } k = 1, 2, \ldots K \\ 0 \qquad \text{otherwise} \end{cases}$$

$= p^{Ky} (1 – p)^{K-Ky}$; since the Y_ks are iid.

11. a) A rectangular pulse of known amplitude A is transmitted starting at time instant t0 with probability 1/2. The duration T of the pulse is a random variable uniformly distributed over the interval [T1, T2]. The additive noise to the pulse is white Gaussian with mean zero and variance N0/2. Determine the likelihood ratio. **10**

b) In a binary detection problem, the transmitted signal under hypothesis H1 is either s1(t) or s2(t), with respective probabilities P_1 and P_2. Assume P1 = P2 = 1/2, and s1(t) and s2(t) orthogonal over the observation time $t \in [0, T]$. No signal is transmitted under hypothesis H0. The additive noise is white Gaussian with mean zero and power spectral density N0/2. Obtain the optimum decision rule, assuming minimum probability of error criterion and P(H0) = P(H1) = 1/2. **6**

OR

12. In a simple binary communication system, during energy T seconds, one of two possible signals s0(t) and s1(t) is transmitted. Our two hypotheses are

H0 : s0(t) was transmitted

H1 : s1(t) was transmitted

We assume that s0(t) = 0 and s1(t) = 1 $0 < t < T$

The communication channel adds noise n(t), which is a zero-mean normal random process with variance 1. Let x(t) represent the received signal :

$x(t) = s_i(t) + n(t)$ i = 0, 1

We observe the received signal x(t) at some instant during each signaling interval. Suppose that we received an observation X = 0.6.

a) Using the maximum likelihood test, determine which signal is transmitted. The pdf of x under each hypothesis is given by **10**

$$f(x \mid H_0) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$$

$$f(x \mid H_1) = \frac{1}{\sqrt{2\pi}} e^{-(x-1)^2/2}$$

b) Derive the Neyman-Pearson test. **6**

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T.E. (E&TC) (Semester – II) Examination, 2011
COMPUTER ORGANISATION AND ARCHITECTURE (New)
(2008 Pattern)

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. a) Draw and explain the Von Neumann architecture. **8**

   b) Using Booth's algorithm multiply the following : **8**

   Multiplicand = +12

   Multiplier = –5

OR

2. a) Describe the IEEE standard for single precision and double precision floating point numbers. **6**

   b) Describe the following addressing mode with example : **6**

   1) Immediate

   2) Auto-increment

   3) Index.

   c) Represent (182.5217) in single precision floating point format. **4**

3. a) Write control sequence for execution of the instruction ADD (R_3), R_1 using single bus organisation (with flow chart). **8**

   b) What are the advantages and disadvantages of Hardwired and micro-programmed control ? **8**

OR

4. a) Draw and explain Multiple bus organisation. **8**

   b) Explain execution of complete instruction with the help of example. **8**

P.T.O.

5. Write short note on : **18**

   1) Memory interleaving

   2) Arbritation technique

   3) USB.

OR

6. a) Explain exception used for debugging the program. **8**

   b) Explain interface between keyboard and processor. Also explain communication between them. **10**

SECTION – II

7. a) Explain the function of following pins **8**

   i) NMI ii) $MN/\overline{MX}$ iii) TEST iv) $\overline{BHE}$

   v) $DT/\overline{R}$ vi) DEN vii) QS_0-QS_1 viii) LOCK

   b) Draw the bit pattern for flag register of 8086 and explain significance of each bit. **8**

OR

8. a) Write an assembly language program to calculate average of 8-bit numbers stored in memory. (Memory location start from 2000 : 1000 to 2000 : 1009 store result to 3000 : 1000). **8**

   b) Compute physical address for specified operand in each of the following instructions. Register contents and variables are as follows. **8**

   CS = 0B00H, DS = 0C00H, SI = 1000H, DI = 0200H, BX = 0300H.

   1) MOV [BX]0300H, CX

   2) MOV BL, [SI].[BX]

   3) MOV $B\dot{X}$, [00FEH]

9. a) Explain architecture of 80386 with neat block diagram. **8**

   b) List various modes of 80386 and explain steps to switch from real mode to protected mode. **8**

OR

10. a) Draw format of segment descriptor register in detail. **8**

    b) What is paging ? Explain how 32-bit physical address is generated in 80386 with paging enabled. **8**

11. a) Compare RISC and CISC processor. **6**

    b) Draw and explain ARM-core data flow model. **6**

    c) Draw format of program status register of ARM processor and explain the significance of each bit in it. **6**

OR

12. a) What is the difference between loosely coupled and tightly coupled multiprocessor system ? **6**

    b) Write note on super-scalar and super pipelining. **6**

    c) Draw and explain the 3-stage pipeline of ARM-organisation. **6**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
INSTRUMENTATION FOR CHEMICAL ANALYSIS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Classify various chemical analytical methods and give example of each type. **10**
   b) Compare classical and instrumental methods of chemical analysis. **6**

OR

2. a) Explain principle and instrumentation used for coulometry. **8**
   b) Explain principle and instrumentation used for voltametry. **8**

3. a) With a neat diagram, explain working and of double beam UV-visible Spectrophotometer. **10**
   b) Explain principle and working of Atomic absorption spectrophotometer. **8**

OR

4. a) With a neat diagram, explain working and of double monochromator UV-visible spectrophotometer. **10**
   b) What is background correction in atomic absorption spectrophotometer ? Discuss any one type of background correction. **8**

5. a) With the help of a neat diagram, explain Inductively Coupled Plasma (ICP) torch. **8**
   b) With a neat diagram, explain working and principle of flame photometer. **8**

OR

P.T.O.

6. a) Enlist various IR detectors and sources and explain any one of them in detail. **8**

   b) What are the advantages of FTIR spectrophotometer over dispersive IR spectrophotometer. **8**

SECTION – II

7. a) Explain construction and working of Raman Spectrometer. **8**

   b) Explain chemical shift and spin-spin decoupling in NMR. **8**

OR

8. a) Explain N_2 and CO_2 Gas Analyzer. **8**

   b) Explain concept of Fluorescence and derive the relation between the concentration and Fluorescence. **8**

9. a) Enlist detectors used in HPLC and GC. Explain in detail anyone detector used in GC. **10**

   b) Explain the concept of Mass Spectrometry and discuss Magnetic Deflection Mass Spectrometer. **8**

OR

10. a) With the help of neat diagram explain Gas chromatography also explain sample introduction system in Gas chromatography. **10**

    b) Enlist different types of Mass analyzers and explain anyone in detail. **8**

11. a) Enlist various radiation detectors and explain GM counter. **8**

    b) Explain X-ray diffractometer with required instrumentation. **8**

OR

12. Write short notes on : **16**

    a) Scintillation counter

    b) Application of Bragg's law.

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
EMBEDDED SYSTEM DESIGN (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw and explain the power on reset circuit of 8051. For how much time should the reset pin be active ? **8**

   b) Describe the dual role of Port 0 of 8051 in providing data and addresses. **8**

OR

2. a) Compare the 8051 and 89C2051 microcontrollers. **8**

   b) For how much time should an interrupt be active for the 8051 to detect it ? Enlist the steps for execution of an interrupt. **8**

3. a) Explain the addressing modes in the following instructions : **8**

   i) ADD 43h, 85h
   ii) MOV A,@R0
   iii) MOVC A,@A+DPTR
   iv) ORL 61H, #21H
   v) SWAP A
   vi) MOVX @DPTR, A
   vii) DEC R2
   viii) SUBB A, #28H

P.T.O.

b) A bank has a circuit fitted to count the number of persons entering the bank. Assume that the circuit gives an output of 5 V continuously, except it transits to 0V and back on detection of a person. If 8051 is used as the controller for this application, with number of persons given out on P1 and P0, write the program and explain the connections done. **10**

OR

4. a) Ten numbers are stored in the internal memory of 8051. Write a program to find the highest number from it. **8**

b) Explain the following instructions of 8051 : **10**

i) DJNZ R5, label

ii) ADDC A, 37h

iii) MOVX A,@R0

iv) SETB PSW.0

v) XRL A,#21h

5. a) With a neat sketch explain the interfacing of 4 seven segment LED digits to 8051, using minimum number of pins. **8**

b) An application needs to transfer a message "PROCESSING" serially to a computer at a baud rate of 9600 from 8051. Explain all the SFRs required and show the calculations in detail. **8**

OR

6. a) With a neat sketch explain the interfacing of 8 bit parallel ADC to 8051. **8**

b) Write a short note on SPI communication and how it can be implemented with 8051 ? **8**

SECTION – II

7. a) Explain the register file structure of AVR microcontrollers. **8**

   b) Compare the ATTiny2313 and ATMega 8535 microcontrollers. **8**

OR

8. a) Explain Timer 0 operation of AVR microcontrollers. **8**

   b) What is a watch dog timer ? Explain the watch dog timer in AVR microcontrollers. **8**

9. a) Explain the AVR hardware design issues with respect to Power Supply. **8**

   b) Explain the RS232 communication link of AVR microcontrollers. **8**

OR

10. a) Explain the following instructions of AVR microcontrollers : **8**

   i) CALL k ii) RJMP k

   iii) SBRS Rd, b iv) EOR Rd, Rs

   b) The AVR microcontrollers have four sources of reset. viz : **8**

   i) power on reset

   ii) external reset

   iii) watchdog reset

   iv) brownout reset

   Discuss on each source of reset.

11. a) With a neat schematic, explain the interfacing of 16 X 2 LCD display to AVR microcontroller. **10**

   b) With a neat diagram explain the interfacing of RTC to the AVR microcontroller. **8**

OR

12. Discuss the Design of Dual Channel Voltmeter, with a 3 digit LED seven segment display, with RS 232 interface using AVR microcontroller based on the following points :

   a) Block diagram **4**

   b) Description **4**

   c) Selection of ICs for the system **6**

   d) A general algorithm **4**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
INDUSTRIAL MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

1. a) State and explain various functions of management. Describe the role of managers in a competitive business scenario. **10**

   b) Critically evaluate the importance of SWOT analysis in developing sustainable business strategy. **8**

   OR

2. a) What is BCG matrix ? How it evaluates business environment ? Explain with examples. **9**

   b) Explain the following :
      i) Porter's five forces of competition.
      ii) Ishikawa diagrams and reverse Ishikawa. **9**

3. a) Briefly explain the salient features of ISO-9000 and ISO-14000 quality standards. **8**

   b) What is statistical process control ? Explain its techniques. **8**

   OR

4. a) Explain the following business strategies :
      i) Diversification
      ii) Mergers and take overs. **8**

   b) State and explain the importance of supply chain management. **8**

P.T.O.

5. a) An automobile company uses 36000 units of a particular component per year. The ordering cost is Rs. 500 per order and inventory carrying cost is estimated at 20% of average inventory value. The cost per unit of the component is Rs. 10. Assuming 300 working days in a year, determine :
   i) EOQ
   ii) No. of orders/year
   iii) Inventory Cycle and
   iv) Total Inventory Cost. **10**

   b) What is ABC analysis ? How it evaluates the inventory to reduce cost ? **6**

OR

6. Define production planning and control. Explain the functions and techniques of production planning and control. **16**

SECTION – II

7. a) Define Motivation. Explain Maslow's Theory of Motivation. **8**

   b) State and explain various methods of Training. How it influence productivity ? **8**

OR

8. Define Man Power Planning. Explain its functions, importance and techniques. **16**

9. a) State and explain the concept of Break-Even Analysis. Draw CVP graph and what are its assumptions ? **8**

   b) A project consists of the following activities with duration :

Activities	**Nodes**	**Duration/Week**
A	1 – 2	10
B	2 – 3	06
C	2 – 4	05
D	2 – 5	07
E	3 – 6	09
F	4 – 6	04
G	5 – 6	17

H	6 – 7	14
I	6 – 8	13
J	7 – 9	02
K	8 – 9	22
L	9 – 10	14

Draw the network diagram. Determine critical path, total float and free float of the above activities. **10**

OR

10. a) State and explain how CPM and PERT techniques used as a tool of project net work analysis. **10**

b) Differentiate between Money Market and Capital Market. **8**

11. What is capital budgeting ? Explain various methods of capital budgeting. **16**

OR

12. State and explain the concept of disaster management. Explain in detail its causes, effects and mitigation mechanism and the impact on global warming. **16**

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[3963] – 298

T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
PROCESS LOOP COMPONENTS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Define and identify the following with respect to a typical flow control loop. **8**

   i) Controlled variable

   ii) Manipulated variable

   iii) Set point

   iv) Disturbances.

   b) Explain the use of DPT for level measurement. Explain zero elevation and zero suppression. **8**

   c) Explain need of transmitter. **2**

OR

2. a) Explain various standard signals used in process industries. Explain the concept of field area and control room area. Write any 2 components in each area. **8**

   b) Design signal conditioning circuit for Pt-100 for a temperature range of 0°C to 150°C to provide 4 to 20 mA output signal. **10**

P.T.O.

3. a) Explain ON-OFF control action in detail. Give its suitable application. **8**

   b) Explain various process lags (any two lag in detail). **4**

   c) What is meant by offset in P-mode ? **4**

OR

4. a) What is reset windup ? Explain methods to overcome the reset windup (any one method). **8**

   b) Explain any two advantages and disadvantages of P, I, D and PID control mode. **8**

5. a) Write the equations of position and velocity algorithms. **4**

   b) What is meant by tuning of controller ? List any 4 methods of tuning of controller. Explain any one method in detail. **8**

   c) Draw the front panel of digital controller. Label all parts. **4**

OR

6. a) Draw block diagram of digital controller. Give advantages and disadvantages of digital controller over analog controller. **8**

   b) Write equation for controller output for following types of controller. Explain each term in the equation : **4**

      i) P-control

      ii) PI-control

      iii) D-control

      iv) PID-control.

   c) Explain working of I-P converter. Give its application. **4**

SECTION – II

7. a) How PLC can be interfaced to pneumatic systems. Develop ladder diagram for forward and reverse motion of double acting cylinder using two limit switches. Draw interface diagram. **12**

   b) Compare conventional relay logic with programmable logic controller. Give examples of DI, DO and AI, AO. **6**

OR

8. a) Develop ladder diagram for elevator control system. Assume suitable sequence. Explain any one type of interlock used in elevator system. **12**

   b) Give the specification of Industrial grade PLC (any 8 specifications). Also list various manufacturers of PLC (min. 4 manufacturers). **6**

9. a) Give classification of control valves based on valve body. Explain any one type in detail. Also draw the diagram. **8**

   b) An equal percentage valve has maximum flow of 60 m^3/s and minimum flow 2 m^3/s. Find the flow rate at 25% opening if the total travel is 10 cm. **4**

   c) Explain use of positioner in control valve. **4**

OR

10. a) Explain different control valve characteristics, why installed characteristics differ from inherent control valve characteristics. **8**

    b) List various control valve accessories (min. 8). Explain any two accessories in brief. **8**

11. a) Explain the following with respect to control valve : **8**

    i) Valve Coefficient (C_V)

    ii) Rangeability (R)

    iii) Turn Down

    Also write equations.

    b) Find i) the proper C_V for a valve that must allow 150 gal. of ethyl alcohol per minute with a specific gravity of 0.8 at maximum pressure of 50 psi and ii) the required valve size. Use following data : **8**

C_V	0.3	3	14	35	55	108	174	400	725
Valve size in inches	1/4	1/2	1	1 1/2	2	3	4	6	8

OR

12. a) Explain cavitations and flashing in detail. Draw pressure variation diagram for above condition. Also explain its effects on control valve. **8**

    b) List any 4 selection criteria for control valve. **4**

    c) List any 4 application of control valve. **4**

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[3963] – 303

T.E. (Printing) Examination, 2011
COLOUR MANAGEMENT AND STANDARDIZATION
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. Answer **any two** : **18**

   A) Explain that Printing is a combination of additive theory and subtractive theory.

   B) Explain reflection and absorption of Red, Green and Blue colour.

   C) Explain Refraction of white light and explain visible spectrum.

2. Solve **any two** : **16**

   A) Explain human vision with neat diagram.

   B) What is Metamerism ? Explain various types of metamerism.

   C) Explain the concept of CIE standard Illuminant. Explain any two standard illuminants with spectral power distribution graph.

3. Answer **any two** : **16**

   A) Compare CIE xyY space with CIE Lab space with 2 advantages and 2 disadvantages.

   B) Explain the Munsell color system.

   C) Explain the term tistimulus values. Explain tristimulus values of Illuminant D 50, D 65.

P.T.O.

SECTION – II

4. Answer **any two** : **18**

A) Explain the principle and construction fo Densitometer.

B) Explain various types of geometries used in spectrophotometer.

C) What is Delta E ? Explain Delta L, Delta C, Delta h.

5. Answer **any two** : **16**

A) What is colour management ? Explain the need of colour management.

B) Explain perceptual rendering intents used in colour management with their application.

C) Explain characterization and conversion of colour management.

6. Solve **any two** : **16**

A) Explain the term Gray Balance for press standardization.

B) Explain Star Target, Ladder Target used for Machine calibration.

C) Draw a workflow diagram for Offset Press Standardization.

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[3963] – 304

T.E. (Printing) Examination, 2011
DESIGN OF PRINTING MACHINE COMPONENTS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. : *1)* ***All*** *questions are* ***compulsory****.*
2) Assume ***suitable*** *data if* ***necessary****.*

SECTION – I

1. a) Explain in short the factors to be considered while selecting a material. **8**

   b) Explain the step by step procedure for design of shaft on the basis of ASME code procedure. **4**

   c) Explain the term 'creativity' in design. **4**

OR

2. a) State and explain the significance of service factor and overload factor. **8**

   b) A shaft supported on two bearings at the end carries the load of 10,000 N at the middle of the shaft. The length of shaft is 150 mm. The power is transmitted to the shaft by gear drive. The power transmitted is 10 KW at 1440 rpm. The material used for shaft has ultimate strength of 620 N/mm^2 and yield strength 480 N/mm^2. The factor of safety is 1.5. Design the shaft using ASME code. **8**

3. a) What is the importance of limits, fits in machine elements ? What are different types of tolerances ? Show how to give such tolerance of machine elements. **8**

   b) State the procedure of designing a shaft as per following approaches :

      i) Equivalent bending moment approach

      ii) Rigidity approach **8**

OR

P.T.O.

4. Design a cotter joint to transmit a load of 90 KN in tension or compression. Assume the following stress for socket, spigot and cotter

   Allowable tensile stress = 90 MPa

   Allowable crushing stress = 120 MPa

   Allowable shear stress = 60 MPa. **16**

5. a) What are the differences between the properties of brittle and ductile materials ? **8**

   b) Draw the sketch of knuckle joint. Also design the knuckle joint to carry axial tension of 1000 N. The permissible tensile and shear stress for knuckle joint are 80 MPa and 40 MPa respectively. The permissible stresses for knuckle pin are 110 MPa and 55 MPa. **10**

OR

6. Two 35 mm shafts of printing machine are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shaft transmit a torque of 800 N-m at 350 rpm. For the safe stresses mentioned below, calculate :

   1) Diameter of bolts

   2) Thickness of flanges

   3) Key dimensions

   4) Hub length

   5) Power transmitted. **18**

SECTION – II

7. a) Prove that maximum efficiency of square threaded screw can be given by

$$\eta_{max} = \frac{1-\sin\theta}{1+\sin\theta}$$

   where θ is pressure angle. **10**

   b) What are the different types of stresses induced in power screw ? **8**

OR

8. a) Derive the relation for torque required to raise load on square threaded screw. **10**

   b) The lead screw of a lathe has ACME threads of 60 mm outside diameter and 8 mm pitch. It supplies drives to a tool carriage which needs an axial force of 2000 N. A collar bearing with inner and outer radii as 30 mm and 60 mm respectively is provided. The coefficient of friction for screw threads is 0.12 and for collar it is 0.1. Find the torque required to drive the screw and the efficiency of the screw. If the lead screw rotates at 30 rpm, find the power required to drive the screw. **8**

9. a) What are the advantages and limitations of welded joints ? **8**

   b) Compare bolted with welded joints. **8**

OR

10. a) What are different methods to make bolt of uniform strength ? **8**

    b) A 50 mm diameter solid shaft is welded to a flat plate by 10 mm fillet weld. Find maximum torque that the welded joint can sustain if the maximum shear stress intensity in the weld material is not to exceed 80 MPa. **8**

11. Write short notes on **(any three)** : **16**

    a) Load stress equation for Helical spring

    b) Types of springs

    c) Spring nomenclature

    d) Load-deflection derivation.

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[3963] – 31

T.E. (Production Engineering) (Semester – I) Examination, 2011
MATERIAL SCIENCE AND COMPOSITE MATERIALS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer to the **two** Sections should be written in **separate** answer book.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
*4) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw Fe-C equilibrium diagram and label the temperatures, composition and phases. **8**

   b) What is macroexamination ? How it is advantageous over microexamination ? What do flow lines indicate ? **8**

OR

2. a) Explain briefly-resolving power, total magnification, numerical aperture of metallurgical microscope. **8**

   b) Explain the following with neat diagrams : **8**

      i) Eutectoid transformation ii) Peritectic transformation

3. a) Describe the cooling of 0.4% C steel from austenitic region to room temperature. **8**

   b) Explain commonly observed heat treatment defects. **8**

OR

4. a) Write the purpose of heat treatment of steel. **8**

   b) Explain the procedure for ploting a TTT diagram for eutectoid steel and draw the curve for the same. **8**

P.T.O.

5. a) Explain the nitriding with its advantages and disadvantages. **6**

   b) Write short note on : **12**

      i) flame hardening

      ii) secondary hardening

OR

6. a) Write short note on : **12**

      i) Austempering

      ii) Ausforming

   b) What is carburizing ? Explain heat treatment after carburizing. **6**

SECTION – II

7. a) What are different types of cast iron ? Explain with its applications and draw the typical microstructure of grey cast iron. **9**

   b) What are the advantages of alloy steel over plain carbon steel ? **9**

OR

8. a) Write short note on heat treatment of cast iron. **9**

   b) What are the types of stainless steel ? Explain with its chemical composition and application. **9**

9. a) What are the types of brasses and distinguish between them ? List application of them. **8**

   b) Give typical composition and use of following : **8**

      i) babbits

      ii) gun metal

      iii) invar

      iv) LM2

OR

10. a) What is season cracking and dezincification ? How it is avoided ? **8**

    b) What are requirement of bearing material ? List commonly used bearing material. **8**

11. a) What is nano material ? Give any one application and composition of Nano material. **8**

    b) What is matrix composites ? Explain with suitable example. **8**

OR

12. a) What is composite material ? What unique properties they have over conventional material ? **8**

    b) How carbon fibers are produced ? Explain with sketch. **8**

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[3963] – 311

T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING MATHEMATICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) A compound material balance around a chemical reactor yields the following steady state equation :

$$O = \frac{F}{V} C_{in} - \frac{F}{V} C - KC^{2.5}$$

where $F/V = 0.1\ \text{min}^{-1}$, $C_{in} = 1.0\ \text{Kg/mol/m}^3$ $K = 0.05\ \text{m}^{4.5}/\text{Kg mol}^{1.5}\ \text{min}$

Perform 4 iterations of Newton-Raphson method using an initial guess C = 1.0. **10**

b) State and explain the graphical interpretation of Secant method. **8**

OR

2. a) Use Mullers method with guess of x_0, x_1 and x_2 = 4.5, 5.5 and 5, respectively to determine a root of the equation $f(x) = x^3 - 13x - 12$.

Note that the roots of this equation are –3, –1 and 4. **10**

b) State and explain graphical interpretation of Regula Falsi method. **8**

3. a) Explain the convergence criteria for Gauss-Seidal method. **8**

b) Apply cholesky decomposition to the symmetric matrix :

$$A = \begin{bmatrix} 6 & 15 & 55 \\ 15 & 55 & 225 \\ 55 & 225 & 979 \end{bmatrix}$$

8

OR

P.T.O.

4. An axially loaded wooden columns has the following characteristics :

   $E = 10 \times 10^9 Pa, I = 1.25 \times 10^{-5} m^4$ and L = 3 m where E = modulus of elasticity, I = moment of inertia of the cross section about its neutral axis, L = Length.

   Determine the first eight eigen values and the corresponding buckling loads. **16**

5. a) From the given data find value of y at x = 4.5. **8**

x	1	2	3	4	5
y	2.38	3.65	5.85	9.95	14.85

   b) The following table gives the temperatures recorded in Pune city from 1st February to first July in 2005. Temperatures are in degree centigrade

February	**March**	**April**	**May**	**June**	**July**
30.3	32.1	37.2	39.8	35.3	29.8

   Find out the approximate value of temperature on 15th February 2005. **8**

OR

6. a) Find the polynomial of degree 3 which takes the values as shown below :

x	0	1	2	4
y	1	1	2	5

   8

   b) State the algorithm for polynomial regression. **8**

SECTION – II

7. a) Explain graphical interpretation of effect of step size on Eulers method. **8**

   b) Using Eulers method, find an approximate value of y corresponding to x = 1, y = x + y and y = 1 when x = 0. **8**

OR

8. a) Using 4th order Runge Kutta method integrate $f(x, y) = -2x^3 + 12x^2 - 20x + 8.5$ using a step size of 0.5 and an initial condition of y = 1 at x = 0. **8**

   b) Discuss the stability region of Runge Kutta method. **8**

9. Use the explicit method to solve for the temperature distribution of a long thin rod with a length of 10 cm and the following values $K' = 0.49$ Cal /(s.cm.°C), $\Delta x = 2$ cm and $\Delta t = 0.1$s. At t = 0, the temperature of the rod is zero and the boundary conditions are fixed for all times at T (0) = 100 °C and T (0) = 50 °C. Note that the rod is aluminium with C = 0.2174 cal/(g.°C) and ρ = 2.7 g/cm^3, K = 0.835 cm^2/S and $\lambda =$ 0.020875. Find the temperature distribution in a long thin rod using explicit method. **16**

OR

10. Discuss in detail the algorithm and flow chart to generate forward differences. **16**

11. Minimize $f(x) = 2x_1^2 + x_2^2 - 3$ starting at $(x^\circ)^T = [1\ 1]$ with the initial direction being $S^\circ = [-4\ -2]^T$. Find a conjugate direction to the initial direction S°. **18**

OR

12. a) Explain numerical methods for optimizing a function of one variable. **9**

    b) Explain scanning and bracketing procedures for optimization of unconditional functions of one dimensional search. **9**

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[3963] – 312

T.E. Chemical (Semester – I) Examination, 2011
MASS TRANSFER – I (New) (2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Discuss basic principle of diffusion process and its applications in chemical process industry. **6**

   b) Explain in brief : **8**

      i) Knudsen diffusion

      ii) Maxwell's law of diffusion.

   c) The coefficient of diffusion of HCl gas in air is 0.145 cm^2/sec. at 20°C and 1 atm. What will be the diffusion coefficient in gm.mole/cm.sec. at the same conditions ? **4**

OR

2. a) Calculate the amount of diffusion of acetic acid (A) in 2 hours across a film on non diffusing water (B) solution, 1 mm thick at 17°C, when concentration on opposite side of the film are 9 and 3 weight % acid respectively. The diffusivity of acetic acid in solution is 0.95×10^{-9} m^2/sec. **10**

P.T.O.

Data : At 17°C :

Density of 9% solution = 1012 kg/m^3

Density of 3% solution = 1003 kg/m^3

Molecular weight of acetic acid = 60

Molecular weight of water = 18

b) Derive the expression to calculate the flux of : **8**

i) Diffusion of gas A through non diffusing stagnant gas B.

ii) Equimolal counter diffusion of gases A and B.

3. a) Explain surface renewal theory and penetration theory. **6**

b) Write a short note on – Mass transfer coefficient. **4**

c) In an oxygen-nitrogen mixture at 10 atm. and 25°C, the concentrations of oxygen at two places of 0.2 cm apart are 10 and 20 volume percent respectively. Calculate the rate of diffusion of oxygen expressed as gm/cm^2-hr for the case of unicomponent diffusion. **6**

Data – Value of diffusivity between oxygen – nitrogen

= 0.181 cm^2/sec.

$$R = 82.06 \ \frac{atm.cm^2}{g\ mole.°K}$$

OR

4. a) Explain the concept of equilibrium in interphase mass transfer. **6**

b) In the dilute concentration region, equilibrium data for SO_2 distributed between air and water can be approximated by $P_A = 25\ X_A$, where the partial pressure of SO_2(A) in the vapour phase is in atmospheres. For an absorption column operating at 10 atm, the bulk vapour and liquid concentrations at one point in the column are : **10**

$Y_A = 0.01$ and $X_A = 0.00$

The mass transfer coefficients for this process are

$K_x = 10$ Kmol/m^2hr and $K_y = 8$ Kmol/m^2hr

i) Find the overall mass transfer coefficient K_x.

ii) Determine the interfacial compositions, x_{Ai} and y_{Ai}.

iii) Calculate the molar flux N_A.

5. a) Derive the equation for operating lines for co-current absorption process and show the location of this line graphically. **6**

b) Light oil is being absorbed from a mixture of light oil vapour and air by means of a non-volatile absorption oil. The absorber is of the plate and bubble cap type. The lean oil entering the absorber contains 0.5% by weight of light oil and the rich oil leaving the absorber contains 5% by weight of the light oil.

The gas entering the absorber contains 2.25% by volume of light oil and the scrubbed gas leaves the absorber containing 0.18% of light oil by volume. The molecular weight of light oil is 80. The average molecular weight of air is 29.

The equilibrium curve for the absorbing oil-light oil mixture at the temperature of operation is represented by the equation, **10**

$Y_i = 0.65\ X_i$ where,

Y_i = kg of light oil per kg of light oil free air

X_i = kg of light oil per kg of light oil free absorption oil.

Calculate :

i) The kg of light oil free air to kg of light oil free absorption oil.

ii) The number of theoretical plates in the absorption solution.

OR

6. a) Write a short note on : **8**

i) Minimum Gas-liquid ratio for absorber

ii) Murphee stage efficiency.

b) Ammonia gas is to be removed from its mixture with air by scrubbing with water in a packed tower. A gas mixture entering the column contains 6% NH_3 (Vol%) and rest air (Vol.), water free of NH_3 enters in the column in counter-current direction. If 90% of the ammonia is to be removed using NH_3 free water at the rate of 2 mole water per mole of air. Determine the exit concentration of ammonia. The gas-liquid equilibrium relationship is $Y = 0.08\ X$, **8**

where, Y = moles of NH_3/mole of air,

X = moles of NH_3/mole of water.

SECTION – II

7. a) Explain the mechanism of : **6**

   i) Humidification

   ii) Dehumidification.

   b) Air at a temperature of 20°C and a pressure of 750 mm Hg has a relative humidity of 80%, calculate – **12**

   i) The molal humidity of air

   ii) The molal humidity of air if its temperature is reduced to 10°C and its pressure increased to 35 Psig, condensing out some of the water

   iii) The weight of water condensed from 28.6 m^3 of the original wet air in cooling and compressing to the conditions of part(ii).

   iv) The final volume of wet air in part(iii).

   Data given :

   i) Vapour pressure of water at 20°C and 10°C are 17.5 and 9.2 mm Hg respectively

   ii) At 20°C, dry air specific volume = 13.25 (from humidity chart), (0.83 m^3/kg dry air)

   iii) At 20°C, saturated air specific volume = 13.60 (from humidity chart), (0.86 m^3/kg dry air)

   iv) At 10°C, dry air specific volume = 12.75 (H^3/1b of dry air), from humidity chart (0.80)

   v) Saturated air volume = 13.00 H^3/1b dry air (from humidity chart)

OR

8. a) Derive an expression which relates wet-bulb temperature, absolute humidity and heat and mass transfer coefficients. Obtain Lewis relationship from this. **6**

   b) Explain : **8**

      i) Humidity chart

      ii) Psychrometric ratio.

   c) Write a short note on – Adiabatic saturation temperature. **4**

9. a) Explain following terms : **8**

      i) Equilibrium moisture content

      ii) Bound moisture content

      iii) Unbound moisture content

      iv) Free moisture

   b) A 100 kg batch of granular solids containing 30% moisture is to be dried in a tray dryer to 16% moisture by passing a current of air at 350°K across its surface at a velocity of 1.8 m/s. If the constant rate of drying under these conditions is 0.7×10^{-3} kg/m^{2}s. and the critical moisture content is 15%, calculate the drying time. **8**

      Drying surface = 0.03 m^2/kg dry weight.

OR

10. a) Explain Rate of drying curve. **6**

   b) Explain construction and working of rotary dryer with neat sketch. **6**

   c) Explain the phenomena of movement of moisture within the solid. **4**

11. a) Explain in detail any one gas dispersal equipment. **6**

b) Write a short note on **(any two)** : **10**

i) Characteristic of Packing material

ii) Venturi scrubber

iii) Wetted wall column.

OR

12. a) Describe operating characteristics of seive tray considering following points : **6**

i) Hooding ii) Weeping

iii) Coning iv) Priming

v) Dumping

b) Write a short note on **(any two)** : **10**

i) HTU and NTU concept

ii) Tray tower Vs packed tower

iii) Fluidized bed dryer.

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T.E. (Chemical) (Semester – II) Examination, 2011
MASS TRANSFER – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) What is boiling point diagram ? Explain vapour-liquid equilibria at constant pressure. **8**

   b) An ethanol-water mixture containing 36% by weight of ethanol is differentially distilled at 1 atm. pressure and the mixture is reduced to a maximum ethanol concentration of 6 mole %. Determine the composition of the distillate. Molecular weight of the distillate = 46 **10**

   The VLE data are :

Mole fraction ethanol in liquid	0.18	0.16	0.14	0.12	0.10	0.08	0.06
Mole fraction ethanol in vapour	0.517	0.502	0.485	0.464	0.438	0.405	0.353

OR

2. a) State and explain principle and operation of steam distillation. **8**

   b) A binary mixture of benzene and toluene containing 40 mole percent benzene is to be distilled at atmospheric pressure to recover 95% of benzene. Estimate the molal percentage of the mixture which should be distilled and the composition of the distillate obtained, if the distillation is carried out be equilibrium distillation. The VLE data are : **10**

x	**:**	0.100	0.200	0.300	0.500	0.700	0.900	1.0
y	**:**	0.217	0.385	0.517	0.714	0.854	0.957	1.0

P.T.O.

3. a) Derive Fenske's-Under wood equation to calculate minimum reflux. **6**

   b) A mixture of benzene-toluene is to be distilled in a fractionating column at 101.3 KPa. The feed of 100 kg mol/h is liquid and it contains 45 mole% benzene and 55% toluene and enters at 327.6% °K(130°F). A distillate containing 95 mole% benzene and 5 mole% toluene and a bottom containing 10 mol% benzene and 90 mole% toluene are to be obtained. The reflux ratio is 4 : 1. The average heat capacity of the feed is 159 KJ/kg mol K and the average latent heat 32099 KJ/Kg mol. Calculate the number of theoretical trays needed. **10**

   The equilibrium data are :

Temp. (°K) :	353.3	358.2	363.2	368.2	373.2	378.2	383.8
$\mathbf{X_A}$:	1.0	0.780	0.581	0.411	0.258	0.130	0
$\mathbf{Y_A}$:	1.0	0.900	0.777	0.632	0.456	0.261	0

OR

4. a) Explain concept of multi-component distillation. **6**

   b) A continuous fractionating column is used to handle 2.5 kg/s of feed containing 40% benzene and 60% toluene. The overhead product contains 97% benzene and bottom product contains 98% toluene. A reflux ratio of 3.5 kmol/kmol is used. Molar latent heat of benzene and toluene may be taken as 30000 KJ/Kmol. Take relative volatility = 2.5. Calculate the number of theoretical plates required and position of feed plate if the feed is liquid at 295 K and its specific heat is 1.84 KJ/Kg K

   Boiling point of benzene = 353.3 K

   Boiling point of toluene = 383.8 K **10**

5. a) It is required to extract picric Acid from dilute aqueous solution containing 0.1 mole picric acid per liter of solution using benzene as solvent with a recovery of 80% of the picric acid originally present. Determine the quantity of benzene required per liter of aqueous solution by employing (a) single-stage extraction (b) three-stage extraction (cross-current) using equal amounts of fresh solvent in each stage. The equilibrium data for benzene-picric acid-water system at 25°C is given by :

$\mathbf{C_B \times 10^2}$	0.0932	0.225	1	2	5	10	18
$\mathbf{M = \frac{C_B}{C_A}}$	2.23	1.45	1.705	0.505	0.32	0.24	0.187

   where C_B and C_A are the equilibrium concentrates of picric acid in benzene and aqueous phases respectively in moles/liter. **14**

   b) Explain use of triangular diagram in liquid-liquid extraction. **2**

OR

6. a) Pure solvent isopropyl ether at the rate of V_{N+1} = 600 Kg/h is being used to extract an aqueous solution of L_0 = 200 kg/h containing 30% wt% acetic acid (A) by countercurrent multi stage extraction. The desired exit acetic acid concentration in the aqueous phase is 4%. Calculate the compositions and amounts of the ether extract V_1 and the aqueous raffinate L_S. **14**

Equilibrium data are :

Water layer (wt%)			**Isopropyl ether layer (wt%)**		
Acetic Acid	**Water**	**Isopropyl ether**	**Acetic Acid**	**Water**	**Isopropyl ether**
0	98.8	1.2	0	0.6	99.4
0.69	98.1	1.2	0.18	0.5	99.3
1.41	97.1	1.5	0.37	0.7	98.9
2.89	95.5	1.6	0.79	0.8	98.4
6.42	91.7	1.9	1.93	1.0	97.1
13.30	84.4	2.3	4.82	1.9	93.3
25.50	71.1	3.4	11.40	3.9	84.7
36.70	58.9	4.4	21.60	6.9	71.5
44.30	45.1	10.6	31.10	10.8	58.1
46.40	37.1	16.5	36.20	15.1	48.7

b) Define HTU and NTU in extraction. **2**

SECTION – II

7. a) Classify leaching equipments. **6**

b) 60 tons per day of oil sand (25 mass % oil and 75 mass % sand) is to be extracted with 40 tons per day of naptha in a continuous counter current extraction battery. The final extract from the battery is to contain 40 mass % oil and 60 mass % naptha and the underflow from each unit is expected to consist of 35 mass % solution and 65 mass % sand. If the over all efficiency of the battery is 50%. How many stages will be required ? **10**

OR

8. a) Explain equilibrium relations in leaching. **6**

b) Oil is to be extracted from meal by means of benzene using continuous counter current extraction unit. The unit is expected to treat 1000 kg of meal (based on completely exhausted solid) per hour. The untreated meal contains 365 kg of oil and 30 kg of benzene. The solvent used contains 14 kg of oil and 590 kg of benzene. The exhausted solids are to contain 55 kg of unextracted oil.

Experimental data on the extraction of oil from meal by means of benzene at a given operating temperature are as follows : **10**

Solution composition kg oil/kg solution	**Solution retained (in under flow) kg solution/kg solids**
0	0.500
0.10	0.505
0.20	0.515
0.30	0.530
0.4	0.550
0.5	0.571
0.6	0.595
0.7	0.620

9. a) Explain Freundlich adsorption isotherms. **10**

   b) State and explain PSA and TSA. **6**

OR

10. a) Explain Adsorption of vapours. **6**

    b) A solution of washed raw can sugar is coloured by the presence of small amounts of an impurity. The solution is to be decolourised by treatment with an adsorptive carbon. The original colour has a colour concentration of 9.6 measured on an arbitrary scale and it is desired to reduce colour to 10% of its original value. **10**

The data for an equilibrium isotherm is as follows :

Kg of carbon/kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium colour, Colour units/kg solution	9.6	8.6	6.3	4.3	1.7	0.7

11. a) Explain working principle of Swenson-Wallker crystallizer. **8**

    b) Explain effects of processing variables on gas separation by membranes. **10**

OR

12. a) State and explain types of membrane and permeabilities for separation of gases. **8**

    b) A crystallizer is charged with 7500 kg of an aqueous solution at 377 k (104°C) 29.6% by weight of which is anhydrous sodium sulphate. The solution is cooled. During the cooling operation, 5% of the initial water is lost by evaporation. As a result, crystals of $Na_2SO_4 \cdot 10\ H_2O$ crystallize out. If the mother liquor is found to contain 18.3% by weight anhydrous Na_2SO_4, calculate the yield of crystals and the quantity of mother liquor. **10**

At.wt : Na = 23, S = 32, O = 16, H = 1.

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T.E. (Petroleum) (Semester – I) Examination, 2011
NUMERICAL METHODS AND GEO-STATISTICS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B.: *1) In Section **I** : Attempt Qu. **1** or Qu. **2**, Qu. **3** or Qu. **4**, Qu. **5** or Qu. **6**.*

*In Section **II** : Attempt Qu. **7** or Qu. **8**, Qu. **9** or Qu. **10**, Qu. **11** or Qu. **12**.*

*2) Answer to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Use of electronic pocket calculator is **allowed**.*

*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Find orthogonal trajectory of $u(x, y) = \frac{1}{2}\log(x^2 + y^2)$. **5**

b) Evaluate $\oint_C \frac{e^z}{(z+1)^3 (z-1)^2} dz$ where 'C' is the contour $|z+1| = \frac{1}{2}$. **6**

c) Find the bilinear transformation which maps the points 0, – 1, i of the z-plane on to the points 2, ∞, $\frac{1}{2}(5+i)$ of the w-plane. **5**

OR

2. a) Show that the transformation $w = \frac{z-b}{z+b}$ maps the right half of the z-plane into the unit circle $|w| < 1$ (b is real positive number). **5**

P.T.O.

b) If s and t satisfy Laplace equation, show that f(z) = u + iv is analytic, where

$$u = \frac{\partial s}{\partial y} - \frac{\partial t}{\partial x}, \; v = \frac{\partial s}{\partial x} + \frac{\partial t}{\partial y}$$ **5**

c) Evaluate $\int_0^{2\pi} \frac{\sin 2\theta}{5 + 4\cos\theta} d\theta$. **6**

3. a) Find the arithmetic mean and standard deviation for the following frequency distribution. **8**

x	5	9	12	15	20	24	30	35	42	49
f	3	6	8	8	9	10	8	7	6	2

b) Obtain regression lines for the following data : **9**

x	2	3	5	7	9	10	12	15
y	2	5	8	10	12	14	15	16

Find estimate of (i) y when x = 6 and (ii) x when y = 20.

OR

4. a) The first four moments of a distribution about the value 5 are 2, 20, 40 and 50. From the given information, obtain the first four central moments, coefficient of Skewness and Kurtosis. **8**

b) From a group of 10 students, marks obtained by each in papers of Mathematics and Applied Mechanics are given as :

x marks in Maths	23	28	42	17	26	35	29	37	16	46
y marks in Applied Mechanics	25	22	38	21	27	39	24	32	18	44

Calculate coefficient of correlation. **9**

5. a) A and B play a game of alternate tossing a coin. One who gets Head first wins the game. Find the probability of A winning the game if B has a start. **5**

   b) An unbiased coin is thrown 10 times. Find the probability of getting exactly 7 Heads, at least 7 Heads. **6**

   c) In an experiment on pea breeding, a scientist obtained the following frequencies of seeds : 316 round and yellow, 102 wrinkled and yellow, 109 round and green and 33 wrinkled and green. Theory predicts that the frequencies of seeds should be in the proportion 9 : 3 : 3 : 1 respectively. Set a proper hypothesis and test it at 5% l.o.s. **6**

   $[\psi^2_{3;0.05} = 7.815]$

   OR

6. a) Find the mean and variance of Binomial probability distribution. **6**

   b) A random sample of 200 screws is drawn from a population which represents the size of screws. If a sample is distributed normally with a mean 3.15 cms and standard deviation 0.025 cm. Find expected number of screws whose size falls between 3.12 cms and 3.2 cms.

   [z = 1.2, A = 0.3849; z = 2.0, A = 0.4772] **5**

   c) In a telephone exchange , the probability that any one call is wrongly connected is 0.02. What is the minimum number of calls required to ensure a probability 0.1 that at least one call is wrongly connected ? **6**

SECTION – II

7. a) With usual notations, establish the following :

   i) $\delta = E^{-1/2}\Delta = E^{1/2}\nabla$

   ii) $\mu^2 = 1 + \frac{\delta^2}{4}$

   iii) $\Delta = \mu\delta + \frac{1}{2}\delta^2$. **9**

   b) Use Simpson's $\frac{1}{3}$rd rule to evaluate $\int_0^{\pi/2} \frac{\sin x}{x}\,dx$ by dividing the interval into six parts. **7**

   OR

8. a) Given the table of square roots, calculate the values of $\sqrt{151}$ and $\sqrt{155}$ by Newton's interpolation formulae. **8**

x	150	152	154	156
$\mathbf{y=\sqrt{x}}$	12.247	12.329	12.410	12.490

b) Given log 2 = 0.3010, log 3 = 0.4771, log 5 = 0.6990, log 7 = 0.8451. Find log 47 using Lagrange's interpolation formula. Determine the accuracy of the result. **8**

9. a) Use the method of Bisection to find a root of the equation $f(x) = x^4 + 2x^3 - x - 1 = 0$ lying in the interval [0, 1] at the end of sixth iteration. How many iterations are required if the permissible error is $\in = 0.0005$. Write the algorithm for the method of bisection. **9**

b) Use method of least squares to fit a parabola of the form $y = ax^2 + bx + c$, to satisfy the data. **8**

x	0	1	2	3	4	5	6
y	1	4	11	22	37	56	79

OR

10. a) Solve the following system of equations by Gauss-Seidel iterative method

$83x_1 + 11x_2 - 4x_3 = 95$

$7x_1 + 52x_2 + 13x_3 = 104$

$3x_1 + 8x_2 + 29x_3 = 71$

finding solution at the end of fifth iteration. **8**

b) Solve the equation $\frac{dy}{dx} = \frac{y - x}{y + x}$ with x = 0, y = 1 using Runge-Kutta method of 4^{th} order, to find y at x = 0.2 taking h = 0.1. **9**

11. a) Solve the Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ at the pivotal points of the grid shown in the figure 11(a). **8**

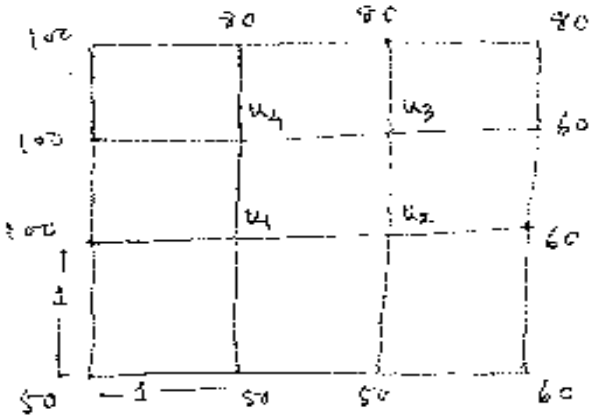

Fig. 11(a)

b) Solve the following LP problem by Simplex method

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to $x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1 + 4x_2 \leq 420$

and $x_1, x_2, x_3 \geq 0$. **9**

OR

12. a) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -500$ over the nodal points of the square plate bounded by x = 0, y = 0, x = 3, y = 3 with u = 0 on the boundary and mesh length = 1. **9**

b) Solve the following LP problem by Simplex method **8**

Maximize $Z = 3x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

and $x_1, x_2 \geq 0$.

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T.E. (Petroleum) (Semester – I) Examination, 2011
DRILLING OPERATIONS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Discuss different components of drill string with illustrative figures. **10**

   b) Discuss advantages & disadvantages of top drive section **8**

OR

2. a) Discuss rig selection criteria in details. **9**

   b) Write short note on “draw works”. **9**

3. a) Discuss the dull bit gradation in detail. **8**

   b) Calculate volume barrels/meter for the following : **4**

      i) Casing O.D. = 13.375 inch I.D. = 12.515 inch

      ii) Drill pipe O.D. = 5″ inch I.D. = 4.216 inch

   c) Calculate bottom hole pressure if well depth is 3200 ft and mud density is 10 ppg. **2**

   d) Calculate mud weight if fracture gradient is 0.87 psi/ft. **2**

OR

4. a) Discuss working principle of triplex single acting pump with suitable sketch. **8**

   b) Discuss different down hole problems in detail. **8**

5. a) Discuss Type I, Type II and Type III directional wells with suitable figure. **8**

   b) What is coring ? Write uses of coring. **8**

OR

6. a) Convert decimal degrees to DMS (degree, min and sec.) 35.4567. **2**

   b) Discuss different types of multilateral wells. **8**

   c) Discuss different types of fishing tools. **6**

SECTION – II

7. a) Discuss the importance of compressive strength and thickening time in oil well cementation. **6**

   b) Calculate number of sacks if **6**
   Lead slurry volume is 412.7 bbls
   Tail slurry volume is 91.1 bbls
   Cement yield for lead slurry = 2.0630 ft^3/sack
   Cement yield for tail slurry = 1.2500 ft^3/sack
   Pumping rate for lead slurry is 5 bbls/min
   Pumping rate for tail slurry is 4 bbls/min
   Calculate total time required for cement Job.

   c) Discuss API classification of oil well cement in details. **6**

OR

8. a) Discuss API grades, properties, threads of casing. **6**

   b) Discuss different types of casing and their functions in brief. **6**

   c) Write note on ‘squeeze cementation’. **6**

9. a) Write different types and functions of a mud in details. **8**

   b) Calculate gain in mud pit after pumping a slug before pulling out
   Weight of mud in hole = 11.2 ppg
   Weight of slug = 13 ppg
   Volume of slug = 5.42 bbl
   Drill pipe capacity = 0.01777 bbl/ft. **8**

OR

10. a) Discuss different rheological properties of mud in details. **8**

    b) Discuss different mud conditioning equipments in detail. **8**

11. a) Draw mud circulation system on a drilling rig. **8**

    b) Calculate pressure loss at bit and B.H.H.P. if **8**
    Circulation rate = 600 gpm
    Hole size = 12.25 inch
    Drill pipe = 5 inch O.D.
    Mud weight = 9.5ppg
    Nozzle size = 14-14-14
    Surface pressure = 2500 psi

OR

12. a) Discuss different pressure losses in circulation system. What is optimum hydraulics ? **8**

    b) Write short note on : **8**

    i) E.C.D.

    ii) Pressure changes during casing operations.

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T.E. (Petroleum Engineering) (Semester – II) Examination, 2011
PETROLEUM GEOLOGY – II (New)
(Common to 2003 & 2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the questions of* ***both*** *the Sections should be written in* ***separate*** *answer books.*
2) Draw ***neat*** *diagrams* ***wherever*** *necessary.*

SECTION – I

1. List and explain in brief, important physical and chemical properties of gaseous and liquid hydrocarbons. **15**

OR

1. Describe in details different carbonate rock deposition system with the help of neat figures. **15**

2. What are the evidences of migration of hydrocarbons ? Explain possible mechanisms of migration. **15**

OR

2. Give an account of the geochemical process of transformation of organic matter to hydrocarbons. **15**

3. Give a classification of "Traps". Explain each type with help of a neat sketch. **20**

OR

3. Write short notes on the following : **20**
   a) Composition of oil field water and different schemes of its classification.
   b) Concept of a Petroleum System.
   c) Transgressive and regressive cycles in relation to origin, migration and accumulation of petroleum.
   d) Types of kerogen.

P.T.O.

SECTION – II

4. Write notes on **any three** of the following : **15**
   a) Geochemical fossils
   b) Surface occurrence of hydrocarbons
   c) Gas hydrates
   d) Origin and occurrence of Coal Bed Methane
   e) Classification of crude oils.

5. What are the duties of a Well Site Geologist ? **15**

OR

5. What is the hydrocarbon potential of East Coast Basins of India on the background of known fields and recent discoveries ? **15**

6. Write short notes on **any four** of the following : **20**
   a) Generalized model of a sedimentary basin
   b) Procedure for examination of drill cuttings
   c) Kinds of subsurface maps
   d) Geological heterogeneities
   e) Significance of isotope studies of oil, gas and water
   f) Shale gas as an important hydrocarbon resource.

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T.E. (Petrochemical) (Semester – I) Examination, 2011
NUMERICAL AND STATISTICAL METHODS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) In Section **I**, attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No.**6**. In Section **II**, attempt Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of non-programmable electronic pocket calculator is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Define the terms : **6**

i) Basic feasible solution

ii) Degenerate solution

Find all basic feasible solutions to the system of equations :

$2x_1 + 3x_2 - 5x_3 = 12$

$2x_1 - x_2 + 3x_3 = 3$

b) Solve the following LPP problem : **10**

Maximize $Z = 20x_1 + 6x_2 + 8x_3$, subject to the constraints :

$8x_1 + 2x_2 + 3x_3 \leq 250,$

$4x_1 + 3x_2 \leq 150,$

$2x_1 + x_3 \leq 50,$

$x_1, x_2, x_3 \geq 0.$

OR

2. a) Write the dual of the following primal LP problem : **6**

Minimize $Z = 2x_1 + 3x_2 + 4x_3$ subject to

$$2x_1 + 3x_2 + 5x_3 \geq 2,$$

$$3x_1 + x_2 + 7x_3 \leq 3,$$

$$x_1 + 4x_2 + 6x_3 \leq 5,$$

$$x_1, x_2, x_3 \geq 0.$$

b) Solve the following LP problem : **10**

Maximize $Z = 5x_1 - 2x_2 + 3x_3$ subject to

$$2x_1 + 2x_2 - x_3 \geq 2,$$

$$3x_1 - 4x_2 \leq 3,$$

$$x_2 + 3x_3 \leq 5,$$

$$x_1, x_2, x_3 \geq 0.$$

3. a) An automobile dealer wishes to assign 4 mechanics to 4 different jobs. Each mechanic has different skills and different levels of efficiency. The number of man hours required for each job-man combination is shown in the matrix given below. Find the optimal assignment that will result in minimum man hours. **6**

Jobs

		A	**B**	**C**	**D**
Men	1	5	3	2	8
	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	8

b) A company has three plants A, B, C and three warehouses X, Y, Z. Number of units available at the plants is 60, 70 and 80 respectively. Demands at X, Y, Z are 50, 80 and 80 respectively. The unit costs of transportation are as follows : **10**

	X	**Y**	**Z**
A	8	7	3
B	3	8	9
C	11	3	5

Find the optimal solution to the above transportation problem, using Vogel's approximation method.

OR

4. a) A Company has 6 jobs to be processed by 6 men. The following table gives the return in rupees when the i^{th} job is assigned to the j^{th} man. (i, j = 1, 2, ... 6). How should the jobs be assigned to the mechanics, so as to maximise the overall return ? **6**

		Men					
		1	2	3	4	5	6
Jobs	I	9	22	58	11	19	27
	II	43	78	72	50	63	48
	III	41	28	91	37	45	33
	IV	74	42	27	49	39	32
	V	36	11	57	22	25	18
	VI	3	56	53	31	17	28

b) Solve the following transportation problem, using Vogel's Approximation method. **10**

	A	B	C	D	E	F	Supply
1	9	12	9	6	9	10	5
2	7	3	7	7	5	5	6
3	6	5	9	11	3	11	2
4	6	8	11	2	2	10	9
Demand	4	4	6	2	4	2	

5. a) The following table gives the aptitude test scores and productivity indices of 10 workers, selected at random : **7**

Aptitude Score (X)	**:**	60	62	65	70	72	48	53	73	65	82
Productivity Index (Y)	**:**	68	60	62	80	85	40	52	62	60	81

b) Assuming that on an average 30% of the candidates appearing in an examination, get first class, what is the probability that out of a group of four such candidates, not more than two will fail to get first class ? **5**

c) The average number of misprints per page of a book is 2. Assuming Poisson distribution, what is the probability that a particular page is free from misprints ? If the book contains 1000 pages, how many of the pages contain more than 2 misprints ? **6**

OR

6. a) For a bivariate distribution, the following information is given : **6**

$\Sigma(X-58)=46,\ \Sigma(X-58)^2=3086,$
$\Sigma(Y-58)=9,\ \Sigma(Y-58)^2=483,$
$\Sigma(X-58)(Y-58)=1095.$
Determine :

i) the correlation coefficient between x and y

ii) the two regression equations.

b) The mean of the inner diameters of a sample of 200 tubes produced by a machine is 0.502 cms. and s.d is 0.005 cms. A maximum tolerance level of 0.496 cms to 0.508 cms. is allowed in the diameter; otherwise the tubes are considered defective. What percentage of the tubes manufactured by the machine is defective ? Area under the standard normal curve between z = 0 to z = 1.2 is 0.3849. **6**

c) The demand for a particular spare part in a factory was found to vary from day to day, as per the following information : **6**

Day	:	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
No. of parts demanded	:	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

Given : $\chi^2_{5,0.05} = 11.07$.

SECTION – II

7. a) i) Prove that $\frac{1}{2}\delta^2 + \delta\sqrt{1+\delta^2/4} = \Delta$ **8**

ii) Prove that $\mu\delta = \frac{\Delta}{2} + \frac{\Delta E^{-1}}{2}$.

7. b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 51 from the following data : **9**

x	50	60	70	80	90
y	19.96	36.65	58.81	77.21	94.61

OR

8. a) Apply Stirling's formula to find y(25) for the following data : **8**

x	20	24	28	32
y	2854	3162	3544	3992

8. b) A curve passes through the points as given in the table. Find :

i) The area bounded by the curve, the x-axis, x = 1 and x = 9

ii) The volume of the solid generated by revolving the area about the x-axis.

$\left[\text{Formula Area} = \int_a^b y\,dx \quad \text{vol} = \int_c^b \pi y^2 dx\right]$. **9**

x	1	2	3	4	5	6	7	8	9
y	0.2	0.7	1	1.3	1.5	1.7	1.9	2.1	2.3

9. a) Find by Regula falsi method the positive root of $x^2 - \log_{10} x - 12 = 0$. **8**

9. b) Solve the following system of equations by Guass elimination method. **8**

$4.12x - 9.68y + 2.01z = 4.93$

$1.88x - 4.62y + 5.50z = 3.11$

$1.10x - 0.96y + 2.72z = 4.02$

OR

10. a) Solve the following system of equations, by Guass-Seidel's method (upto 5 iterations) **8**

$1.02x_1 - 0.05x_2 - 0.10x_3 = 0.795$

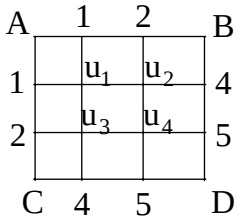
$-0.11x_1 + 1.03x_2 - 0.05x_3 = 0.849$

$-0.11x_1 - 0.12x_2 + 1.04x_3 = 1.398$

10. b) Fit a straight line to the following data by the method of least squares. **8**

x	3.4	4.3	5.4	6.7	8.7	10.6
y	4.5	5.8	6.8	8.1	10.5	12.7

11. a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary values as shown in figure given below (use symmetry $u_2 = u_3$). **8**



11. b) Use Euler's modified method to find the value of y satisfying the equation $\frac{dy}{dx} = \log(x + y),\ y(1) = 2$ for x = 1.2, x = 1.4, h = 0.2. **9**

OR

12. a) Use Runge-Kutta method of fourth order to obtain the numerical solution of $\frac{dy}{dx} = x^2 + y^2$ y (1) = 1.5 in the interval (1, 1.2) with h = 0.1. **8**

12. b) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -x^2 y^2$ over the square region bounded by the lines x = 0, x = 3, y = 0, y = 3 given that u = 10 throughout the boundary taking h = 1. **9**

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T.E. (Petrochemical) (Semester – I) Examination, 2011
PETROCHEMICAL PROCESSES – I (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Describe with flowsheet the process for conversion of acetaldehyde to acetic acid. **10**

   b) Mention the types of oxidative reactions with examples. **6**

   c) Write mechanism for chlorination of benzene. **2**

2. a) Describe with flowsheet the process for conversion of ethyl benzene to styrene. **10**

   b) Write a note on Bechamp reduction. **6**

3. a) Describe the continuous process for conversion of chlorobenzene to aniline. **8**

   b) Write a note on Schmidt nitrator. **4**

   c) Mention with examples the methods used for chlorination. **4**

4. a) Describe with flowsheet the manufacture of ethyl acetate. **10**

   b) Write a note on agents used for alkylation. **6**

P.T.O.

SECTION – II

5. a) Describe with flowsheet the process for manufacture of ethanol by fermentation. **10**

   b) Explain DVS with significance. **4**

   c) Write a note on catalysts used for hydrogenation. **4**

6. a) Describe with flowsheet any one process to manufacture vinyl chloride monomer. **10**

   b) Describe the photochlorination process for conversion of cyclohexane to chlorocyclohexane. **6**

7. a) Describe with flowsheet the process for manufacture of dodecyl benzene from benzene. **10**

   b) Explain desulfonation reaction with significance. **3**

   c) Write a note on Friedel Crafts alkylation and acylation. **3**

8. a) Describe the process for preparation of 1, 2-dichlroethane from ethene and chlorine. **8**

   b) Write a note on working up procedures for sulfonation. **5**

   c) Differentiate between chemical process and bio-chemical process. **3**

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T.E. Petrochemical (Semester – II) Examination, 2011
MASS TRANSFER – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) **Assume** suitable data, if **necessary**.*

SECTION – I

1. Answer the following questions: **18**

i) Write a brief note on : Choice of solvent for gas absorption.

ii) Write a brief note on : Optimum reflux ratio for distillation.

iii) Define feed line. Discuss the various feed line (q line) conditions with neat sketch.

iv) Write down analytical equations for binary distillation column design.

OR

2. a) 5000 kg/hr. of a SO_2 – air mixture containing 5% by volume of SO_2 is to be scrubbed with 2,00,000 kg/hr of water in a packed tower. The exit concentration of SO_2 is reduced to 0.15%. The tower operates at 1 atm. The equilibrium relation is given by: Y = 30 X

where $$Y = \frac{\text{Mole } SO_2}{\text{Mole air}}$$

$$X = \frac{\text{Mole } SO_2}{\text{Mole water}}$$

If the packed height of tower is 0.42 m, calculate the height of transfer unit. **10**

b) Write a brief notes on : HETP, NTU and HTU. **8**

P.T.O.

3. a) Derive the Rayleigh's equation for simple distillation. State the assumption made, if any. **6**

   b) Methanol and ethanol form an ideal solution. Compute vapor-liquid equilibrium data and prepare plots of x-y and T-x-y at 1 atm pressure. The following pure component vapor pressure data is given :

Vapor pressure, mm Hg	200	400	760	1520
Temperature °C for ethanol	48.4	62.5	78.4	97.5
Temperature °C for methanol	34.8	49.9	64.7	84

   What value of relative volatility will you recommend for this system ? **10**

OR

4. a) A feed of known composition (binary mixture of constant relative volatility) is to be distilled in a continuous fractionating column consisting of a partial condenser, one plate and a reboiler. The feed enters the reboiler from which a bottom product is continuously withdrawn. The liquid reflux from the partial condenser is returned to the plate. The distillate composition (x_D) is 0.8 and the reflux ratio is 2.

   Do as follows :

   1) What is the slope of the operating line on x–y plot and its intercept on the y-axis ?

   2) Using the McCabe-Thiele method, qualitatively locate on the x-y plot:

      i) the composition of the streams leaving the plate, and

      ii) the bottom product composition. **8**

(Do not use graph paper)

b) A continuous rectification column is used to separate a binary mixture of A and B. Distillate is produced at 100-kmol/hr containing 98 mole % A. The mole fractions of A in the liquid and in the vapour, x and y respectively, from two adjacent ideal plates in the enriching section are as follows :

x	y
0.65	0.85
0.55	0.75

If the latent heat of vaporization is the same for all mixtures and if the feed is a saturated liquid, calculate :

a) The reflux ratio.

b) Vapour rate in the stripping section in kmol/hr. **8**

5. A bubble cap-fractionating column consisting of 15 plates working at an average efficiency of 85% is being used to distill 10,000 kg/hr of aqueous methanol at its bubble point entering the tower. The feed, overhead product and bottom product are 50-mole % 90-mole % and 10-mole % methanol (1) respectively. A total condenser is provided. The reflux is sent at this saturation temperature. If the reflux ratio is 1.7 times the minimum, check whether the column available is satisfactory. The VLE data are : **16**

x_1	8	10	20	30	40	50	70	80	95
y_1	36.5	41.8	57.9	66.5	72.9	77.9	87.0	95.8	97.9

OR

6. a) Indicate how the use of the enthalpy-composition diagram and McCabe-Thiele diagram could be utilized for the design of distillation columns. Specify the application of each method. Explain by means of both methods to determine:

a) Minimum reflux.

b) The number of plates at total reflux and the

c) Location of the correct feed plate in the fractionation of liquid mixture in a bubble plate column using open steam. **8**

b) Derive the Fenske equation for distillation. State the assumption made, if any. **8**

SECTION – II

7. a) A solute is recovered from an aqueous solution containing 20% of the solute by weight using kerosene as the solvent. The distribution of the solute in water and kerosene may be described by $x' = 6.25\ y'$ where x' is the kg of solute per kg of water and y' is the kg of solute per kg kerosene. Calculate the following :

   i) The final concentration in the final raffinate if the extraction is done in 3 simple equilibrium contacts using 5 kg solvent per kg of initial solution in each stage.

   ii) The number of equivalent theoretical contacts necessary to obtain the concentration of solute in the final raffinate as 4% by weight with the extraction done by counter current stage contacting using 6 kg of Kerosene per kg of aqueous solution. **8**

   b) 150 kg of Nicotine-Water solution containing 1% nicotine is to be extracted with 250 kg of kerosene at 273 K. Water and kerosene is essentially immiscible in each other. Determine the percentage of extraction of nicotine after one stage operation.

   At the dilute end of the system, the equilibrium relationship is given by :

   $Y^* = 0.755\ X$

   Where, $Y = \frac{\text{kg of nicotine}}{\text{kg of kerosene}}$ and $X = \frac{\text{kg of nicotine}}{\text{kg of water}}$ **10**

OR

8. a) In order to extract acetic acid from dilute aqueous solution with isopropyl either, the two immiscible phases are passed counter-currently through a packed column 3.05 m in height and 7.6 cm in diameter.

It is found that if 1950 kg/hr m^3 of pure ether is used to extract 975 kg/hr m^2 of 4% acid by weight then the ether phase leaves the column with a concentration of 1% acid by weight. Calculate :

a) the number of overall transfer units based on raffinate phase;

b) overall extraction co-efficient based on raffinate phase.

The equilibrium relationship is given by,

Wt. % acid in ether phase = 0.3 times the wt. % acid in water phase. **12**

b) Discuss the factors, which govern the selection of solvents to be used for liquid-liquid extractions ? **6**

9. a) Classify the commercial extraction equipments. State working principles of any one of them. **10**

b) Discuss the ternary diagram for liquid-liquid extraction by taking suitable example. **6**

OR

10. a) The adsorption of ethane as Linde molecular sieve 5A, was studied by Glessner and Myers (1969) at 35°C. Using the data given below, **9**

a) Determine if the Langmuir equation can be used to model the data

b) Calculate the total surface solid, if Density of Ethane = 0.356 gm/cc.

Data :

P, [mm Hg)	Uptake, V[cm^3 (STP/gm]
0.17	0.059
0.95	0.31
5.55	1.63
12.5	3.61
111.3	24.23
220.8	34.27
300.5	38.34
401.2	41.77
500.4	44.03
602.7	45.69

b) In an experiment, an activated alumina adsorbent was used on aqueous glucose solution. The equilibrium data at a single temperature is shown the table given below :

Data :

C (g/cm^3)	0.004	0.009	0.0150	0.026	0.056	0.191
q (g glucose/g alumina)	0.027	0.047	0.067	0.080	0.1078	0.130

Which of the three models best suits this data and what are the parameters ? **7**

11. a) Discuss in brief Process principles involved in PSA and TSA. **8**

    b) Write a brief note on : Types of Adsorbents and their commercial applications. **8**

OR

12. Write short notes on **(any three)** : **16**

    a) Classification of membrane separation processes

    b) Types of Adsorption Isotherms

    c) Principles of MF, UF and NF

    d) Physical and Chemical Adsorptions

    e) Reverse osmosis : Principles and applications.

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T.E. (Polymer) (Semester – I) Examination, 2011
DESIGN OF EQUIPMENT AND MACHINERY ELEMENTS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt Q. No. **1** or **2**, Q. No. **3** or **4** and Q. No. **5** or **6** from Section **I**. Attempt Q. No. **7** or **8**, Q. No. **9** or **10** and Q. No. **11** or **12** from Section **II**.*

*2) Figures to the **right** indicate **full** marks.*

*3) **Use** of pocket calculator, graph paper is **allowed**.*

*4) Assume **suitable** design data, **if required**.*

*5) Answers to the **two** Sections should be written in **separate** answer books.*

SECTION – I

1. a) A 40 mm diameter shaft is made of steel with yield strength of 380 MPa. A parallel key of size 10 mm wide and 6 mm thickness made of steel with yield strength of 300 MPa is to be used. Find length of key for maximum torque to be transmitted using maximum shear stress theory and factor of safety 2. **4**

   b) The normal stresses on two planes at right angles to each other are 50 MPa and 100 MPa, both compressive accompanied by a shear stress of 40 MPa. Find maximum and minimum principle stresses. Find also maximum shear stress using Mohr circle diagram. **6**

   c) What is stress concentration ? Explain methods of reducing it. **4**

   d) Explain design procedure for sleeve coupling. **4**

P.T.O.

2. a) Write a short note on composition and use of different types of stainless steel. **6**

   b) Draw a neat sketch of Bushed pin flexible coupling and explain its design procedure. **8**

   c) Interpret following BIS material lodes : **4**

      i) F4 350

      ii) XT 75 W 18 Cr 4 V1

      iii) PM 500

      iv) 35C8

3. a) Write short note on material used for belts. **4**

   b) A horizontal steel shaft rests on two bearings, A at the left and B at the right end and carries two gears C and D located at distances of 200 mm and 350 mm respectively from the centerline of the left and right bearings. The pitch circle diameter of the gear C is 500 mm and that of gear D is 150 mm. The distance between the centerline of bearings is 2000 mm. The shaft transmits 20 kW at 150 rpm. The tooth pressure of both gears act vertically downward. Find diameter of shaft if working stress is 100 MPa in tension and 55 MPa in shear. The gears C and D weigh 950 N and 350 N. The combined shock and fatigue factor for bending and torsion are 1.5 and 2 respectively. **12**

4. a) Derive an expression for length of a cross belt drive. **6**

   b) Design a rubber belt to drive a dynamo generating 20 kW at 2000 rpm and fitted with a pulley 150 mm diameter. Assume dynamo efficiency to be 80%. **8**

      Allowable stress for belt = 2.00 MPa

      Density of rubber = 1000 Kg/m^3

      Angle of contact for dynamo pulley = 165°

      Coefficient of friction between belt and pulley = 0.3.

   c) What are the advantages of V-belt over flat belt ? **2**

5. a) Explain the terms 'Bearing characteristic number' and 'Bearing Modulus' for journal bearings. **8**

   b) Calculate basic dynamic load rating for a self aligning ball bearing for a radial load of 6000 N and thrust load of 2000 N. The desired life of bearing is 150 millions of revolution at 300 rpm. Assume uniform and steady load. Take radial factor (X) and thrust factor (Y) as 0.65 and 3.5 respectively. **8**

6. a) Write short notes on : **6**

   i) Norton gear drive

   ii) Cone and pulley arrangement.

   b) A pair of straight teeth spur gears is to transmit 18 kW when pinion rotates at 300 rpm. The velocity ratio is 1 : 3 allowable static stress for pinion and gear material 120 MPa and 100 MPa. The pinion has 15 teeth and its face width is 14 times the module. Determine :

   i) Module

   ii) Face width

   iii) P.C.D. of pinion and gear from standpoint of strength only.

   The tooth form factor Y can be taken as

$$Y = 0.154 - \frac{0.912}{\text{no. of teeth}}$$

   and velocity factor C_v as

$$C_v = \frac{3}{3+v}$$ where v is expressed in m/sec.

   Take service factor $C_s = 1$. **10**

SECTION – II

7. a) Draw a neat sketch of sequence valve and explain its functioning. **4**

   b) Fig. No. 1 and Fig. No. 2 show hydraulic circuits. Explain the functioning of hydraulic circuits. **12**

8. a) With a neat sketch, explain any one type of pressure control valve. **6**

   b) With a neat sketch, explain functioning of inline ball type check valve. **4**

   c) With a circuit diagram, explain 'Traverse and Feed circuit'. **6**

9. a) Explain the concept of back pressure. Draw a circuit diagram for plasticizing and back pressure control using conventional hydraulics and explain the functioning of the circuit. **9**

   b) Draw a hydraulic circuit diagram detailing mould open, mould close and mould safety operations. Explain the functioning of the circuit. **9**

10. a) Explain the requirements of hydraulic oil in case of injection moulding. **3**

    b) Explain the use of accumulator in hydraulic circuit of injection moulding. **3**

    c) What do you understand by decompression of clamp force ? Explain also the benefit of partial decompression. **4**

    d) Give merits of toggle mechanism over direct hydraulic locking mechanism. **4**

    e) A injection moulding machine has four tie bars of 75 mm diameter and centre distance between the platens is 2 meters. If maximum permissible extension of the individual tie bar is to be limited to 0.08 mm, find out maximum possible tonnage that can be taken on the machine. Take Young's modulus of steel as 200 GPa. **4**

11. a) A vessel is to be designed to withstand an internal pressure of 1500 kg/cm^2. Internal diameter is 250 mm. Yield strength of material is 4500 kg/cm^2. Calculate wall thickness required if monoblock construction is specified. Compare thickness with jacketted construction. Fluid pressure inside vessel is 400 kg/cm^2. Use factor of safety as 2.0. **7**

b) Give design pressure for calculation of thickness of :

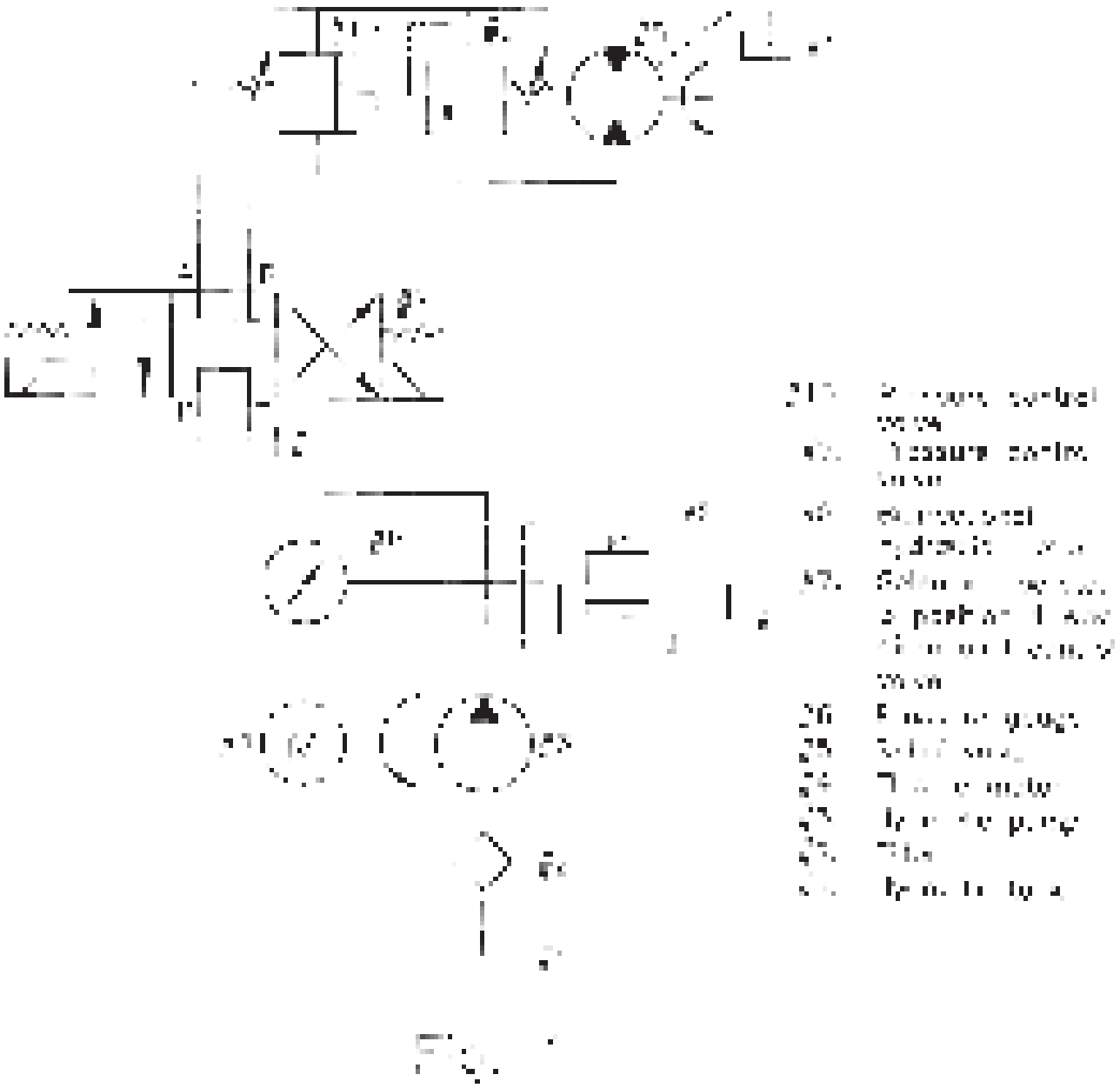
i) Hemispherical head

ii) Torispherical head

iii) Elliptical head. **9**

12. a) With the help of neat sketches, explain different types of jackets used for reaction vessel. Draw comparison between Jacket and Coil. **10**

b) Write in short about various stresses induced in vessels subjected to internal pressure. **6**



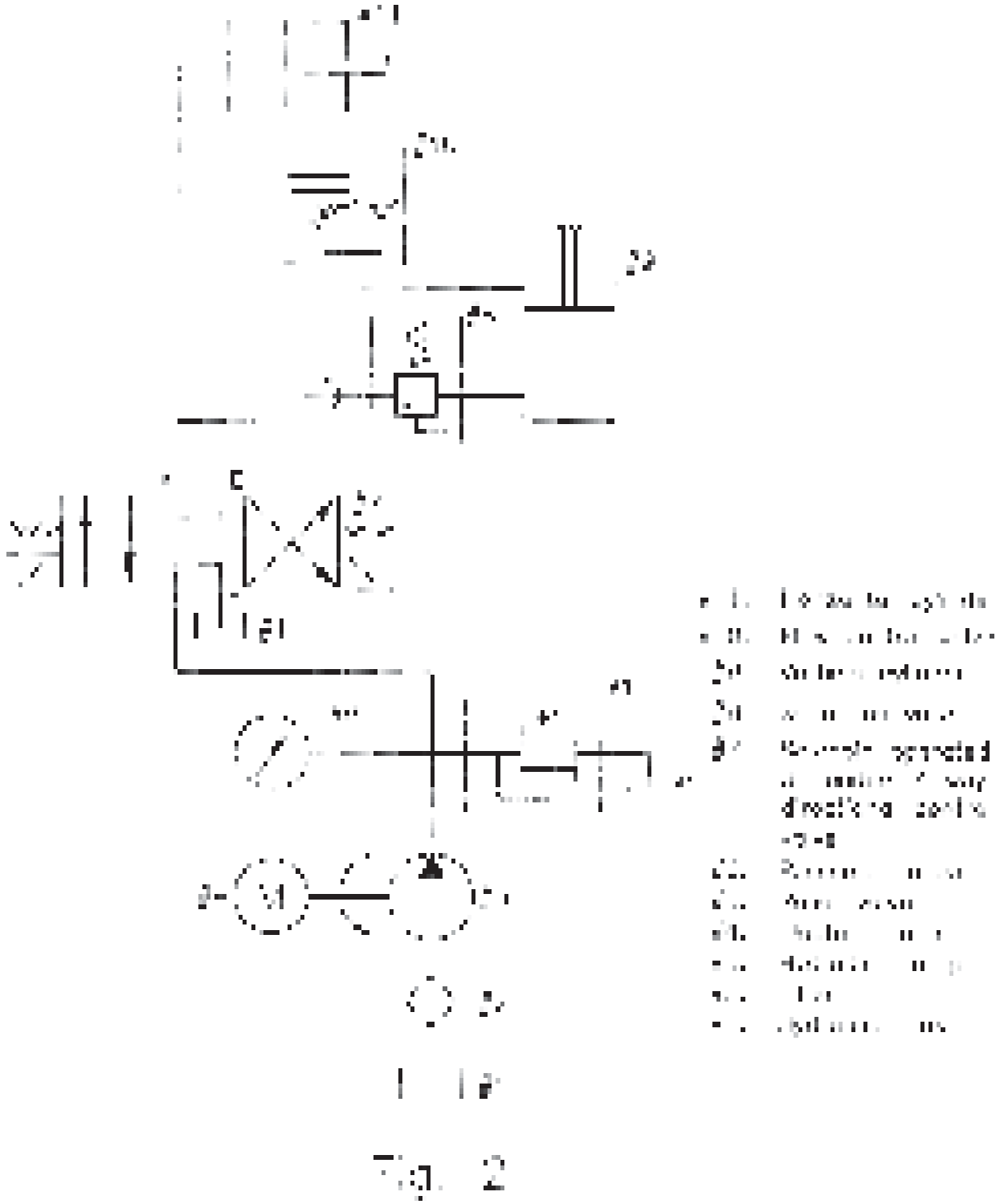


Fig. 2

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T.E. (Polymer) (Semester – I) Examination, 2011
MASS TRANSFER AND REACTION ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Draw **neat** diagrams **wherever** necessary.*
*3) Numbers to the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*
*5) Use of logarithmic table, electronic pocket calculators is **allowed**.*

SECTION – I

1. a) Explain the Fick's Law for the diffusion through solid and explain the phenomena of diffusion through polymers and porous solid. **8**

   b) Explain the terms on Molecular Diffusion, Molar Flux. **5**

   c) Explain in detail the film theory. **5**

OR

2. a) Oxygen (A) is diffusing through Carbon monoxide (B) under steady state condition, with the Carbon monoxide as non-diffusing. The total pressure is 1×10^5 N/m^2 and temperature 0°C. The partial pressure of Oxygen at two planes 2 mm apart is 13000 N/m^2 and 6500 N/m^2 respectively. The diffusivity for the mixture is 1.87×10^{-5} m^2/sec. Find the rate of diffusion of oxygen through each square meter of the two planes. **9**

   b) Write a note on classification of Mass Transfer Operations. **9**

3. a) Write a note on Simple Distillation. **8**

   b) Write a note on "Choice of Solvent" for gas absorption. **8**

OR

4. a) Explain the importance of Equilibrium Curve, Operating Line, in stage wise contact processes. Explain how to determine the number of stages needed for given separation through graphical method. **10**

   b) Write a note on Ideal Solution and Non Ideal Solutions. **6**

P.T.O.

5. a) Explain the terms such as Free Moisture, Equilibrium Moisture and Drying Time. **8**

   b) Explain the terms dry bulb temperature and wet bulb temperature, dew point. **8**

OR

6. a) Explain the following terms : Absolute Humidity, Relative Humidity, Saturated Humidity, Percentage Humidity, Adiabatic Saturation. **8**

   b) Discuss any two drying equipments in detail. **8**

SECTION – II

7. a) Explain the different definitions of rate of reaction and different variables that affects the rate of reaction. **8**

   b) Explain the term Chemical Kinetics and its importance. **8**

OR

8. a) Discuss the terms : i) Elementary and non elementary reactions, ii) Single and multiple reactions. **8**

   b) Discuss the temperature dependency of rate equation from Arrhenius Law, Collision theory. **8**

9. a) Discuss the Integral Method of analysis of kinetics of constant volume batch reactor for irreversible unimolecular first order reaction. **12**

   b) Discuss the terms space time and space velocity. **6**

OR

10. a) Draw neat diagrams of Batch Reactor, Mixed Flow Reactor and Plug Flow Reactor. **6**

    b) Discuss the term variable volume batch reactor and discuss the integral method of analysis of kinetics of variable volume batch reactor for irreversible unimolecular first order reaction. **12**

11. a) Write different factors to be considered while designing of polymer reactors. **8**

    b) Discuss the size comparison of single reactors for carrying out first order reactions. **8**

OR

12. Write a short note on i) Plug flow reactors in series ii) Equal size mixed reactors in series. **16**

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T.E. (Polymer) (Semester – II) Examination, 2011
MATHEMATICAL METHODS FOR POLYMER ENGINEERS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) In Section **I** : Attempt Qu. **1** or Qu. **2**, Qu. **3** or Qu. **4**, Qu. **5** or Qu. **6**.*
*In Section **II** : Attempt Qu. **7** or Qu. **8**, Qu. **9** or Qu. **10**, Qu. **11** or Qu. **12**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Electronic Pocket is **allowed**.*
*6) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Prove the following : **4**

i) $E^{1/2} = \mu + \frac{1}{2}\delta$

ii) $\mu\delta = \frac{\Delta}{2} + \frac{\Delta E^{-1}}{2}$

b) A function y = f(x) is given by the following data. Find f(0.2) by suitable formula. **6**

x	0	1	2	3	4	5	6
y=f(x)	176	185	194	203	212	220	229

c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with h = 0.2. Hence determine the value of π. **6**

OR

2. a) The population of a certain town is shown in the following table. Find the rate of growth in 1961. **6**

Year	1931	1941	1951	1961	1971
Population	40.62	60.8	79.95	103.56	132.65

b) Find the form of the function y for the following data. Hence find y(3). **5**

x	0	1	2	5
y	2	3	12	147

c) Calculate $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's $\frac{1}{3}$ rule with h = 0.25. **5**

3. a) Find the positive real root of $x \log_{10} x = 1.2$, using bisection method in four iterations. **5**

b) Solve the following equations using Jacobi's iteration method : **6**

$3x + 4y + 15z = 54.8$

$x + 12y + 3z = 39.66$

$10x + y – 2z = 7.74.$

c) Fit a least square curve of the form $y = ax^b$ for the following data where a and b are constants. **6**

x	61	26	7	2.6
y	350	400	500	600

OR

4. a) Find a root of the equation $x^3 - 3x - 5 = 0$ by the method of false position (4 iterations). **5**

   b) Solve the system of equations using Gauss Seidel iteration method. **6**

   $6x + 15y + 2z = 72$; $x + y + 54z = 110$; $27x + 6y - z = 85$

   c) By the method of least square, find the straight line that best fits the following data. **6**

x	1	2	3	4	5
y	14	27	40	55	68

5. a) Using Runge-Kutta method of fourth order find $y(0.1)$ and $y(0.2)$, given $\frac{dy}{dx} = 1 + xy$, $y(0) = 2$. **8**

   b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in the following square region with boundary conditions as shown in the figure. **9**

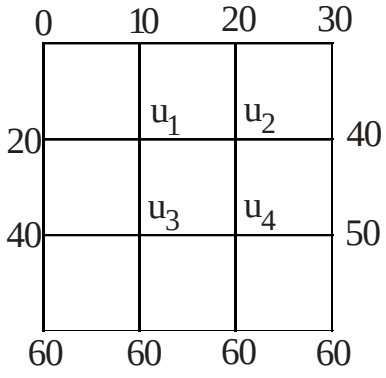

Fig. 5(b)

OR

6. a) Given $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}$; $y(1) = 1$ and $h = 0.1$. Evaluate $y(1.2)$ by modified Euler's method. **8**

b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -(x + y)^2$ over the square region bounded by the lines $x = 0$, $y = 0$, $x = 3$, $y = 3$ given that $u = 0$ throughout the boundaries taking $h = 1$. **9**

SECTION – II

7. a) Solve the following LPP by using Simplex technique **10**

Maximize $Z = 3x_1 + 6x_2 + 2x_3$

Subject to $3x_1 + 4x_2 + x_3 \leq 2$

$x_1 + 3x_2 + 2x_3 \leq 1$

and $x_1, x_2, x_3 \geq 0$.

b) Write the dual of the following LPP **6**

Maximize $Z = 10x_1 + 13x_2 + 19x_3$

Subject to $6x_1 + 5x_2 + 3x_3 \leq 26$

$4x_1 + 2x_2 + 5x_3 \leq 7$

and $x_1, x_2, x_3 \geq 0$.

OR

8. a) Solve the following LPP by using Simplex technique. **10**

Minimize $Z = x_1 - 3x_2 + 2x_3$

Subject to $3x_1 - x_2 + 3x_3 \leq 7$

$-2x_1 + 4x_2 \leq 12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

and $x_1, x_2, x_3 \geq 0$.

b) Write the dual of the following LPP **6**

Minimize $Z = \frac{15}{2}x_1 - 3x_2 + 4x_3$

Subject to $3x_1 - x_2 - x_3 \geq 3$

$x_1 - x_2 + x_3 \geq 2$

and $x_1, x_2, x_3 \geq 0$.

9. a) Find the lines of regression for the following data : **8**

x	10	14	19	26	30	34	39
y	12	16	18	26	29	35	38

and estimate y for x = 17.5 and x for y = 36.6.

b) Probability of man aged 60 years will live for 70 years is $\frac{1}{10}$. Find the probability of 5 men selected at random 2 will live for 70 years. **4**

c) In a certain factory turning out razor blades, there is a small chance of $\frac{1}{500}$ for any blade to be defective. The blades are supplied in a packet of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective and two defective blades, in a consignment of 10,000 packets. **5**

OR

10. a) Obtain regression lines for the following data : **7**

x	2	3	5	7	9	10	12	15
y	2	5	8	10	12	14	15	16

Find estimate of (i) y when x = 6 and (ii) x when y = 20.

b) In a certain examination test, 2000 students appeared in a subject of statistics. Average marks obtained were 50% with standard deviation 5%. How many students are expected to obtain more than 60% of marks, supposing that marks are distributed normally ? **5**

[z = 2, A = 0.4772]

c) The table below gives number of books issued from a certain library on the various days of a week **5**

Days	Monday	Wednesday	Thursday	Friday	Saturday	Sunday
No. of books issued	120	130	110	115	135	110

Test at 5% l.o.s. whether issuing the book is day dependent, $\left[\Psi^2_{5,0.05} = 11.07\right]$.

11. a) Determine whether each of the following quantities is a tensor. If so, state whether it is contravariant or covariant and give its rank : **6**

a) dx^k, b) $\frac{\partial \Phi (x^1, x^2 ... x^N)}{\partial x^k}$

b) A covariant tensor has components xy, $2y - z^2$, xz in rectangular co-ordinates, find its covariant components in spherical polar co-ordinates. **6**

c) If A_r^{pq} and B_r^{pq} are tensors, prove that their sum and difference are tensors. **5**

OR

12. a) Prove that δ_q^p is a mixed tensor of the second rank. **5**

b) Determine the conjugate metric tensor in cylindrical co-ordinates. **6**

c) Prove that a) [pq, r] = [qp, r] ; b) $\left\{ \begin{matrix} s \\ pq \end{matrix} \right\} = \left\{ \begin{matrix} s \\ qp \end{matrix} \right\}$. **6**

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T.E. (Computer) (Semester – I) Examination, 2011
(2008 Pattern)
DATA COMMUNICATIONS (New)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain the functional block diagram of Modem. **8**

   b) Explain the implementation of QPSK. **8**

OR

1. a) Write the comparison between FM and AM systems. **8**

   b) Show and analyse the constellation diagram for an ASK, BPSK and QPSK. **8**

2. a) Encode the following binary data stream into RZ, NRZ, AMI and Manchester codes

   1 1 0 0 1 0 1 0 **8**

   b) Describe effect of Gaussian noise on digital communication. **8**

OR

2. a) A TV signal with a bandwidth of 4.2 MHz is transmitted using binary PCM. The number of quantization levels is 1024. Calculate its code word length, transmission bandwidth, final bit rate and output signal to quantization noise ratio. **8**

   b) Explain with diagram operation of DPCM transmitter. **8**

3. a) Explain Stop and Wait ARQ system. **6**

   b) Write short notes on CRC. **6**

   c) Explain the Huffman encoding algorithm. **6**

OR

P.T.O.

3. a) How to improve the throughput efficiency of ARQ system ? **6**

   b) State and explain Shannon's theorem on channel capacity. **6**

   c) Explain the error detection and correction capabilities of hamming code. **6**

SECTION – II

4. a) List and explain DSL technologies. **8**

   b) Write short notes on "Cellular telephony" **8**

OR

4. a) Explain with diagram SONET frame structure. **8**

   b) Describe the need of frame relay. **8**

5. a) Explain fiber optics modes of propagation. **8**

   b) List and write the use of different network connecting devices. **8**

OR

5. a) What is switch ? Explain difference between manageable and nonmanageable switch. **8**

   b) Explain the switching techniques used in computer data communication. **8**

6. a) Explain various methods of framing in data link layer. **8**

   b) Why internet needs point-to-point protocol (PPP) ? Write features provided by PPP. Describe frame format of PPP. **10**

OR

6. a) Explain bit-map and binary countdown protocol. **8**

   b) Explain in brief pure ALOHA, slotted ALOHA and CSMA/CD mentioning the efficiency of each. **10**

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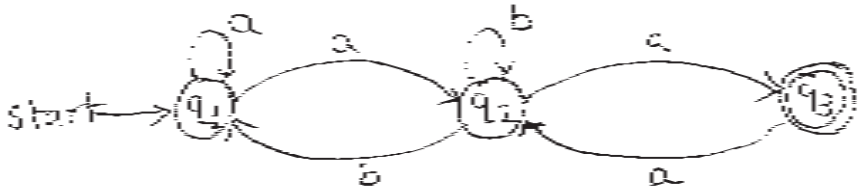
T.E. (Information Technology) (Semester – I) Examination, 2011
THEORY OF COMPUTATION (New) (2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Consider the transition diagram given below. Prove that the strings recognized are : (a + a (b + a a)*b)*a (b + a a)*a. **6**



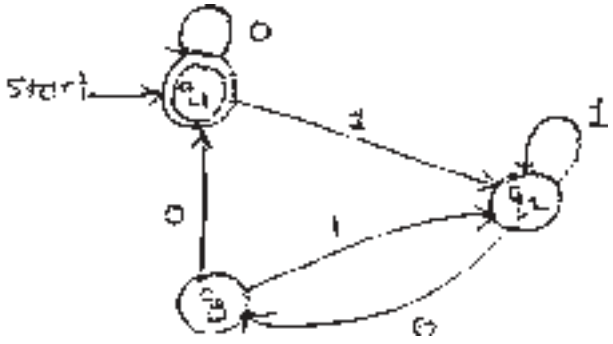
b) State and explain Pumping Lemma for regular sets. **6**

c) Construct NFA for the following regular expression. **6**

$(0 + (0 + 1)^*)^+$

OR

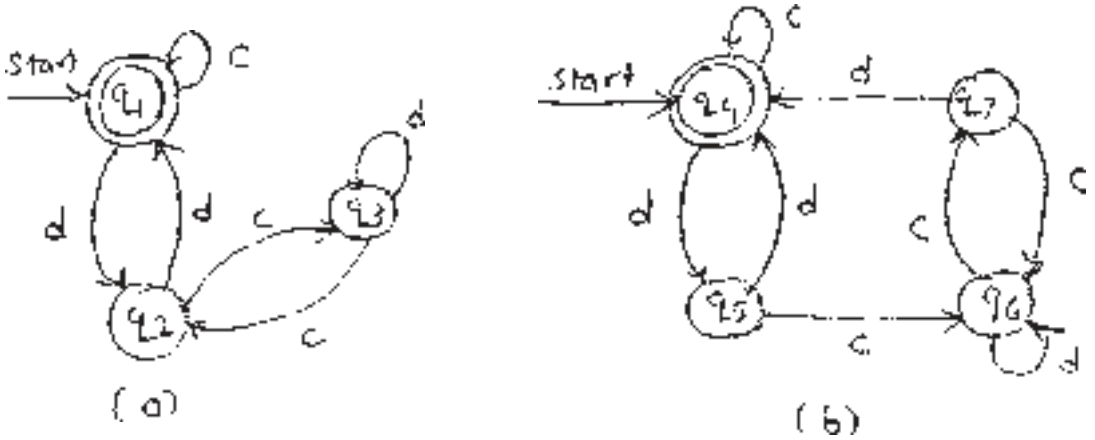
2. a) Construct a regular expression corresponding to the state diagram given below : **6**



P.T.O.

b) Show that the set $L = \left\{ a^{i^2} \mid_{i \geq 1} \right\}$ is not regular. **6**

c) Consider the DFAs shown below. Are they equivalent ? **6**



3. a) Design a finite automata which accepts even number of 0's and odd number of 1's. **6**

b) Convert the following NFA into equivalent DFA **6**

$$M = (\{q_0, q_1\}, \{0, 1\}, \delta, q_0, \{q_1\}) \text{ where}$$

$\delta(q_0, 0) = \{q_0, q_1\}$, $\delta(q_0, 1) = \{q_1\}$, $\delta(q_0, 0) = \phi$

$\delta(q_1, 1) = \{q_0, q_1\}$

c) Design a Moore machine to generate 1's compliment of the given binary number. **4**

OR

4. a) State with brief explanation FSM properties and limitations. **6**

b) Convert the following Moore machine to Mealy machine. **6**

State	Input		Output
	a	b	
q_0	q_1	q_3	1
q_1	q_3	q_1	0
q_2	q_0	q_3	0
q_3	q_3	q_2	1

c) Design a FSM to concept those strings having 101 or 110 as substring. **4**

5. a) Let $G = (\{s\}, \{a, b\}, \{s \to asb, s \to \varepsilon\}, s)$ **4**
Find the language L(G).

b) Define ambiguous grammar.

Consider the following CFG

$E \to E + E$

$E \to E * E$

$E \to E \wedge E$

$E \to id$

Write an unambiuous CFG equivalent to the above grammar. **8**

c) Write a CFG to represent a language defined by the regular expression a^*b^*. **4**

OR

6. a) Construct a grammar for L which consists of strings over $\{0, 1\}^*$ with at least one occurrence of '000'. **4**

b) Find a grammar in Chomsky normal form equivalent to $S \to aAbB$, $A \to aA/a$, $B \to bB/b$. **6**

c) Convert the given right-linear grammar into its equivalent left linear grammar. **6**

$S \to bB$

$B \to bC$

$B \to aB$

$C \to a$

$B \to a$

SECTION – II

7. a) Explain properties of regular expression. **6**

b) Let $G = (\{A_0, A_1\}, \{a, b\}, P, A_0)$ where

$P = \{ A_0 \to aA_1$
$A_1 \to bA_1$
$A_1 \to a$
$A_1 \to bA_0$
$\}$

Construct a FA equivalent to G. **6**

c) Convert the following CFG to CNF **6**

$S \to aSa \mid bSb \mid a \mid b \mid aa \mid bb$

OR

8. a) Explain Chomsky Hierarchy. **6**

   b) Construct a regular grammar G generating the regular set represented by $P = a^{*}b(a + b)^{*}$. **6**

   c) If a regular grammar G is given by $S \rightarrow aS \mid a$, find M accepting L(G). **6**

9. a) Construct a PDA which accepts the language generated by the following CFG for arithmetic expressions **8**

   $S \rightarrow S + S$

   $S \rightarrow S * S$

   $S \rightarrow 8$

   b) Construct a regular grammar G generating the regular set represented by $P = a * b(a + b)^{*}$. **8**

OR

10. a) Compare PDA with FSM. **4**

    b) Show that post machine has more power than PDA. **4**

    c) Design a PM to check well formed parenthesis. **8**

11. a) Design a Turing machine to subtract two unary numbers, the original numbers need not be retained. **8**

    b) Write a short note on universal Turing machine. **8**

OR

12. a) Design a Turing machine to compute 2's complement of a given binary number. **8**

    b) Explain limitations of Turing machine with reference to the halting problem. **8**

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T.E. (Prod.) (Semester – II) Examination, 2011
MANUFACTURING PROCESSES – II
(Common to Production S/W)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*5) Assume **suitable** data, **if necessary**.*

SECTION – I

Unit – I

1. a) Explain non conductor ferrule method and semiconductor cartridge method with neat sketch in stud welding. **8**

   b) Discuss TIG (Tungsten Inert Gas) welding process, with its advantages and disadvantages. **8**

OR

2. a) Explain with neat sketch MIG welding process (Metal Inert Gas Welding) with its applications. **8**

   b) Explain the importance of ASME codes for welding electrodes. **8**

Unit – II

3. a) Describe various types of flames in gas welding with its applications. **8**

   b) Discuss spot welding and seam welding process. **8**

OR

4. a) How oxy-fuel gas cutting torch is differ from oxy-fuel welding torch ? **8**

   b) Explain principle of resistance welding and differentiate between upset welding and flash welding. **8**

P.T.O.

Unit – III

5. a) Explain with neat sketch LASER beam welding and give its applications. **10**

   b) Discuss brazing and braze welding process. **8**

OR

6. a) Explain with neat sketch Electron Beam Welding (EBW) process, write its advantages and limitations. **10**

   b) Write function of flux and filler metal in soldering and compare soldering with brazing. **8**

SECTION – II

Unit – IV

7. a) Explain the importance of good design of gating system in casting. **8**

   b) Explain choke area in casting in detail. **8**

OR

8. a) Define gutting ratio. Differentiate between pressurized and unpressurized gating systems. **8**

   b) Explain directional solidification with neat sketch. **8**

Unit – V

9. a) Classify the different thread cutting methods. Explain the process and principle of thread rolling with a neat sketch. **8**

   b) Explain the process of gear hobbing with neat sketch and write its advantages. **8**

OR

10. a) Explain with neat sketch thread whirling and state its applications. **8**

    b) Describe the process of gear shaping with neat sketch and write its advantages and disadvantages. **8**

Unit – VI

11. a) Explain the principle of Ultra Sonic Maching (USM) process and discuss effect of process parameters on MRR. **10**

    b) Explain the R-C circuit in EDM. **8**

OR

12. a) Explain the principle of Abrasive Jet Machining (AJM) and discuss process parameters, accuracy and applications of AJM. **10**

    b) Explain the mechanism of LBM and EBM. **8**

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T.E. (Information Technology) (Semester – II) Examination, 2011
HUMAN COMPUTER INTERACTION AND USABILITY (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer Question **1** or **2**, **3** or **4** and **5** or **6** from Section – **I** and question **7** or **8**, **9** or **10** and **11** or **12** from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** answer sheet.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Human memory plays an important role in how well people deal with an interface. Describe two important differences between Short-Term Memory and Long-Term Memory. **8**

   b) Discuss general principles and goals of user interface design. **8**

OR

2. a) What is the difference between recognition and recall in relation to human memory ? Explain with example. **8**

   b) What is ergonomics ? Describe with the help of example. **8**

3. a) Describe how HCI affects use of Library Management system with respect to : **10**

      i) The aim of the program (what it is used for)

      ii) Describe its interface (picture of the screen)

      iii) Describe its interaction (how it is used).

   b) Express your opinion – "A design should be User-Centric". **8**

OR

4. a) Describe briefly four different interaction styles used to accommodate the dialog between user and computer. Specify advantages and disadvantages of each interaction style. **10**

   b) What is WIMP ? Explain how to use its elements to design user interface. **8**

5. a) A practical usability engineering process that can be incorporated into the software product development process to ensure the usability of interactive computer products is presented. Explain your view regarding usability engineering life cycle for online hospital management system. **8**

   b) Evaluate Microsoft Word interface using the "Eight golden rules of interface design". **8**

OR

6. a) Explain the guidelines for data display and data entry. **8**

   b) List and explain the steps of usability testing. What are some of the limitations of such testing ? **8**

SECTION – II

7. a) What is DECIDE ? Explain in detail DECIDE framework. **10**

   b) Write a short note on HCI Pattern. **8**

OR

8. a) Discuss the characteristics, guidelines and principles of good web page design. **10**

   b) Explain in brief Hutch World Case Study evaluation framework. **8**

9. a) Hierarchical Task Analysis (HTA) is used to describe the interactions between a user and a software system. Draw and explain HTA to borrow a book from library. **8**

   b) What is Linguistic Model ? Explain BNF and TAG Linguistic Notations. **8**

OR

10. a) What is Cognitive Model ? Discuss with example. **8**

    b) What is Dialog ? Explain different diagrammatic dialog design notations. **8**

11. a) Explain various design issues related to Computer Support Co-operative Work (CSCW). How to tackle these issues through intelligent use of Computers and Networks ? **8**

    b) Differentiate Augmented Reality versus Virtual Reality. **8**

OR

12. Write a short note on : **16**

    i) Information and data visualization

    ii) Synchronous and asynchronous groupware applications.

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T.E. (Biotechnology) Examination, 2011
MASS TRANSFER
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Figures to the **right** indicate **full** marks.*
*2) Use of scientific calculator is **allowed**.*
*3) Draw a **neat** sketch **wherever** necessary.*
*4) Make necessary assumptions **wherever** required.*
*5) Answer **any three** questions from Section **I** and **any three** questions from Section **II**.*
*6) Answer to the **two** Sections should be written in **separate** answer books.*

SECTION – I

1. a) Explain Maxwell's law of diffusion along with equation. **4**

   b) Hydrogen gas at 3 atm and 25 °C flows through a pipe of unvulcanized rubber with I.D of 50 mm and O.D of 75 mm. The solubility of Hydrogen at 273 K and 1 atm pressure is 0.053 cm^3/cm^3 atm and diffusivity of Hydrogen through rubber is 1.8×10^{-10} m^2/sec. Estimate the loss of Hydrogen per meter length of pipe. **12**

OR

2. a) Derive an expression for steady state diffusion through a stagnant film. Plot P_A, P_B and PVs distance Z. **4**

   b) Calculate the amount of oxygen (A) diffusing in one hour under steady state conditions through a non diffusing gaseous mixture of methane (B) and hydrogen (C) in volume ratio 2 : 1. The diffusivities are estimated as $D_{O2\text{-}H2} = 6.99 \times 10^{-5}$ m^2/sec and $D_{O2-CH4} = 1.86 \times 10^{-5}$ m^2/sec. The total pressure is 1×10^5 N/m^2. And temperature is 0 °C. The partial pressure of oxygen at two planes 2 mm apart is 13000 and 6500 N/m^2 respectively. **12**

P.T.O.

3. Write short notes on : **16**
   i) Low pressure distillation with neat sketch
   ii) Use of open steam in distillation.

OR

4. a) Explain steam distillation with neat sketch. **8**
   b) Define differential distillation. Derive Rayleigh's equation with necessary assumptions and nomenclature. **8**

5. A continuous column is to be designed to separate a binary feed mixture containing 50 mole% n-heptane with a distillate product containing 98 mole% n-heptane and bottom product containing 98 mole% n-octane. The feed is at boiling point and operation is at 1 atm using following data. Calculate :
   i) Minimum reflux ratio
   ii) Number of plates at total reflux.

x	0.1	0.3	0.5	0.7	0.9
y	0.195	0.585	0.690	0.840	0.950

18

OR

6. a) 100 moles of A and B mixture containing 50 mole% of lighter component (A) is subjected to differential distillation at atm pressure till composition of A in the residue is 33%. Calculate the total moles of mixture distilled. Average relative volatility is 2.16 . **12**
   b) Write short notes on : **6**
      i) Total condensers ii) Partial condensers.

SECTION – II

7. A plate absorption column is used to reduce the concentration of pollutant A in air stream from 5% to 0.3% in counter current scrubbing with solvent S. This solvent is fresh on entering top of the column and gas enters the bottom of column at a rate of 2.4 m^3/sec at the column operating conditions of 298 K and 1 atm. Equilibrium data is given as

x	0	0.005	0.01	0.020	0.03	0.040	0.045
y	0	0.002	0.005	0.015	0.032	0.053	0.065

16

OR

8. a) Write short notes on Absorption with chemical reaction. **8**

   b) Write short notes on $(L/G)_{min}$ for absorbers. **8**

9. a) Explain the following terms : **8**
   i) Equilibrium moisture content
   ii) Bound moisture
   iii) Unbound moisture
   iv) Free moisture.

   b) Explain the mechanism of moisture movement within the solid. **8**

OR

10. A porous solid is dried in a batch drier under constant drying conditions. 6 hours are required to reduce the moisture content from 30% to 10%. The critical moisture content is found to be 16% and equilibrium moisture content is 2%. All moisture contents are on dry basis. Assume the rate of drying during falling rate period is proportional to free moisture content. How long will it take to dry the solid from 35% to 6% ? **16**

11. a) How are industrial crystallizers classified ? Describe with a neat sketch principle, construction, working, applications of any one crystallizer. **10**

    b) Define super saturation. Explain Meir's super saturation theory with a neat sketch. **8**

OR

12. Calculate the yield of $MgSO_4 . 7H_2O$ crystals when 1000 kg saturated solution of $MgSO_4$ at 353 K is cooled at 303 K assuming 10% of water is lost by evaporation during cooling. Solubility of $MgSO_4$ at 353 K is 64.2 Kg/100 Kg water, solubility of $MgSO_4$ at 303 K is 40.8 Kg/100 Kg water. Atomic weight of Mg = 24, S = 32, H = 1, O = 16. **18**

[3963] – 4

T.E. (Civil) (Semester – I) Examination, 2011
GEOTECHNICAL ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Derive relationship between water content, specific gravity, void ratio, degree of saturation. **7**

   b) Draw and explain plasticity chart. **4**

   c) Explain Flocculent and Honeycomb structure of soil. **5**

OR

2. a) A soil sample in its undisturbed state was found to have volume of 105 cm^3 and mass of 201 gm. After oven drying the mass got reduced to 168 gm. Compute (i) water content (ii) void ratio (iii) porosity (iv) degree of saturation and (v) air content. Take G = 2.7. **7**

   b) Explain in detail IS classification of soil by using dry sieve analysis. **4**

   c) Explain determination of field density by core cutter method. **5**

3. a) List the factors that influence the permeability of soil and mention the manner in which they do so. **5**

   b) Explain the permeability of soil parallel to bedding plane and perpendicular bedding plane. **5**

P.T.O.

c) A cylindrical mould of diameter 7.5 cm contains 15 cm long sample of sand. When water flows through the soil under constant head at a rate of 55 cc/minute the loss of head between two points 8 cm apart is found to be 12.5 cm. Determine the coefficient of permeability of the soil. **6**

OR

4. a) What are properties and uses of flow net ? **5**

b) Explain quick sand condition. **5**

c) Draw schematic diagram of falling head test set up. Derive an expression for coefficient of permeability. **6**

5. a) Explain the factors affecting the compaction of soil. **4**

b) Differentiate between Boussinseq theory and Westerguards theory **4**

c) The following observation were made in a standard proctor test.

Trial No.	1	2	3	4	5	6
Mass of wet soil (kg)	1.70	1.89	2.03	1.99	1.96	1.92
Water content	7.7	11.5	14.6	17.5	19.7	21.2

Volume of mould = 945 cc. G = 2.67.

Determine max. dry density and OMC. Also plot zero air voids line. **10**

OR

6. a) What is contact pressure ? Explain the factors affecting contact pressure with suitable sketches. **5**

b) Write a short note on field compaction control. **5**

c) A concentrated load of 40 kN is applied vertically on a horizontal ground surface. Determine the vertical stress intensities at the following points :

i) At a depth of 2 m below the point of application of the load.

ii) At a depth of 3 m and at a radial distance of 1 m from the line of action of the load. **8**

SECTION – II

7. a) Explain the terms, total stress, effective stress and pore water pressure and state Coulomb's law of shearing strength in total and effective stress condition. **5**

   b) Write a note on Skempton's pore pressure parameters. **5**

   c) An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38 mm and length 76 mm. The load at failure was 30 N and the axial deformation of the sample 11 mm. Determine the undrained shear strength parameters, if the failure plane made an angle of 50° with horizontal. **6**

OR

8. a) Explain the various drainage conditions under which the shear tests can be carried out. **5**

   b) Explain step by step, how unconfined compression strength of a soil sample is determined in laboratory with suitable sketch. **5**

   c) An unconfined cylindrical specimen of clay fails under an axial stress of 240 kN/m^2. The failure plane was inclined at an angle of 55° to the horizontal. Determine the shear strength parameter of the soil. **6**

9. a) Explain the terms earth pressure at rest, active earth pressure and passive earth pressure. **4**

   b) Write a note on Taylor stability number. **6**

   c) Explain Rehbann's graphical method for evaluation of earth pressure. **8**

OR

10. a) Differentiate between Rankine's and Coulomb's theories of earth pressure. **4**

    b) What are the different modes of slope failure ? Give examples. **6**

    c) A retaining wall 9 m high retains a cohesionless soil, with an angle of internal friction 33°. The surface is level with the top of the wall. The unit weight of the top 3 m of the fill is 21 kN/m^3 and that of the rest is 27 kN/m^3. Find the magnitude and point of application of the resultant active thrust. **8**

11. a) What are the different modes of failure of rocks ? Give examples of each. **8**

    b) Write short notes on :

    i) Hardness of rocks

    ii) Rock permeability. **8**

OR

12. Write short notes on **any four** :

    a) Measurement of in-situ stresses in rock.

    b) Sonic velocity

    c) Shear strength of rocks

    d) Porosity of rocks

    e) Durability of rocks. **16**

[3963] – 40 B

T.E. (Production S/W) (Semester – II) Examination, 2011
PROCESS PLANNING AND INDUSTRIAL STATISTICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*

2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

3) Black figures to the ***right*** *indicate* ***full*** *marks.*

4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is ***allowed****.*

5) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Define Process Engineering. Explain different types of functions required to be performed by Process Engineer. **12**

   b) Draw different types of tools and toolings used in shop floor. **4**

OR

1. a) Explain Part – Print Analysis with suitable example. **12**

   b) Enumerate, how machining time is calculated. **4**

2. a) Explain process picture sheet with suitable example. **12**

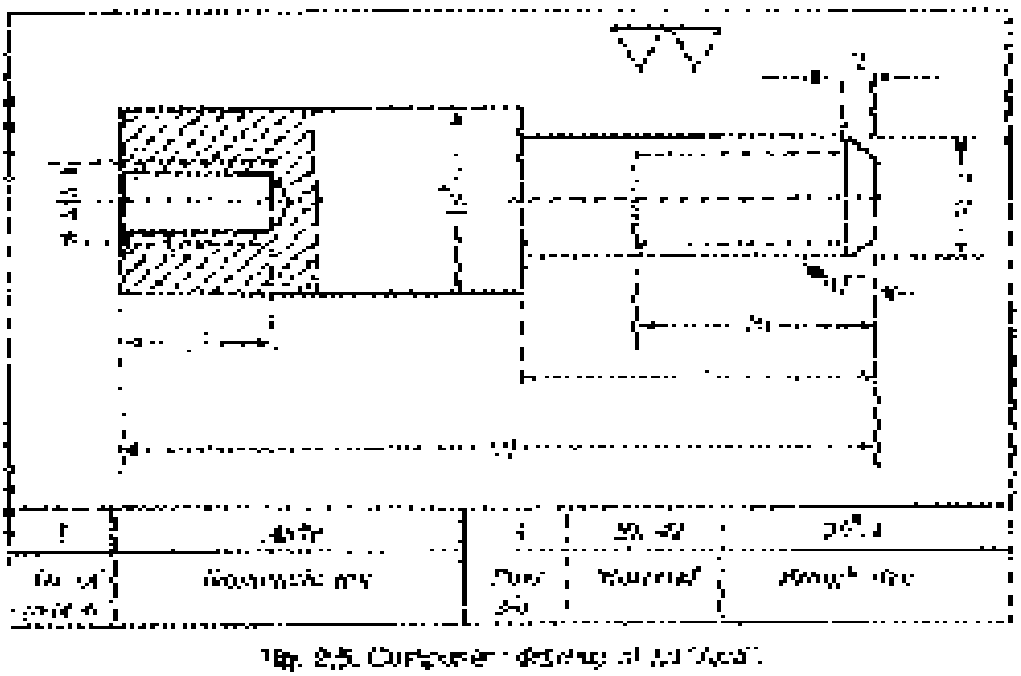
   b) What is the role of product engineering in process planning ? **4**

OR

2. Explain Locating, Supporting and Holding area with suitable example for achieving location, mechanical and geometric control. **16**

P.T.O.

3. Prepare a process plan for a component to be produced by using standard lathe machine as shown in fig. 2.5.



The process plan should include :

i) Manufacturing process plan : selection of machine tool, details of measuring instrument, work and tool holding devices, cutting tools, special tools required if any.

ii) Operations process plan in tabular format containing operation sequence, manual/machine operation, speed, feed, depth of cut, other machining parameters and frequency of operation. Also include time estimate for each operation.

iii) Estimate total time of manufacturing considering 5% fatigue allowance of normal time. **18**

OR

3. Prepare a process plan machine to drill four 8 mm diameter holes and one 40 mm dia central hole for the component shown in fig. 5.26.20 mm dia hole to be drilled first and then enlarged to 40 mm ϕ hole.

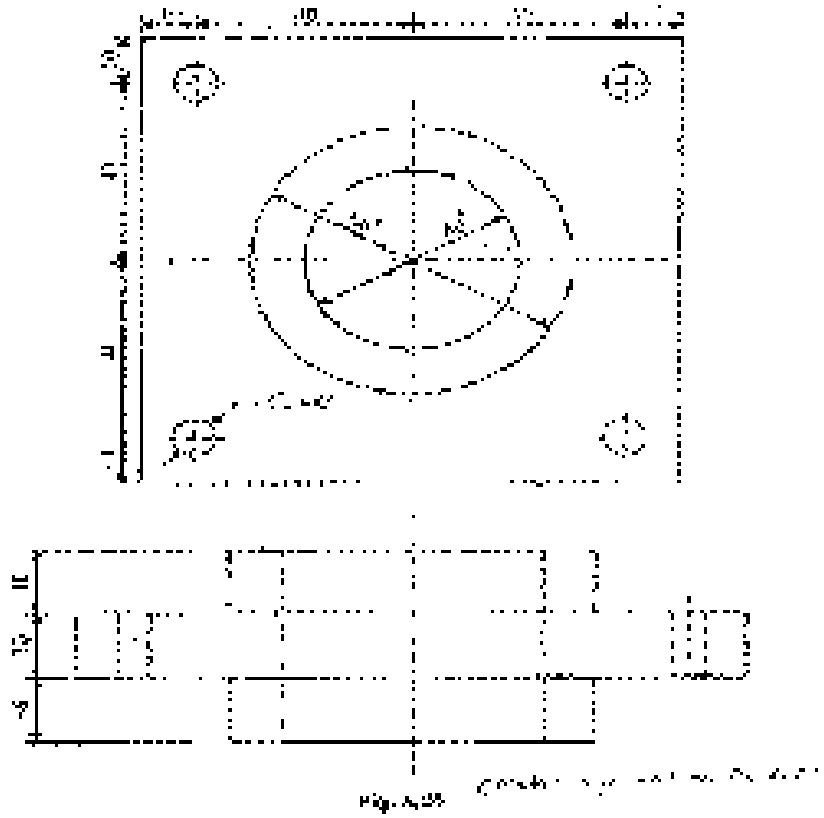
   Material for given job is M.S. Plate

   The process plan should include

   i) Manufacturing plan-selection of machine tools, details of measuring instruments, work holding devices, cutting tools, special tools required if any and their sketches to accompany.

   ii) Operation process plan-operation sequence, manual/machine operation, speed, feed, depth of cut and other machining parameters for each operations and time estimates for each operation.

   iii) Estimate total time of manufacturing for producing 100 No. of such jobs. **18**



SECTION – II

4. Define following with the help of diagram : **16**
   i) Datum
   ii) Flatness
   iii) Allowance
   iv) Tolerance.

OR

4. Explain tolerance stacking and tolerance chart with suitable example. **16**

5. Explain : i) X and R chart ii) p-chart iii) np-chart iv) c-chart. **16**

OR

5. a) Explain correlation and regression analysis in detail. **12**

   b) Draw a normal distribution curve and explain terminologies associated with it **4**

6. Explain the term Hypothesis. What are the different methods to carry out Hypothesis ? Explain procedure of t and f test in detail. **18**

OR

6. Write short notes on : **18**
   i) OC Curve
   ii) Acceptance sampling
   iii) AQL and LTPD.

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T.E. Electrical (Semester – I) Examination, 2011
MICROPROCESSOR FUNDAMENTALS AND APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. Draw and explain the architecture of 8085 microprocessor with description of each section. **16**

OR

2. a) Explain various instruction formats and addressing modes of 8085 instruction set with example of each. **6**

   b) Explain function of following pins of 8085 :
      i) HOLD
      ii) READY
      iii) $\overline{\text{RESET IN}}$
      iv) INTR
      v) $IO/\overline{M}$. **5**

   c) Explain operation of stack of 8085. **5**

3. a) Distinguish between memory mapped I/O and I/O mapped I/O scheme. **8**

   b) Write an assembly language program to separate odd numbers from a given array of 10 H hexadecimal 8 bit numbers stored from C000H location onwards. Store odd numbers from D000H location onwards. **10**

OR

4. a) Explain various techniques of data transfer in detail. **8**

   b) Write an assembly language program to add 8 bit hexadecimal numbers stored in two array whose starting address is E000H onward and F000H onward. Length of array is 0EH. Store the addition result in third memory array whose starting address is D000H onward. **10**

5. a) Explain the Programmable Communication Interface 8251 with block diagram. **8**

   b) Explain RS 232 standard of serial communication. **8**

OR

6. a) Explain command instruction format and status word format of 8251. **8**

   b) Explain asynchronous serial data communication. What is baud rate ? **8**

SECTION – II

7. a) Specify the handshake signals and their functions if port B of 8255 is set up as an input port in mode 1. Discuss the various handshake signals. **8**

   b) Explain with the help of control word format the various operating modes of 8255. Give its control word format in BSR mode. Write an assembly language programme to set and reset PC0 bit in BSR mode. **8**

OR

8. a) Draw and explain functional block diagram of 8254 PIT. **8**

   b) Explain the functional block diagram of 8279 display interface with neat sketch. **8**

9. a) Draw and explain interfacing of ADC0808/09 with 8085 microprocessor. Write an assembly language programme for A/D conversion. **10**

   b) Explain with the help of block diagram measurement of power factor by using 8085 microprocessor. **8**

OR

10. a) Draw and explain interfacing of stepper motor to 8085 microprocessor. Write an assembly language program to control stepper motor. **10**

    b) With the help of block diagram explain application of 8085 microprocessor for measurement of voltage and current. **8**

11. a) Explain the concept of memory segmentation with its advantages used in 8086. Enlist the default segment register – offset register pair. **8**

    b) Explain minimum and maximum mode of operation of 8086 microprocessor. **8**

OR

12. a) Explain in brief the function of following pins of 8086 microprocessor :

    i) NMI

    ii) TEST

    iii) DT / $\overline{R}$

    iv) $\overline{BHE}$ / ST . **8**

    b) State and explain functions of i) Execution unit ii) Bus interface unit of 8086. **8**

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T.E. (Civil) (Semester – II) Examination, 2011
ADVANCED SURVEYING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Assume suitable data, if **necessary**.*

SECTION – I

1. a) What are different triangulation systems ? Give specifications of any one in detail. **6**

   b) Define Geodetic Surveying. What factors are to be considered while selecting a triangulation figure or system ? **6**

   c) What do you mean by signal ? State its classification. What are requirements of good signal ? **6**

OR

2. a) Derive an expression for reduction to centre for a satellite station, if the satellite station (Say 'S') lies on the left of true station and also 'S' is outside the triangle "ABC". **6**

   b) The elevations of two triangulation stations A and B, 120 km apart are 200 m and 1000 m above m.s.l. The elevations of two peaks C and D on the profile between them are respectively 290 m and 540 m. The distance AC = 50 km and AD = 80 km. Design a suitable signal required at B, so that it is visible from ground station A. (Use McCaw's Method). **8**

   c) Enlist various methods of measurement for a Baseline and explain Hunter's short base method. **4**

P.T.O.

3. a) Define the following terms (Give **one** example of **each**) :
   1) Independent quantity
   2) Conditioned quantity
   3) Direct observation
   4) Weight of an observation. **6**

   b) On a station O, three horizontal angles, closing the horizon, were measured as follows

   $\angle A = 34^\circ\ 10'\ 20'' \pm 3''$, $\angle B = 176^\circ\ 40'\ 32'' \pm 4''$, $\angle C = 149^\circ\ 09'\ 04'' \pm 5''$.

   Calculate the corrected angles. **6**

   c) Explain spherical excess. **4**

OR

4. a) Define the following terms (Give **one** example of **each**) :
   1) Indirect observation
   2) Observed value of a quantity
   3) Observation equation
   4) Conditioned equation. **6**

   b) Following angles were measured at a station. Find their most probable values

Angle	**Value**	**Weight**
AOB (α)	$125^\circ\ 30'\ 20''$	2
BOA (β)	$234^\circ\ 28'\ 40''$	4

   6

   c) State any four laws of weights. **4**

5. a) Derive an expression for axis signal correction. **8**

   b) Derive an expression to determine the difference in elevation by single angle observation for angle of elevation. **8**

OR

6. a) Derive an equation for determination of difference in elevation by reciprocal observations. **8**

b) Two triangulation stations A and B are 3200.65 m apart. Find the difference of elevation of the two stations for the following data :

Angle of depression at B to A	=	$2^\circ 18' 16''$
Height of signal at A	=	4.23 m
Height of instrument at B	=	1.24 m
Coefficient of refraction at B	=	0.07
R Sin 1"	=	30.88 m
R.L of B	=	242.6 m

8

SECTION – II

7. a) Define sounding. Enlist different equipments required for sounding, also state different purposes of sounding. **6**

b) Describe briefly how the soundings are located by a) two angles from boat and b) intersecting ranges. **6**

c) Enlist different tidal gauges. Explain any one with neat sketch. **4**

OR

8. a) Explain Echo-sounding. State its advantages. **6**

b) Explain with a neat sketch the method of locating sounding by two angles from the shore. **6**

c) Explain any one of the mechanical solution to solve three point problem. **4**

9. a) Two points A and B having elevations of 650 m and 250 m respectively, above datum appear on a vertical photograph obtained with a camera of focal length of 250 mm and flying altitude of 2700 m above datum. Their correlated photographic co-ordinates are as follows.

Point	**Photographic Co-ordinates**	
	x (cm)	**y (cm)**
a	+ 3.65	+ 2.54
b	– 2.25	+ 5.59

Determine the length of the ground line AB. **6**

b) Define the following terms :
   1) Tilt
   2) Crab and drift
   3) Flying height
   4) Iso-centre. **6**

c) How will you plan your flights for surveying a specified area ? **6**

OR

10. a) Explain overlap in vertical photographs and also explain the necessity of overlap. **6**

b) It is desired to compute a flight mission for an area 8 km wide and 16 km long. The airplane has speed of 192 km/hr. A camera with a focal length of 21 cm is to be used. The approximate scale is 1 : 10,000, the average elevation of the ground is 366 m and the photographs are to be 23 cm × 23 cm. The forward lap is 60% and the side lap is 25%. **8**

c) Explain the method of determining air-base distance in the surveying laboratory also explain what is air-base distance. **4**

11. a) Explain the role of GIS and GPS in flood planning. **6**

b) Explain the working principle of electronic total station. Explain its advantages over 20″ transit theodolite. **6**

c) State the use of Echo-sounder used in hydrographic surveying. **4**

OR

12. a) Explain the application of remote sensing in disaster management. **6**

b) Explain REM (Remote Elevation Measurement) and RDM (Remote Distance Measurement), special functions of total station. **6**

c) Explain Active Remote Sensing and Passive Remote Sensing. **4**

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T.E. (Electrical) (Semester – II) Examination, 2011
ELECTRICAL INSTALLATION, MAINTENANCE AND TESTING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any one** question from **each** Unit.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

Unit – I

1. a) Compare 3 phase 3 wire underground system with 1 phase 2 wire underground system for volume of conductor material required. Clearly state the assumptions made. **8**

   b) State and prove Kelvin's law for feeder design with reference to supply system. State limitations of Kelvin's law. **8**

OR

2. a) A single phase cable has R = 0.3 Ω/km, X = 0.15 Ω/km. The length of cable is 1 km and load points A, B, C and D are loaded as 25 A at 0.8 p.f. lag, 15 A at 0.8 p.f. lag, 50 A at unity p.f. and 40 A at 0.9 p.f. lag respectively. The distance of load points from sending end is 200 m, 400 m, 600 m and 1000 m respectively. The voltage at sending end is maintained at 240 V. The load power factors are referred to sending end. Find the voltages at respective loading points. **10**

   b) Draw single line diagram of typical AC supply distribution system. **6**

P.T.O.

Unit – II

3. a) Explain in detail classification of substation. **8**

   b) Discuss in detail soil resistivity and the different factors which affect soil resistivity. **8**

OR

4. a) Explain in detail procedure of design of earthing grid of a substation. **10**

   b) Explain the terms :
      i) Touch potential
      ii) Step potential. **6**

Unit – III

5. a) Discuss planned and preventive maintenance of generators. **10**

   b) Define and explain its significance w.r.t. condition monitoring :
      i) Polarization index
      ii) Dielectric absorption ratio. **8**

OR

6. a) Explain in detail importance and necessity of maintenance. **8**

   b) Write note on various insulation stressing factors. **10**

SECTION – II

Unit – IV

7. a) Write a note on dissolved gas analysis in context with condition monitoring of transformers. **10**

   b) Explain process of condition monitoring of on load tap changer used in power transformers. **8**

OR

8. a) Explain transformer oil contamination process. Explain the filtration of transformer oil with block diagram. **10**

   b) Discuss in detail different failure modes of transformer. **8**

Unit – V

9. a) What is Signature Analysis ? How it is useful in condition monitoring of electrical equipments ? **8**

   b) What are the various abnormal operating conditions in induction motor and their causes ? **8**

OR

10. a) Explain thermography and its use in condition monitoring of electrical equipments. **8**

    b) Explain in detail condition monitoring of power cables. **8**

Unit – VI

11. a) Explain vibration signature analysis used for failure analysis of rotating machines. **8**

    b) What are different failures modes of bearing ? **8**

OR

12. a) Explain the nomenclature of the bearings. Draw the relevant figure. **8**

    b) Write note on explain spark pulse measurement. **8**

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T.E. (E&TC)/(Electronics) (Indl. Elex.) (Semester – II) Examination, 2011
ADVANCED MICROPROCESSORS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain the following addressing modes of 8086 with suitable examples. **8**

   i) Register Relative

   ii) Indirect Relative

   iii) Based Index

   iv) Indexed

   b) Compare micro and procedure. **4**

   c) Explain segmentation concept in detail and list its advantages. **4**

OR

2. a) Describe interrupt structure of 8086. **6**

   b) How large is the 8086 memory and I/O address space ? **2**

   c) Write assembly language program to convert upper case to lower case and lower case to uppercase. **8**

P.T.O.

3. a) Explain in detail control registers of 80386. List all registers used in protected mode of 80386. **8**

   b) Explain real mode of 80386. **8**

OR

4. a) Explain with suitable diagram addressing mechanism for paging giving details of page table, page directory. **8**

   b) Explain Multitasking. How it is achieved in 80386 ? **8**

5. a) State the features and working of CGA graphics adapter. **6**

   b) Explain various data encoding formats used for storing data on magnetic disks. **6**

   c) What is debouncing and scan codes in keyboard of personal computers and how scan codes are generated when key is pressed ? **6**

OR

6. a) Explain following mouse interface types : **6**

      i) Serial mouse interface

      ii) PS/2 mouse interface.

   b) With suitable block diagram explain CRT interface to PC. **6**

   c) Explain with block diagram pentium mother board. **6**

SECTION – II

7. a) List the features of PCI bus and explain how the addresses can be captured from PCI bus. **8**

   b) With respective to VSB explain : **8**

      i) End point

      ii) Enumeration

      iii) Different types of data transfer.

OR

8. a) Write ALP program to implement PC to PC communication using serial port. **8**

   b) Draw interfacing diagram of standard parallel port with printer. Also draw the timing diagram. **8**

9. a) Explain different types of operating system used in practice. **8**

   b) What is process ? Explain any two ways of implementing inter process communication. **8**

OR

10. a) What is device driver ? Explain structure of MS-DOS device driver. **8**

    b) Explain operating system as memory manager. **8**

11. a) Explain Data flow model of ARM processor. **6**

    b) List features of ARM processor. **6**

    c) Explain the following instructions of ARM processor **6**

       i) MOV PC, LR

       ii) MOV R_2, R_3, LSL #2

       iii) LDR R_2, [R_0], #4

OR

12. a) Describe various modes of operation of ARM core. Explain in detail : **8**

       i) Supervisory mode

       ii) FRQ mode.

    b) Write ASM program to add 10 nos. **6**

    c) Explain CPSR in ARM processor. **4**

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[3963] – 75

T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
ELECTRONIC INSTRUMENTATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be **valued** as a whole.*
*6) **Use** of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Explain principle of Q meter with neat diagram. **4**

   b) Explain RMS reading voltmeter with neat diagram. **8**

   c) Explain following term with respect to R.M.S. meter : **6**

      i) AC/DC coupling

      ii) Crest factor.

OR

2. a) Find crest factor for sinusoidal, rectangular and triangular waveform if $V_{pp} = 4$ V. **6**

   b) Explain Automatic Test Equipment (ATE) with the help of neat block diagram along with its advantages and limitations. **12**

3. a) Give two differences between function generator and frequency synthesizer. **4**

   b) Explain following pulse characteristics with neat diagram : **8**

      i) Duty cycle ii) Pulse droop

      iii) Pulse jitter iv) Rise time and fall time

   c) Why output impedance of function generator is low ? Justify. **4**

OR

P.T.O.

4. a) Explain sampled sine wave synthesizer with neat schematic. **8**

   b) With the help of neat block diagram/ circuit diagram, explain working of Ramp generator. **8**

5. a) Explain following terms in oscilloscope **(any 4)** : **8**

   i) Delayed sweep ii) Vertical sensitivity

   iii) Control grid iv) Delay line

   v) Astigmatism

   b) Give four differences between dual trace oscilloscope and dual beam oscilloscope. **8**

OR

6. a) Explain following terms in storage oscilloscope : **8**

   i) Flood gun ii) Roll mode

   iii) Pretrigger mode iv) Post trigger mode

   b) Give two differences between active and passive probe. **4**

   c) Short note on 10×1 Probe. **4**

SECTION – II

7. a) Explain successive approximation type of ADC with the help of neat block diagram. **8**

   b) What is conversion time for 8 bit successive approximation type of ADC if clock frequency is 1 MHz. **2**

   c) Explain any two specifications of DAC and ADC each. **8**

OR

8. a) State whether following statements are **True**/**False** justify your answer.

   i) Flash type of ADC is faster than successive approximation type of ADC

   ii) Averaging method used in ADC gives good series mode rejection. **6**

   b) Explain dual slope integrating type of ADC with neat block diagram. **10**

   c) Give significance of sample and hold circuit in ADC. **2**

9. a) Explain universal counter with neat block diagram. **8**

   b) Explain any four sources of errors in universal counter. **8**

OR

10. a) What is autozeroing techniques in digital multimeter ? Explain with neat diagram. **8**

    b) Short note on digital capacitance meter. **8**

11. a) What is modulation ? Give two differences between amplitude modulation and frequency modulation. **6**

    b) Short note on telemetry. **6**

    c) Explain in brief frequency division multiplexing. **4**

OR

12. a) Explain distortion meter with Bridge T network. **8**

    b) Write short note on frequency shift keying. **8**

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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Determine H(z) for the system $8\,y(n) - 6\,y(n-1) + y(n-2) = 8x(n)$. Discuss the system stability and determine $H(e^{j\omega})$ from H(z). **8**

   b) Obtain the direct form-I and II structures for the following systems **8**
   i) $y[n] = 0.5[x[n] + x[n-1]]$
   ii) $y[n] - 5y[n-1] = 7x[n]$.

OR

2. a) Determine the impulse response of the system described by the difference equation
   i) $y[n] = 0.6y[n-1] - 0.08y[n-2] + x[n]$
   ii) $y[n] = 0.\,70y[n-1] - 0.10y[n-2] + 2x[n] - x[n-2]$. **8**

   b) Given the system function

$$y[n] = x[n] - 2x[n-1] + \frac{1}{2}x[n-2] + \frac{1}{2}x[n-3] + \frac{1}{2}x[n-4]$$

   Obtain a cascade realization. **8**

3. a) State and prove the following properties of DFT :
   i) Circular convolution
   ii) Circular Time-shifting. **8**

P.T.O.

b) Determine the 8 point DFT of the sequence

$x[n] = \{1, 2, 3, 4, 5, 6, 7, 8\}$

Using the in place radix-2 decimation-in-time (DIT) algorithms. **8**

OR

4. a) Determine the 8 point sequence x[n] of

$X(k) = \{36, -4 + 9.656j, -4 + 4j, -4 + 1.656j, -4, -4 - 1.656j, -4 - 4j, -4 - 9.656j\}$

Using IFFT algorithm. **8**

b) Derive an 8-point DFT using DIF-FFT algorithm. **8**

5. For the desired response

$$H_d(e^{j\omega}) = \begin{cases} e^{-j2\omega}, & -\frac{\pi}{4} \le \omega \le \frac{\pi}{4} \\ 0, & \frac{\pi}{4} < \omega \le \pi \end{cases}$$

Determine the filter coefficients $h_d[n]$ M = 5 using

i) Rectangular window

ii) Hamming window

iii) Hanning window. **18**

OR

6. a) Derive the condition for linear phase for FIR filter. **6**

b) Design a FIR digital filter to approximate an ideal LPF with pass-band gain of unity, cut-off frequency of 850 Hz and working at a sampling frequency of f_s = 5000 Hz. The length of impulse response is 5. Use Rectangular and Bartlett window. **12**

SECTION – II

7. a) From

$$H_a(s) = \frac{1}{(s-1)(s^2+s-1)}$$

Determine H(z) using impulse invariance for T = 1 S. **6**

b) Design a digital low pass Butterworth filter using following specifications

$$0.8 \le \left| H(e^{j\omega}) \right| \le 1 \qquad 0 \le \omega \le 0.2\pi$$

$$\left| H(e^{j\omega}) \right| \le 0.2 \qquad 0.6\pi \le \omega \le \pi$$

Use bilinear transformation to convert into digital filter. **12**

OR

8. a) Discuss design steps of IIR filter using Bilinear transform method. How frequency response is obtained ? **6**

b) Design digital Chebyshev type I filter which satisfy the following specifications :

$$1/\sqrt{2} \le |H(e^{j\omega})| \le 1 \text{ ... for ... } 0 \le \omega \le 0.2\pi$$

$$\text{...} \left| H(e^{j\omega}) \right| \le 0.2 \text{ ... for ... } 0.6\pi \le \omega \le \pi$$

Use the bilinear transformations. **12**

9. a) What are the various DSP processors available in the market ? **6**

b) List out the important features of the DSP procesors. **6**

c) Draw the architecture of DSP processor. **4**

OR

10. a) Draw and explain in detail the architecture of DSP processor. **8**

    b) Explain fixed point and floating point data format in DSP processor. **4**

    c) Explain the indirect addressing modes in TMS320C6X. **4**

11. a) Compare DSP processor with conventional microprocessor architectures. What is the use of DAG1 ad DAG2 ? List the number of internal buses and memory pointer registers used in TMS67XX. **10**

    b) What are desirable features of digital signal processor ? **6**

OR

12. a) Explain in brief the following functional units : **10**

    i) Barrel shifter

    ii) MAC.

    b) Draw architectural block diagram of DSP processor and explain function of each block. **6**

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T.E. (Printing) (Semester – I) Examination, 2011
PRINTING PROCESS INSTRUMENTATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and solve Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*

*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*3) Answers to the **two** Sections should be written in **separate** books.*

*4) **Neat** diagrams must be drawn **wherever** necessary.*

*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*

*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw and explain the block diagram of automatic control system with suitable example. **8**

   b) Discuss the two static and two dynamic characteristics of instruments. **8**

   OR

2. a) Give comparison between gross errors and systematic errors. Explain methods to minimize these errors. **8**

   b) With suitable example explain in detail the term servomechanism. **8**

3. a) What are the different methods for high temperature measurement ? Explain any one in detail. **8**

   b) Define the term vacuum. List the different methods to measure vacuum pressure. Explain any one method in detail. **8**

   OR

P.T.O.

4. a) A copper constantan thermocouple was found to have linear calibration between 0°C and 600°C. With emf at maximum temperature (at cold junction temperature 0°C) being equal to 30 mV. Determine the correction, which must be made to the indicated emf if cold junction temperature is 25°C. If indicated emf is 10 mV (at cold junction temperature 25°C) in thermocouple circuit determine temperature of hot junction. **8**

   b) Explain any one non contact type method for angular displacement measurement. **8**

5. a) Explain the working of phototransistor in detail. What are its applications in printing processes ? **8**

   b) Draw the circuit diagram for instrumentation amplifier using three op-amps. Derive the equation for its overall gain. List the features of instrumentation amplifier. **10**

OR

6. a) Explain the process of linearization in detail. **8**

   b) Define the term filter. Explain first order low pass Butterworth filter with its frequency response. Explain the terms cut off frequency and roll off rate. **10**

SECTION – II

7. a) What are the different types of continuous controllers ? Explain any one continuous controller in detail. **8**

   b) With suitable example explain final control operation. **8**

OR

8. a) With a neat sketch, show the output of following controllers if the input to the controller is a step function -

      P, I, PI, PID. **8**

   b) Explain multiposition controller in detail. **8**

9. a) A J type thermocouple with a 0°C reference is used in proportional mode temperature control system with a 140°C setpoint and a 100°C to 180°C range. The zero error output should be 45% and PB = 35%. The output is 0 to 10 volts and full scale input range is 0 – 1 volt. Design a operational amplifier based proportional controller. **8**

   b) Explain in detail pneumatic proportional plus derivative controller. **8**

OR

10. a) Explain electronic proportional plus derivative controller. **8**

    b) Explain in detail different controls required in ink flow control system. **8**

11. a) Define the term PLC. Draw the different symbols for control and timer relays and output devices. **8**

    b) A pump is used to fill two storage tanks. The pump can be manually started or stopped using push buttons. When first tank is full the circuit must have automatic actions to fill second storage tank by opening valves ? When second tank becomes full pump must be stopped automatically and tank full indication must light up ? Draw the circuit diagram and ladder diagram for the system given above. **10**

OR

12. a) Write a short note on SCADA. **8**

    b) Explain in detail 8-channel data logger system. **10**

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T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING MATHEMATICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Black figures to the **right** indicate **full** marks.*

*4) Your answers will be **valued** as a whole.*

*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*

*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Solve the following equations using Gauss elimination method **9**

$$2x_1 - 3x_2 - 4x_3 = 11$$
$$9x_1 + 2x_2 - 8x_3 = 1.9$$
$$15x_1 - 8x_2 + 6x_3 = 14.7$$

b) State the convergence criteria for the Gauss seidal method. **9**

OR

2. a) State and explain three categories in which systems of linear algebric equations can be classified. **9**

b) Determine eigen values of the following matrix $A = \begin{bmatrix} -5 & 2 \\ 5 & -2 \end{bmatrix}$ **9**

P.T.O.

3. a) Give the graphical interpretation of Eulers method and obtain the formula for Eulers method. **8**

   b) A compound material balance around a chemical reactor yields the following steady state equation

$$O = \frac{F}{V} C_{in} - \frac{F}{V} C - KC^{2.5}$$

where $\frac{F}{V} = 0.1 \text{ min}^{-1}$

$C_{in} = 1.0 \text{ Kg mol}/\text{m}^3$, $K = 0.05 \text{ m}^{4.5}/\text{Kgmol}^{1.5} \text{ min}$

Perform 8 iterations of Newton-Raphson method using initial guess C = 1.0. **8**

OR

4. a) The temperature of the slab at one end is 1000 °C. The ambient temperature is 45 °C. Heat flow from one end to other end of the slab is 20.4 kW, for area of 1 m^2. The thermal conductivity of a slab is given by K = 0.8 (1 + 0.002T) where T is the temperature at the other end. The thickness of slab is 40 cm. Find the temperature at the other end. Use 2^{nd} order Runge-Kutta method. Take h = 10 cm. **8**

   b) Give the graphical interpretation of Newton-Raphson method and obtain

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$ **8**

5. Establish a relation between adjacent cells with approximate step size for finite difference approximation. **16**

OR

6. Solve $\frac{d^2y}{dx^2} + y = 0$ with boundary conditions

   $y = 0$ when $x = 0$

   $y = 0$ when $x = 1$

   Find y at x = 0.5 **16**

SECTION – II

7. a) Fit a parabola to the following data using method of least squares. **10**

x	1.0	1.2	1.4	1.6	1.8	2.0
y	0.98	1.40	1.86	2.55	2.28	3.20

b) Explain linear regression for least squares. **6**

OR

8. Explain the following terms :
   1) Arithmetic mean
   2) Standard deviation
   3) Variance
   4) Degree of freedom
   5) Coefficient of variance. **16**

9. Determine whether each of the following quantities is a tensor. If so state whether it is contravarient or covarient and give its rank **16**

   a) dx^k

   b) $\frac{\partial \phi}{\partial x^k}(x^1, ..., x^N)$

OR

10. a) Explain tensor components in a curvilinear co-ordinates. **8**
    b) What are different fundamental operations with tensor, explain in brief. **8**

11. a) What is optimization, state its utility in brief. **6**
    b) Maximize $Z = 14x + 20y$
    Subjected to condition
    $20x + 6y \leq 1000$
    and $40x + 8y \leq 500$
    $x, y \geq 0$ **12**

OR

12. A company making cold drinks has two bottling plants located at towns T_1 and T_2. Each plant produces three drinks A, B and C and their production capacity per day is shown below :

Cold drinks	**Plants at**	
	T_1	**T_2**
A	6000	2000
B	1000	2500
C	3000	3000

The marketing department of the company forecasts a demand of 8000 bottles of A, 22000 bottles of B and 40000 bottles of C during month of June. The operating cost per day of plants at T_1 and T_2 are 6000 and Rs. 4000 respectively. Find the number of days for which each plant must be run in June. So as to minimize the operating cost while meeting the marketing demand. **18**

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T.E. (Chemical) (Semester – II) Examination, 2011
CHEMICAL PROCESS TECHNOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*

SECTION – I

1. a) Discuss various forms of flow diagrams used in process industry. **8**
   b) Define unit operation and unit processes and give applications of each. **8**

OR

2. a) Describe Solvay's process in detail. **8**
   b) Discuss Production of Aluminium in Electrolytic Industry. **8**

3. a) Explain the engineering problems involved in production of Urea. **8**
   b) Draw and explain the process used for Ammonium Sulphate production. **8**

OR

4. a) Describe the process for producing Phosphoric acid. **8**
   b) Discuss how super phosphates are produced. **8**

5. a) Explain the unit operations and processes used for sugar production. **10**
   b) Discuss Kraft pulp process in detail. **8**

OR

6. a) Explain the procedure of absolute alcohol production. **8**
   b) Discuss the various starch derivatives used in industry and explain production of dextrin. **10**

P.T.O.

SECTION – II

7. a) Explain the destructive distillation of coal. **10**

   b) Discuss production process for soap with cleaning action of soap. **8**

OR

8. a) Describe production of Pencillin. **10**

   b) Explain Hydrogenation of oil. **8**

9. a) Explain recovery or production method for Natural gas and give its industrial applications. **8**

   b) Describe cracking operation. **8**

OR

10. Describe with neat diagram **(any two)** : **16**

    a) Reforming
    b) Isomerization
    c) Alkylation
    d) Hydrogenation.

11. a) Describe production of acetylene in detail. **8**

    b) Explain the production of Phenol. **8**

OR

12. Draw neat flow diagrams **(any two)** : **16**

    a) Production of cumene
    b) Production of styrene
    c) Production of formaldehyde
    d) Halogenation of Hydrocarbons.

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T.E. Civil (Sem. – I) Examination, 2011
THEORY OF STRUCTURES – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *:* 1) *Answer to the* ***two*** *Sections should be written in* ***separate*** *books.*
2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
3) *Black figures to the right indicate full marks.*
4) *Your answers will be valued as a* ***whole****.*
5) ***Use*** *of electronic pocket calculator is* ***allowed****.*
6) ***Assume*** *suitable data,* ***if*** *necessary.*
7) ***All*** *questions are* ***compulsory****.*
8) ***Solve*** *Que.* ***1*** *or Que.* ***2*** *, Que.* ***3*** *or* ***4****, Que.* ***5*** *or Que.****6****, from Section* ***I****. Que.* ***7*** *or* ***8****, Que.* ***9*** *or* ***10****, Que.* ***11*** *or Que.* ***12*** *from Section* ***II****.*

SECTION – I

1. a) If BC is the intermediate span of the continuous beam ABCD, derive the slope deflection equations for beam BC if one of the support sinks down by an amount delta. Explain the meaning of each notation you use in the expression. **8**

   b) Using Slope Deflection Method, determine the rotation/s and lateral sway of the frame loaded and supported in fig. 1. Assume constant EI for beam and columns. **10**

OR

2. Using Moment Distribution Method, draw BMD and SFD for the frame loaded and supported as shown in fig 1. Assume constant EI for beam and columns. **18**

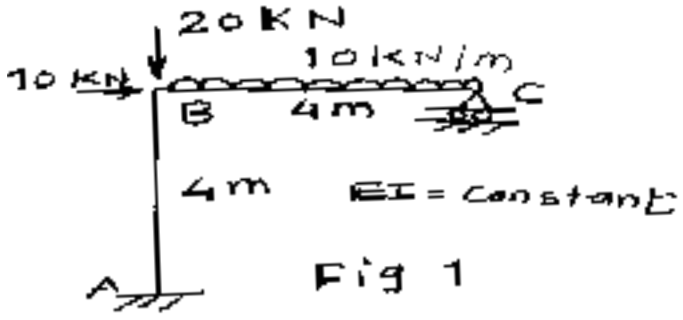

Fig 1

P.T.O.

3. a) Derive flexibility coefficient matrix for the horizontal cantilever beam with span. L, subjected to action (i.e. forces) A_1 and A_2 at the free end. Action A_1 is vertically downward point load and action A_2 is clockwise moment. EI as a constant flexural rigidity. **8**

   b) Using Flexibility Matrix Method, determine the reactions of the propped cantilever beam of span L and subjected to udl, w/m over total span. Assume EI as a constant. **8**

OR

4. a) a. State the properties of stiffness coefficients matrix. **8**

      b. State any four points of comparison between flexibility and stiffness matrix methods.

   b) Derive the stiffness matrix for the frame loaded and supported as shown in fig 2. **8**

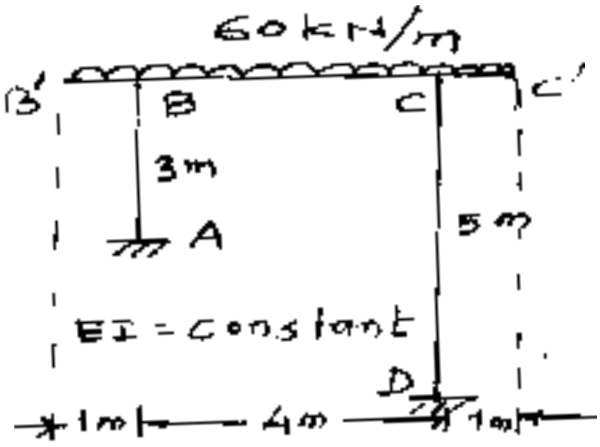

Fig 2

5. a) A rigid jointed 2 bay – 2 story frames is subjected to lateral loads of 50 kN (left to right) at story levels 1 and 2. Story heights and bay spans are 4 m each. Area of each beam is 'A' and area of each column is '2A'. Using Cantilever method, draw Bending Moment Diagram, Shear force diagram and Axial Force diagram for the roof level beams. **8**

   b) A uniform semicircular beam, ABC, curved in plan with radius 2 m, is simply supported at three equally spaced supports A, B and C. The beam is loaded with udl of 30 kN/m, over the entire curved length of beam. Plot the SFD and BMD for this continuous beam ABC. **8**

OR

6. a) A rigid jointed 1 bay – 3 story frames is subjected to lateral loads of 100 kN (right to left) at all story level. Total height of frame is 15 m. Story height and bay span is 5 m each. Using Portal method, determine the support moments and reactions. Plot Bending Moment Diagram, Shear force diagram and Axial Force diagram for the left column. **8**

   b) A circular beam curved in plan has a radius 5 m, uniform distributed load, 20 kN/m over the entire beam and supported by 6 columns. Obtain the expression for the torsional moment at section xx at an angle ' β ' with the line joining center 'O' of the beam and any one support. **8**

SECTION – II

7. a) Derive the Connectivity matrix relating stresses with strain in 2D elastic state. **9**

   b) For Beam-Column element of span, L and subjected to transverse udl, w/m run and axial load, P, derive the differential equation for Elastic Stability. **9**

OR

8. a) An elastic body under the action of external force has the displacement field given by : $D = (x^2 + y^2)\, i + (2z - y)\, j + (3x + y^2)\, k$.
   Evaluate the components of strain at point (1,2,3) **9**

   b) For Beam-Column element, derive the elastic stability stiffness matrix. State the meaning of each notation you use. **9**

9. a) Determine the shape factor for circular cross section of radius, 5 m. **8**

   b) Derive the general expression of profile of parabolic light weight cable subjected to udl w per unit run on the horizontal span, L. Assume h is the dip. **8**

OR

10. a) A continuous beam ABC is loaded with ultimate load, W_u and constant plastic moment, M_p. Determine the plastic moment at the collapse for the beam with following data.
    Support A is fixed and B and C as roller. Length AB = 3 m and length BC = 5 m.Span AB carries udl, 50 kN/m and span BC carries central point load, 100 KN. **8**

    b) A suspension bridge of 80 m span is hung with the help of cable between two piers which are 10 m and 5 m respectively above the lowest point of the cable. If load carried by the cable is 5 kN /m, determine the length of the cable and tension in the cable near the two piers. **8**

11. a) Using finite difference method, determine the displacement at centre of simple supported beam, AB of span 6 m subjected to udl of 10 kN/m over the half span. Assume the interval as 1m and constant EI for beam AB. **8**

    b) Explain the following: **8**

    i) Typical finite elements.

    ii) Convergence requirement for displacement function.

    iii) Pascal's triangle.

OR

12. a) Using finite difference method, determine the displacement at the centre of simple supported beam AB of span 4 m subjected to concentric point load of 50 kN at 1m from support A. Assume 1 m interval and EI for AO and OB is EI:2EI. Point 'O' is the mid point of span AB. **8**

    b) List out the basic steps in Finite element method for the solution of static problems. **8**

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T.E. (Civil) (Semester – II) Examination, 2011
TRANSPORTATION ENGINEERING – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Describe classification of Indian railway lines on speed criteria. **6**

   b) Compare railway transportation with road transportation. **6**

   c) Describe in brief various load and stresses acting on the rail. **4**

   OR

2. a) What is creep ? What are its effects ? How it is adjusted ? **6**

   b) Write a short note on double headed rail. **4**

   c) Draw a typical cross section of a permanent way. Also state the basic functions of various components of the railway track. **6**

3. a) Describe in brief the different types of surveys to be carried out in case of a new railway project. **6**

   b) Why is it necessary to provide grade compensation on curves ? If the ruling gradient is 1 in 250 on a particular section of BG and if a curve of 3 degree is situated on this gradient, what should be the actual ruling gradient ? **6**

   c) What is necessity of welding the rails ? Explain in brief Alumino thermit welding. **6**

   OR

P.T.O.

4. a) What is meant by crossing ? What are the essential requirements of a good crossing ? **6**

   b) With the help of a neat sketch, explain the concept of negative superelevation. **6**

   c) Define gradient state and explain various types of gradients. **6**

5. Write short notes on : **(4×4=16)**

   i) Directed track maintenance

   ii) Triangle

   iii) Classification of signals

   iv) Automization of Indian railways.

OR

6. a) What are the functions of railway station ? Discuss the various requirements of railway station. **6**

   b) Explain clearly the location and use of the following signals. **6**

   i) Outer signal ii) Starter signal

   iii) Warner signal iv) Caution indicator.

   c) Explain in brief measured shovel packing. **4**

SECTION – II

7. a) Explain the various factors which influence the size and shape of tunnel. **6**

   b) State the various types of drilling pattern. What factors govern the selection of a particular drilling pattern ? **6**

   c) Describe NATM method of tunnelling. **6**

OR

8. a) Define Twin Tunnels. Under what circumstances are they useful ? **6**

   b) State various cross sections of tunnel. Why horse shoe section is used for carrying sewage ? **6**

   c) Write a brief note on pilot tunnel. **6**

9. a) Enlist the various kinds of explosives used in tunnel excavation. Explain any one in brief. **4**

   b) Draw a neat sketches of the following methods of mucking
   i) Cherry picker method ii) California crossing method **6**

   c) Define ventilation. What are the requirements of tunnel ventilation system ? **6**

OR

10. a) Bring out the sequence of operation for concrete lining in tunnel. **6**

   b) Write short notes on : **(5×2=10)**
   i) Types of tunnel lining ii) Safety precautions in tunnelling

11. a) Explain the following : **(2×4=8)**
   i) Dolphin ii) Wharve
   ii) Tetrapode iv) Port

   b) What are the various points to be considered while selecting a site for a harbour ? **4**

   c) State the advantages and disadvantages of water transportation. **4**

OR

12. Write a short notes on : **(4×4=16)**
   i) Breakwater
   ii) Types of fenders
   iii) Commercial and fishery Harbours
   iv) Jetty and Wharve.

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T.E. (Chemical) (Semester – II) Examination, 2011
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(Common to Bio-Technology)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain the contribution of Henry Fayol to the development of scientific management. **8**
   b) Briefly explain the definition and functions of management. **8**

OR

2. Distinguish between Partnership and Joint Stock Company. Explain in detail the formation and function of Joint Stock Company. **16**

3. a) State and explain Mcgregor's theory of motivation and compare it with Maslow's heirarchy theory of motivation. **10**
   b) Define merit rating. Explain any two methods of merit rating. **6**

OR

4. State and explain the concept of man power planning. Enlist various techniques and objectives of man power planning. **16**

5. a) What is Economic order quantity ? How it is derived ? Explain the assumptions and objectives of EOQ ? **10**
   b) What is ABC analysis ? Explain its importance and objectives. **8**

OR

6. a) State and explain various functions of stores management. **9**
   b) Explain in detail Bin card and storage ledger. How it helps to inventory management ? **9**

P.T.O.

SECTION – II

7. What is Market Research ? Explain various methods of market research . How it helps an enterprise to position its business in a competitive business environment ? Explain. **16**

OR

8. a) State and explain the objectives and importance of advertising and sales promotion. **8**

   b) Distinguish between penetration pricing and skimming pricing. Under what conditions these pricing methods are adopted ? **8**

9. a) What is quality ? What are its features ? Explain the concept of total quality management. **8**

   b) Distinguish between product patent and process patent. How patent right is different from copyright ? **8**

OR

10. a) State and explain the functions of Export Promotion Council. How it facilitates International Trade ? **8**

    b) What is anti-dumpling duties ? How it is Levied ? Explain the impact of anti-dumpling in International Business. **8**

11. a) Define Method Study. Explain its procedures and objectives. **9**

    b) Explain in detail

       i) Flow process chart

       ii) Therblige. **9**

OR

12. Write short notes on :

    i) Contract Act,

    ii) MRTP act and

    iii) FERA and FEMA. **18**

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[3963] – 101

T.E. Petroleum (Semester – I) Examination, 2011
MATHEMATICAL METHODS FOR PETROLEUM ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: 1) In Section **I** attempt Qu. **1** or Qu. **2**, Qu. **3** or Qu. **4**, Qu. **5** or Qu. **6**. In Section **II** attempt Qu. **7** or Qu. **8**, Qu. **9** or Qu. **10**, Qu. **11** or Qu. **12**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of electronic pocket calculator is **allowed.***

*6) Assume suitable data, **if** necessary.*

SECTION – I

1. a) Show that $u = x^4 - 6x^2y^2 + y^4$ is harmonic and find its harmonic conjugate. Also find corresponding analytic function. **6**

   b) If f (z) is an analytic function of z and f (z) = u + iv prove that

   $$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\left(|\text{Re f }(z)|^2\right) = 2\,|f'(z)|^2$$ **6**

   c) Find the bilinear transformation, which sends the points 1, i, –1 from z-plane into the points i, 0, – i of the w-plane. **5**

OR

2. a) Find the analytic function f (z) = u + iv where $u = r^3\cos 3\theta + r\sin\theta$. **6**

   b) Show that analytic function f (z) with constant modulus is constant. **5**

   c) Show that the map $w = \dfrac{2z+3}{z-4}$ transforms the circle $x^2 + y^2 - 4x = 0$ into the straight line 4u + 3 = 0. **6**

P.T.O.

3. a) Use Cauchy integral formula to evaluate

$\oint_C \frac{z+3}{z^2+2z+5}\,dz$, where 'C' is the circle $|z-2i|=\frac{3}{2}$. **6**

b) Find residues at each of the poles of $f(z)=\frac{z^3+2}{(z+1)^2(z-i)(z+2)}$. **5**

c) Using contour integration evaluate

$\int_0^{2\pi} \frac{\sin^2\theta}{5+4\sin\theta}\,d\theta$. **6**

OR

4. a) Evaluate $\oint_C \frac{\sin \pi z^2 + 2z}{(z-1)^2(z-2)}\,dz$ where C is the circle | z | = 4. **6**

b) Find the residues at poles of the function $f(z) = e^z \sec z$ which lie within the circle | z | = 2. **5**

c) Evaluate by using complex variable method $\int_0^{2\pi} \frac{d\theta}{1-2a\cos\theta+a^2}\ (0<a<1)$. **6**

5. a) Compute correlation coefficient between supply and price of commodity using following data : **6**

Supply	152	158	169	182	160	166	182
Price	198	178	167	152	180	170	162

b) Find mean and variance of Binomial probability distribution. **6**

c) In a Poisson distribution if p (r = 1) = 2 p (r = 2) find p (r = 3). **4**

OR

6. a) Obtain regression lines for the following data : **6**

x	6	2	10	4	8
y	9	11	5	8	7

b) Assuming that the diameters of 1000 brass plugs taken consecutively from machine form a normal distribution with mean 0.7515 cm and standard deviation 0.0020 cm. How many of the plugs are likely to be rejected if the acceptable diameter is 0.752 ± 0.004 cm. ?
(z = 2.25, A = 0.4772 ; z = 1.75, A = 0.4708). **5**

c) A nationalized bank utilizes four teller windows to render fast service to the customers. On a particular day, 800 customers were observed. They were given service at the different windows as follows :

Window number	**Number of customers**
1	150
2	250
3	170
4	230

Test whether customers are uniformly distributed over the windows, at 5 % l.o.s. $\psi^2_{3;0.05} = 7.815$. **5**

SECTION – II

7. a) With usual notations, establish the following :

i) $hD = \log E = 2\sinh^{-1}\left(\frac{\delta}{2}\right)$

ii) $1 + \delta^2\mu^2 = \left(1 + \frac{1}{2}\delta^2\right)^2$

iii) $\Delta = \mu\delta + \frac{1}{2}\delta^2$. **9**

b) Following table gives, speeds at various points of the distance covered. Find the time taken to travel the complete distance, using Simpson's $\frac{1}{3}$rd rule : **8**

Distance s	0	5	10	15	20	25	30
Speed in km. per hour	10	45	60	65	70	55	20

OR

8. a) Following table shows enthalpy at different pressures

Pressure (Bar)	1.9	2.2	2.4	2.6
Enthalpy	497.9	517.6	529.6	540.9

Find out the enthalpy at pressure 2.1 bar, by Lagrange's interpolation method. **8**

b) Prepare the forward difference table for y = sinx, where $x = 10° (5°) 35°$. Find $\sin(12.5°)$, $\cos(12.5°)$ using appropriate interpolation formula. **9**

9. a) Obtain one root of the equation $8x^3 - 6x - 1 = 0$ correct to four decimal places, using Newton-Raphson method. Write the algorithm for the above method. **8**

b) The values of Nusselt number (y) and Reynolds number (x) found experimentally are given below. Find the relation of the form $y = ax^b$, using method of least squares **8**

Reynolds No. (x)	3000	4000	5000	6000	7000
Nusselt No. (y)	14.3575	15.6517	16.7353	17.6762	18.5128

OR

10. a) Use Gauss-Seidel method to solve the system of equations **8**

$4x_1 - 2x_2 - x_3 = 40$

$x_1 - 6x_2 + 2x_3 = -28$

$x_1 - 2x_2 + 12x_3 = -86$

finding solution at the end of fourth iteration.

b) Use Runge-Kutta method to solve $\frac{dy}{dx} = x - y^2$ with x = 0, y = 1 to calculate y at x = 0.4 in two steps of size h = 0.2. **8**

11. a) Given the values of u (x, y) on the boundary of the square plate in Fig. 11 (a), evaluate the function u (x, y) at the nodal points, satisfying the Laplace equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$ **8**

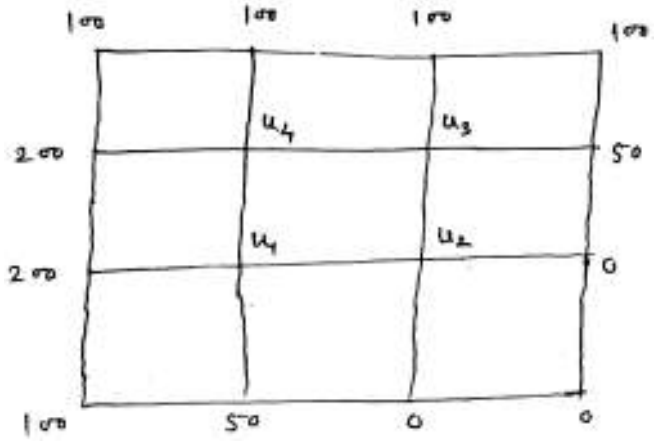

Fig. 11 (a)

b) Solve the following Linear programming problem by Simplex method : **9**

Maximize $Z = 3x_1 + 6x_2 + 2x_3$

Subject to $3x_1 + 4x_2 + x_3 \leq 2$

$x_1 + 3x_2 + 2x_3 \leq 1$

and $x_1, x_2, x_3 \geq 0$

OR

12. a) Using the finite difference method, solve the boundary value problem

$$x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} = 1 \text{ [taking h = 0.1]}$$

subject to the conditions y (1) = 0, y (1.4) = 0.0566. **9**

b) Solve the following LP problem by Simplex method

Maximize $Z = 3x_1 + 2x_2$

Subject to $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

and $x_1, x_2 \geq 0$ **8**

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[3963] – 102

T.E. (Petroleum Engineering) (Semester – I) Examination, 2011
PETROLEUM GEOLOGY – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answers to the **two** Sections should be written in **separate** books.*
*ii) **Neat** diagrams should be drawn **wherever** necessary.*
*iii) Attempt **any three** questions from Section – **I** and Section – **II.***
*iv) Figures to the **right** indicate marks.*

SECTION – I

1. a) Using a sketch, explain relative abundance of igneous, sedimentary and metamorphic rocks in terms of weight and volume proportion. **6**

   b) What is relationship between the rate of solubility of quartz and calcite with pH of water ? **5**

   c) Give suitable classification based on mode of occurrence of igneous rocks. **5**

OR

1. a) What are clay minerals ? Distinguish between cohesive and in cohesive clay minerals. How are these recognized in the field ? Discuss their signification in the sedimentary rocks. **10**

   b) Explain the term 'Rock Cycle' with the help of a neat diagram. **6**

2. a) What is physical and chemical weathering ? Discuss any two modes of physical weathering. **8**

   b) Discuss with the help of neat diagrams, convergent and divergent plate margins. **8**

OR

2. a) How is occurrence of an earthquake is discussed on the basis of elastic rebound theory ? **8**

   b) Draw and explain the triangular classification of mass movements. **8**

P.T.O.

3. a) How are faults recognized in field ? What are sealing faults / clay smears ? Discuss their behavior and significance. **8**

   b) A sandstone bed is recorded in boreholes A and C at a depth of 300 and 650 m respectively. Its presence in borehole B is insignificant or minor. The boreholes are taken along E - W direction with a spacing of 500 m. A fault dipping 45° towards west is interpreted at a depth of 600 m in borehole C. The sandstone dips at an angle of 5° towards East and it has a vertical thickness of 150 m. Classify the fault. What is the heave, throw and net slip of the fault ? At what depth fault would be interpreted in borehole A and C. **10**

OR

3. a) Describe anyone geometric classification of folds. How is the relationship of wavelength and amplitude useful in ascertaining the persistence and penetration of folds ? **12**

   b) Distinguish between plunging and non plunging folds with the help of neat diagram. **6**

SECTION – II

4. a) Explain with suitable diagrams how compaction, recrystallisation and dissolution as post depositional changes alter the original nature of sediments / sedimentary rocks. **10**

   b) Discuss in brief mud supported and grain supported framework of sedimentary rocks. **6**

OR

   a) What are the major components of carbonate rocks ? Discuss Dunham's scheme of classification of carbonate rocks. **10**

   b) What is a textural maturity of sediments ? What are the various criteria are applied to explain it ? **6**

5. a) How to interpret the sedimentary environments using the various trace fossils ? **6**

   b) What are microfossils ? Explain the importance of microfossils in the exploration of hydrocarbons. **10**

OR

5. a) Discuss in brief various marine depth zones with suitable diagram. **10**

   b) Explain in brief the concept of index fossils and zone fossils. **6**

6. a) Following sedimentary sequence is encountered. (F During preliminary investigations (Figure : 0.1). Reconstruct the chronology of events based on emergence and submergence of coast. Discuss in brief the geological conditions promoting the regression and transgression of sediments. **10**

Figure : 0.1

b) Write in tabular form Geological Scale and important events in it. **8**

OR

6. a) Following subsection is revealed in exploratory drilling. Give chronology of events in tabular form. **10**

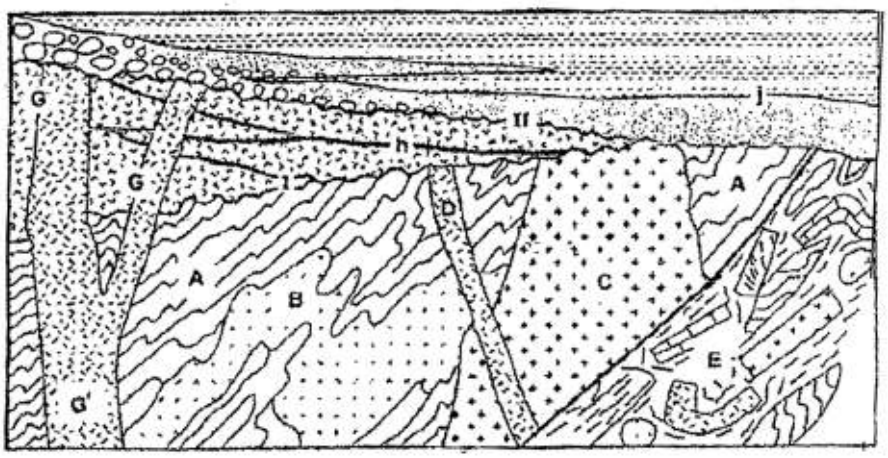

Figure. 2

b) What is unconformity ? Discuss in detail the various types of unconformities with the help of neat sketches. **8**

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[3963] – 104

T.E. (Petroleum) (Semester – I) Examination, 2011
PRINCIPLES OF CHEMICAL ENGINEERING – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) Figures to the **right** indicate **full** marks.*

*4) **Use** of logarithmic tables, slide rule, Mollier charts, Electronic Pocket calculator and steam table is **allowed**.*

*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Define : Closed system, Path function, Enthalpy. **6**

   b) State 2^{nd} law of Thermodynamics and provide mathematical expression. **4**

   c) With help of neat sketch discuss Carnot Cycle and write down equation of its efficiency. **6**

OR

2. a) With help of neat sketch write a short note on absorption refrigeration. Highlight how it deviates from normal refrigeration cycle. **8**

   b) Discuss Joule Thomson Expansion and its usefulness. **4**

   c) Define Entropy and provide statistical mechanical view of it. **4**

P.T.O.

3. a) With help of diagram explain various types of regime possible for multiphase flow through a pipe. **6**

   b) With help of neat sketch discuss standard dimensions of a agitated vessel. **6**

   c) Define following : **6**

   Mach Number, Stagnation Property, Subsonic flow.

OR

4. a) What is cavitation in pump, how it can be removed ? **4**

   b) Discuss flow of compressible fluid moving through Converging Diverging nozzle. **6**

   c) Discuss the important characteristics of a centrifugal pump. **4**

   d) With help of diagram explain working of a compressor. **4**

5. a) Discuss stepwise procedure of catalytic reaction. **6**

   b) Discuss importance of Chemical Reaction Engineering. **6**

   c) Define : Flash point and Detonation. **4**

OR

6. a) Differentiate between molecularity and order of reaction. **4**

   b) Obtain the mathematical expression for elementary 1^{st} order reactions occurring in plug flow reactor. **6**

   c) If rate constant for the following 1^{st} order elementary reaction be 234.5 min^{-1} at 250°C, what will be rate constant at 500°C ? **6**

   $X \rightarrow Y$

   Activation energy for the reaction = 12000 kCal/kmol.

SECTION – II

7. a) With help of neat diagram explain PVT behavior of fluids. **6**

   b) Write down three different equations of state for real gases. Explain all the symbols therein. **6**

   c) Write down short note on Compressibility Factor. **4**

OR

8. a) Define supercritical state and highlight its importance. **6**

   b) What is the need of modifications to ideal gas laws ? Discuss all the modifications in details. In this context write down van der Waal's equation of state with proper discussion on all the symbols. **10**

9. a) Write down mathematical expression of Raoult's law. What is its significance ? Explain deviations from Raoult's law. **8**

   b) What is vapour liquid equilibrium ? Explain its significances. Briefly discuss how VLE of a system can be determined experimentally. **8**

OR

10. a) Define chemical potential and state its significances. **5**

    b) What is fugacity ? Define fugacity coefficient. **5**

    c) Define bubble point. Discuss the stepwise procedure to obtain bubble point of a multi-component mixture. **6**

11. a) Discuss the means and mechanism of extraction of Gas Hydrates. **6**

    b) Name six gases which can produce gas hydrates. **6**

    c) With help of neat diagram explain different structures possible for gas hydrates – discuss their stabilities as well. **6**

OR

12. a) 1 m^3 of methane gas hydrate contain almost 520 m^3 of methane gas at STP and 1 m^3 of water. From this information calculate the density of the gas-hydrate. **6**

    b) With help of phase diagram explain formation of Gas Hydrates. **6**

    c) Gas hydrates may be the main reason behind mysterious Bermuda Triangle - Elaborate and explain. **6**

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[3963] – 105

T.E. (Petroleum) (Semester – I) Examination, 2011
PETROLEUM FIELD INSTRUMENTATION AND CONTROL
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt **any 3** questions from **each** Section.*
*2) Figures to the **right** indicate **full** marks.*
*3) **Use** of electronic calculators, is **allowed**.*
*4) Draw **neat** sketch **wherever** necessary.*

SECTION – I

1. a) What do you understand by the term calibration of an instrument ? Why it is necessary ? How it is carried out ? State sources of errors. Explain with suitable example. **8**

   b) Explain the term fidelity, dynamic error, speed of response and measurement lag. **4**

   c) Classify and define the characteristics of an instrument with respect to its accuracy. **4**

2. a) Describe in brief the International Temperature Scale. Describe in detail the selection of thermocouples, based on the use of thermocouple tables. **7**

   b) Explain the classification of flowmeters. Explain how will you use the area type flow meter if its working fluid is changed. **8**

   c) Give the classification of pressure measuring instruments. **3**

3. a) List various level measuring instruments. Explain any one instrument in detail used in petroleum field application. **6**

   b) Explain any one method for measurement of vacuum. **4**

   c) Explain the working of electro-pneumatic converter with proper sketch. **6**

4. a) Explain the instrumentation involved in oil and gas gathering station. **6**

   b) Describe with proper sketch the symbols used in instrumentation diagram. **6**

   c) How will you measure temperature of oil wells ? **4**

P.T.O.

SECTION – II

5. a) What is transfer function ? What is the significance of deriving a transfer function for a system ? **6**

   b) Define time constant. How will you experimentally find a time constant of a first order system ? Give example. **6**

   c) Explain the relationship between magnitude of overshoot and controller settings. **6**

6. a) Explain the proportional control action. How the proportional control action can be used in controller tuning ? **8**

   b) Explain with the help of proper symbolic sketch, the flow control feedback loop having pneumatically activated globe valve as its final control element. **8**

7. a) What are different types of valves used in petroleum industry ? How will you obtain inherent valve characteristics in a laboratory ? **8**

   b) Explain the ratio control strategy with application in petroleum industry. **5**

   c) Give examples of servo and regulatory problem. **3**

8. a) What is the difference between conventional feedback loop and a programmable logic controller ? **5**

   b) What are the components of a SCADA system ? Explain how a SCADA system works ? **6**

   c) Draw a sketch of distillation column control with reference to inventory, product quality and pressure control. **5**

[3963] – 109

T.E. (Petroleum) (Semester – II) Examination, 2011
PRINCIPLES OF CHEMICAL ENGINEERING – II
(2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define : Relative volatility, HETP and explain its importance. **4**

   b) With help of sketch compare packed tower and tray towers for separation. **8**

   c) Name four important characteristics of packing materials. **4**

OR

2. a) Write down stepwise procedure to determine theoretical number of stages for a tray distillation column. **8**

   b) Define q line and indicates its significances. **4**

   c) What is stage efficiency ? How efficiency governs actual no. of plates required for separation ? **4**

3. a) Write a short note on choice of solvents for Gas Absorption. **4**

   b) "Membrane separations are very important"–Elaborate with help of suitable examples from industry as well as domestic applications. **6**

   c) With help of neat sketch explain operations of various types of cooling tower. In this context highlight the mechanism of cooling of water. **6**

OR

4. a) Discuss the analogy between Heat, Mass and Momentum Transfer. Write down Reynolds analogy and its usefulness. **6**

   b) Differentiate between physical adsorption and chemisorption. **4**

   c) With help of psychometric chart discuss how relative humidity can be measured. **6**

5. a) Write a short note on TEMA specifications and discuss importance. **6**

   b) Discuss the necessity of baffles in shell and tube heat exchangers. **4**

   c) Name two different types of compact heat exchangers and discuss their usage. **4**

   d) Product vapor coming out of the distillation column is to be condensed using raw water available from nearby river. Indicate the flow passages of the streams if a shell and tube heat exchanger is to be used for this purpose. **4**

OR

6. a) Water with a flow rate of 23 kg/s enters a baffled shell-and-tube heat exchange at 63°C and leaves at 48°C. Heat is to be transferred to 34.6 kg/s of raw water coming from a supply at 23°C.
      i) What will be outlet temperature of raw water stream ?
      ii) Obtain LMTD for co-current and counter current flow. **6**

   b) Liquid product P needs to be cooled from 180°C to 30°C at a rate of 10 kg/hr in a countercurrent double pipe heat exchanger, with water as coolant flowing through inner tube side. Raw water is available at 30°C and maximum temperature rise possible is of 10°C. **12**
      i) Obtain heat duty of the exchanger
      ii) Calculate flow rate of raw water.
      iii) If overall heat transfer coefficient be 520 W/(m^2.K), obtain the length of the required exchanger.

      Data :

      Inner Tube : ID = 15 mm, OD = 18.3 mm, k_{wall} = 74.5 W/(m.K)

      Outer Pipe : ID = 48 mm, OD = 52 mm

      For Product P : C_p = 1.2 kJ/(kg.°C), μ=0.17 cP, ρ=720 kg/m^3 and k = 0.254 W/(m.K)

      For raw water : μ=0.7 cP, and k = 0.6 W/(m.K).

SECTION – II

7. a) Discuss the major causes of water pollution. How these pollutants can be removed ? **6**

b) Write a short note on Green House Effect-its causes and remedy. **6**

c) What is HAZOP study ? With a suitable example explain the HAZOP study also highlight its necessity. **6**

OR

8. a) What is BOD test ? Discuss its importance in effluent treatment. What is the relation of BOD with COD ? **6**

b) Discuss the major pollutants for air. Indicate the immediate and long term impacts of these pollutants on human and animal life. **6**

c) With help of neat diagram explain the operation of effluent treatment plant (ETP). **6**

9. a) XYZ organization decided to set up a chemical plant for some speciality chemical. Discuss all the important factors to be considered while choosing appropriate location of the plant. Elaborate all the points appropriately. **8**

b) Discuss in details the development of P&ID for a chemical process and role of various persons involved. In this context explain the need and usefulness of the developed P&ID. **8**

OR

10. a) With help of neat sketch explain how plot plan development is to be done for any processing unit. **8**

b) With help of diagram discuss all the major sections of a typical Rig Layout. Highlight importance of the Rig in Petrolem engineering. **8**

11. a) Name four insulating materials. How insulation is done in processing units-discuss in brief. **6**

    b) Write down advantages of Cross Country piping over other methods of transport. **6**

    c) Describe construction and working of (**any two**) : **4**

    i) Butterfly Valve

    ii) Plug Valve

    iii) Gate Valve.

OR

12. a) Discuss usefulness of non destructive testing. Explain any one method in details. **6**

    b) How Assembly and Erection of Equipments are done ? Explain. **6**

    c) Define economic diameter of a pipe-Explain its significance. **4**

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[3963] – 11

T.E. (Mechanical) (Semester – I) Examination, 2011
DESIGN OF MACHINE ELEMENTS
(2003 Course)

Time : 4 Hours Max. Marks: 100

Instructions *: 1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*

2) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

3) Black figures to the ***right*** *indicate* ***full*** *marks.*

4) Your answers will be valued as ***a whole****.*

5) ***Use*** *of logarithmic tables, electronic pocket calculator is* ***allowed****.*

6) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) Explain briefly the basic procedure of machine design. **6**

   b) Write a note on sources of design data. **6**

   c) What are preferred numbers ? List the R-10 series. **4**

OR

2. a) A bracket shown in figure 1 is subjected to a pull of 5 kN acting at an angle of 45° to the vertical. The bracket has a rectangular section. If the permissible stress of the material is 55 MPa, determine the cross-section of the bracket. **8**

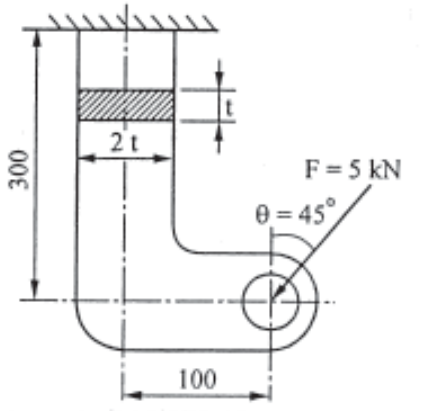

FIGURE 1, QUE 2a

b) Draw a neat diagram of a knuckle joint and explain its construction. **6**

c) State the difference between service factor and factor of safety. **2**

3. a) A torque transmitting shaft with two spur gears mounted is shown in Figure 2. The PCD of gears B and C are 300 mm and 200 mm respectively. The material of the shaft is $55CM_n75$ and has ultimate tensile strength of 880 MPa and an yield strength of 530 MPa. The shaft is subjected suddenly applied loads with minor shocks and may be assumed to have $K_b = 2$ and $K_t=1.5$. Find the diameter of the shaft. **12**

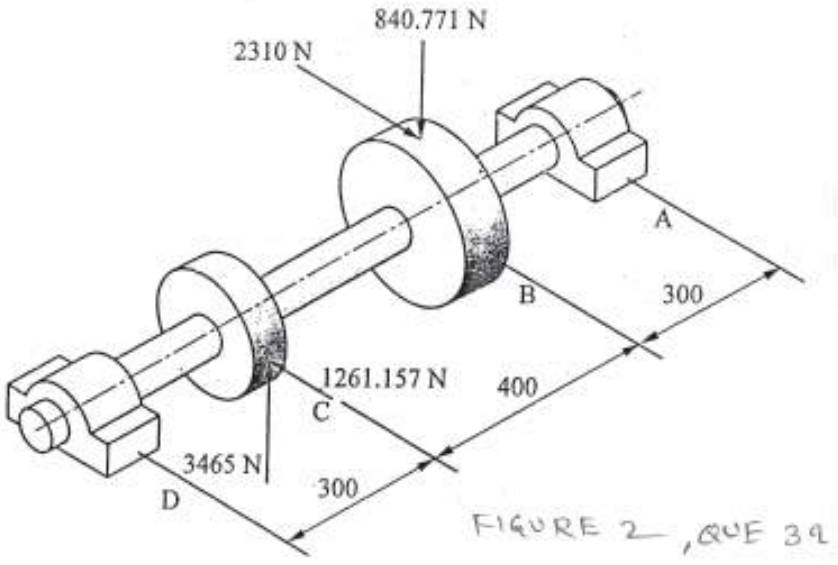

FIGURE 2 , QUE 3 a

b) State Castigliano's theorem. How is it useful while designing shaft ? **4**

OR

4. a) Design a cast iron flange coupling to connect two shafts of 45 mm diameter to transmit 20 kW power at 400 rpm. The permissible shear strength for the shaft bolt and key is 50 N/mm^2 and the permissible compressive stress is 120 N/mm^2. The permissible shear strength for cast iron is 15 N/mm^2. Assume starting torque 30 percent higher than the nominal torque. Design the coupling. **12**

b) Design a square key to transmit 5 kW power at 1440 rpm. The shaft diameter is 20 mm. The key has a yield strength of 300 N/mm^2. Assume a factor of safety as 3. **4**

5. a) A bracket is subjected to a load of 40 kN as shown in Figure 3. If the permissible tensile strength is 50 MPa and the permissible shear strength is 30 MPa, determine the size of the bolts. **9**

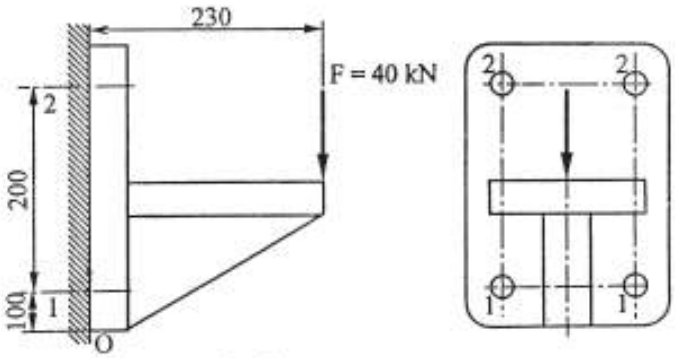

FIGURE 3 , QUE 5a

b) A bracket is bolted as shown in Figure 4. All bolts are identical and have yield strength in tension 400 MPa. Determine the size of the bolts, assuming factor of safety as 3. **9**

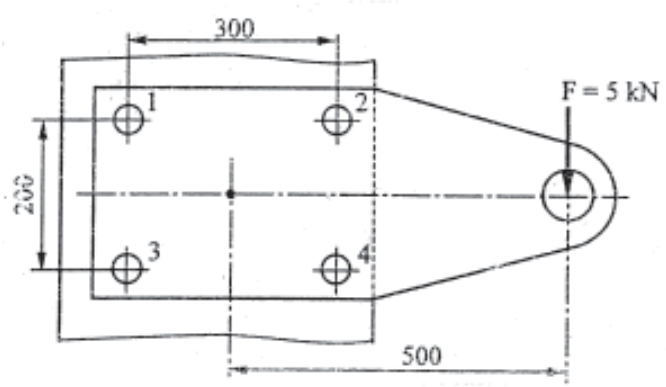

FIGURE 4 , QUE 5 b

OR

6. a) Find the suitable size of the weld for a bracket plate carrying a load of 120 kN which is to be welded to a column as shown in Figure 5. Assume allowable shear stress in the weld is 110 MPa. **9**

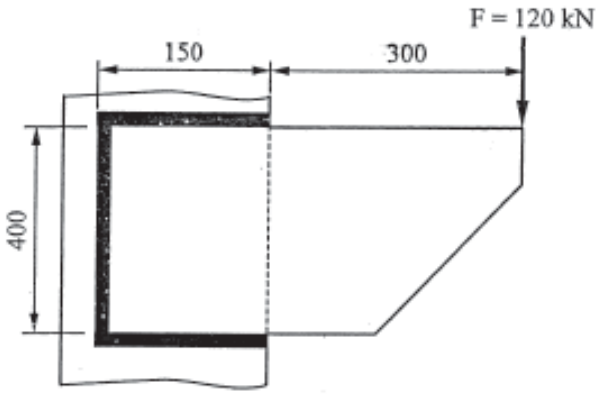

FIGURE 5 , QUE. 6 a

b) Determine the weld size of an annular fillet used to weld a circular cantilever shaft of diameter 30 mm and length 100 mm. The force acting at the free end of the shaft is 5 kN and the permissible weld stress is 80 N/mm^2. **9**

SECTION – II

7. a) Explain with the help of sketch the term "Collar Friction" in case of screw jack. **6**

b) A power screw having double start square threads of 30 mm nominal diameter and 6 mm pitch is acted upon by an axial load of 10 kN. The collar outer and inner diameters are 50 mm and 30 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.25 and 0.18 respectively. The screw rotates at 12 rpm. Assuming uniform wear conditions at the collar and allowable bearing pressure of 6.3 N/mm^2, find

i) torque required to rotate the screw

ii) the stresses in the screw

iii) nut height. **10**

OR

8. a) Prove that the maximum efficiency of a square screw thread is given as

$$\eta_{max} = \frac{1 - \sin\phi}{1 + \sin\phi}$$ **6**

b) A lead screw of a lathe has acme threads of 50 mm outer diameter and a pitch of 8 mm. The axial load on the lead screw is 3000 N. The thrust is carried by a collar of 120 mm outer diameter and 60 mm inner diameter. The lead screw rotates at 40 rpm. Find the power required to drive the screw and the efficiency of the screw. Assume friction in threads as 0.15 and that at the collar as 0.12. Evaluate the results based on uniform pressure theory and uniform wear theory. **10**

9. a) What is stress concentration ? What are the causes of stress concentration ? Explain with diagrams, methods for reducing stress concentration. **8**

b) A cantilever beam having an ultimate tensile strength of 500 N/mm^2 is subjected to a completely reversing laod of 1.2 kN as shown in Figure 6. The notch sensitivity at the fillet is 0.6. Determine the diameter 'd' for a life of 8000 cycles. Assume surface factor as 0.8, size factor as 0.9 and the calculations are expected at 90% reliability, for which the reliability factor is 0.897.

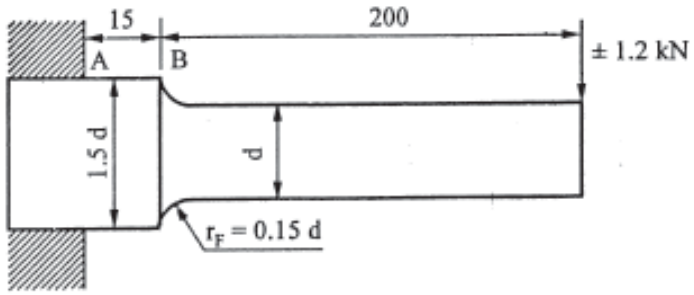

FIGURE 6, QUE 9b

Assume theoretical stress concentration factor as 1.5. **10**

OR

10. Write notes on :

i) Cumulative damage **5**

ii) Factors for correcting endurance limits **5**

iii) Modified Goodmann diagram **4**

iv) Fatigue failure **4**

11. a) Write a note on springs in series and springs in parallel. **6**

b) Design a helical compression spring for a maximum load of 1200 N for a deflection of 25 mm. The spring index is 5 and the maximum permissible stress for the spring material is 400 MPa. Assume modulus of rigidity as 85 GPa. **10**

OR

12. a) Explain different types of spring materials. **6**

b) In the design of an elevator, 8 springs are arranged in parallel to absorb the shock of impact, in case of failure. The elevator weighs 10 kN. Assuming a free fall of 1.5 m from rest, find the maximum stress in each spring, if each spring is made of 25 mm diameter and has a spring index as 8. The number of active turns are 20 and the modulus of rigidity of the spring material is 83 GPa. **10**

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T.E. (Petroleum) (Semester – II) Examination, 2011
DESIGN OF PETROLEUM MACHINERY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Question Nos.* ***2*** *and* ***6*** *are* ***compulsory****. Out of the remaining attempt* ***2*** *questions from Section* ***I*** *and* ***2*** *questions from Section* ***II****.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) Neat diagrams must be drawn ***wherever*** *necessary.*

4) Black figures to the ***right*** *indicate* ***full*** *marks.*

5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*

6) Assume suitable data, if ***necessary****.*

SECTION – I

1. Discuss different types of shaft. Select suitable diameter for a solid circular shaft to transmit 150 kW at 180 r.p.m. if allowable shear stress is 80 MPa. **16**

2. a) Discuss the following types of keys : **12**
   i) Sunk key ii) Feather key
   iii) Splines iv) Saddle keys
   v) Tangent keys vi) Taper pins.

   b) A propeller fastened by means of sunk key to the shaft subjected to torsion only. Find the length of the key 20 mm wide for a shaft of 70 mm in diameter. Take allowable shear stress for the key and the shaft as 55 MPa and 66 MPa respectively. **6**

3. a) Discuss different types of couplings. **8**

   b) Discuss different types of belt drives. **8**

4. a) Draw circulation system of a drilling rig. **8**

   b) Discuss different types of pulley and uses of pulleys on a drilling rig. **8**

P.T.O.

SECTION – II

5. a) Discuss design factors considered for pressure vessels. **8**

   b) Discuss different types of welded joints. **8**

6. Write short notes on : **18**

   i) Storage Tank

   ii) Compressors.

7. a) What are different types of bearing ? Write use of bearing in drilling bit. **8**

   b) What are different types of Gears ? Discuss between gear system in detail. **8**

8. a) Discuss function and working of a gate valve and globe valve in detail. **8**

   b) Explain working of a reciprocating triplex single acting Pump. **8**

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T.E. (Petrochemical) (Semester – I) Examination, 2011
DIFFUSION AND MASS TRANSFER
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: i) Answer **any three** questions from **each** Section.*
*ii) Answers to the **two** sections should be written in **separate** books.*
*iii) Neat diagrams must be drawn **wherever** necessary.*
*iv) Black figures to the **right** indicate **full** marks.*
v) Your answers will be valued as a whole.
*vi) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables **is allowed.***
*vii) Assume suitable data, **if necessary.***

SECTION – I

1. Answer the following questions in brief: **18**
   a) Describe a method to estimate the diffusivity of a volatile solvent into air.
   b) Explain with suitable graph the moisture content in the solid.
   c) Differentiate between flash distillation, differential distillation and rectification.

OR

2. a) Derive an expression for finding the mass flux of diffusion of P through non diffusing Q, P and Q are liquids. **9**

   b) The solute HCl(A) is diffusing through a thin film of water (B) 2.5 mm thick at 285 K The concentration of HC*l* at point 1 at one boundary of the film is 15.0 wt% HCl (density $\rho_1 = 1065$ kg/m^3), and at the other boundary of the film at point 2 it is 6.0 wt% HCl (density $\rho_2 = 1035$ kg/m^3). The diffusion coefficient of HCl in water is 2.5×10^{-9} m^2/s. Assuming steady state and one boundary impermeable to water, calculate the flux of HCl. **9**

3. a) Gas A is diffusing from a gas stream at point 1 to a catalyst surface at point 2 and reacts instantaneously and irreversibly as follows : $2A \rightarrow B$. Gas B diffuses back to the gas stream. Derive the final equation for NA at constant pressure P and steady state in terms of partial pressure. **8**

P.T.O.

b) A large water storage tank is filled with water. The tank has a vent line open to the atmosphere. The vent line is 1 m long and 1 inch ID. How many kg of water are lost per hour if the atmosphere is dry air at 40°C ? Assume that the liquid level remains constant. The vapour pressure of water at 40°C is 55.3 kPa. $D_{water\text{-}air} = 2.77\times10^{-4} m^2/s$. **8**

OR

4. A Well located in the desert is 10 m deep to the water level and 1.0 m in diameter. The stagnant air and water in the Well are at 30°C and normal atmospheric pressure. A slight breeze of dry air is blowing across the top of Well. Calculate the rate of steady-state diffusion of water vapour in the Well. (Assume partial pressure of water vapour in the air = vapour pressure of water at 30°C). Assume diffusivity of water vapour in air at 30°C is $D_{AB} = 2.6\times10^{-5} m^2/sec$. Vapour pressure of water at 30°C = 4.112 kN/m^2. **16**

5. a) The gas hydrogen at 17°C and 0.010 atm partial pressure is diffusing through a membrane of vulcanized neoprene rubber 0.5 mm thick. The pressure of H_2 on the other side of the neoprene is 0. Calculate the steady-state flux, assuming that the only resistance of diffusion is in the membrane. The solubility S of H_2 gas in neoprene at 17°C is 0.051 m^3/m^3 solid –atm, and the diffusivity D_{AB} is $1.03\times10^{-10} m^2/s$. **8**

b) A narrow tube is partially filled with liquid and maintained at a constant temperature. A gentle stream of a gas is passed across the open end of the tube. As the liquid evaporates, the level drops slowly. At a given time t, this level in the tube is Z from the top. Derive an expression to calculate the value of diffusivity of liquid vapour in the gas. **8**

OR

6. Winklemann's method can conveniently determine diffusivity of vapour of volatile liquid in air, in which liquid is contained in a narrow vertical tube maintained at constant temperature. Air stream is passed over the top of tube rapidly to measure the partial pressure of vapour remains approximately zero. On the assumption, vapour is transferred from surface of liquid to a stream by molecular diffusion. Calculate the diffusivity of CCl_4 vapour in air at 321 K and 1 atm. pressure from following experimental data as given in Table 1.

Table 1 Experimental Data for Winklemann's experiment

Time from common cement of experiment (ks)	Liquid Level	
	(cm)	(mm)
0	0	0
1.6	0.25	0.025
11.1	1.29	0.129
27.4	2.32	0.232
80.2	4.39	0.439
117.2	5.47	0.547
168.6	6.70	0.670
199.7	7.38	0.738
289.3	9.03	0.903
383.1	10.48	1.048

Data : Vapour pressure of CCl_4 at 321 K is 37.6 kN/m^2 and density of liquid is 1540 kg/m^3. The kilogram molecular volume is 22.4 m^3. **16**

SECTION – II

7. a) If the local Nusselt number for the laminar boundary layer that is formed over a flat plate is $Nu_x = 0.332\, Re_x^{1/2}\, Sc^{1/3}$

Obtain an expression for the average film-transfer coefficient k_c, when the Reynolds number for the plate is:
(a) $Re_L = 100000$, (b) $Re_L = 1500000$
The transition from laminar to turbulent flow occurs at $Re_x = 3\times10^5$. **10**

b) The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6\left(\frac{d^3\rho^2 g\beta\beta\Delta}{\mu^2}\right)\left(\frac{c_p\mu}{k}\right)^{1/3} \text{ for } Gr^{1/4}\,Pr^{1/3} < 200$$

Where d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 140°C and 1 atm.

Explain the analogy between Nu = Sh, Sc = Pr, Gr = Gr_{AB}.

Data:

$P^{vap}_{naphthalene} = 0.15$ atm, $D_{AB} = 5.95\times10^{-6} m^2/s$, $d = 7\times10^{-2} m$

$\rho_{air} = 0.850 kg/m^3, \mu_{air} = 2.4\times10^{-5} kg/m.s$ **8**

OR

8. A solid disc of benzoic acid 2.5 cm in diameter is spinning at 20 r.p.m. and 25°C. How fast will it dissolve in a large volume of water ? How fast will it dissolve in a large volume of air ? The diffusion coefficients are 1×10^{-5} cm^2/sec. in water and 0.233 cm/sec. in air. The solubility of water is 0.003 gm/cm^3, its equilibrium vapour pressure is 0.30 mm Hg.

You may use following correlation to find mass transfer coefficient: **18**

$$k = 0.62 D \left(\frac{\omega}{\nu}\right)^{1/2} \left(\frac{V}{D}\right)^{1/3}$$

9. a) Discuss the theory of wet-bulb thermometry. Under what conditions the wet-bulb temperature and adiabatic saturation temperature will be identical ? **10**

b) Define the humidity term you know. **6**

OR

10. a) A certain material was dried under constant drying conditions and it was found that 4 hours are required to reduce the free moisture concentration from 25% to 15%. How much longer would be required to reduce the free moisture to 6% ? Assume that no constant rate period is encountered. **12**

b) Define the following: **4**

a) Total-moisture content

b) Free-moisture content

c) Equilibrium-moisture content

d) Unbound moisture.

11. A batch of solid is dried from 25% to 10% moisture, wet basis. The initial weight of solid is 380 kg and the drying surface is $0.25 m^2$/40 kg dry weight. The critical moisture content is 28% dry basis and the constant drying rate is 0.35 kg/hr. m^2. For the falling rate period, the following data are available :

Moisture content % dry basis	Rate of drying kg/hr. m^2
25	0.30
21.9	0.27
19	0.24
16	0.21
13.6	0.18
11	0.15
8.2	0.07
7.5	0.044
6.4	0.025

Determine the time of drying. **16**

OR

12. Write short notes on: **16**

i) Wetted Wall towers

ii) Types of Cooling towers

iii) Types of Industrial Dryers.

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T.E. (Petrochemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING THERMODYNAMICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Attempt **any three** questions from each Section.*
*2) Answers to the **two** Sections should be written in two **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) Assume suitable data **wherever** necessary.*
*5) Use of steam tables and electronic calculator is **allowed**.*

SECTION – I

1. a) Discuss equations of state in context of hydrocarbon mixtures. State where they find their applications. **8**

   b) Calculate the specific volume of and hence the volume occupied by 350 Kg of methanol vapor at 200 K and 15 bar using ideal gas law and the van der Waals equation. Tc and Pc for methanol are 512.6 K and 81 bar respectively. Compare your answers. **10**

2. a) State first law of thermodynamics in various forms. Explain the terms involved. **6**

   b) Iron is reacted with aqueous HCl at 350 K to give aqueous $FeC1_2$ and hydrogen gas. Calculate the work done when 190 kg of iron reacts with HCl in a (a) closed vessel and (b) an open vessel. **10**

3. State Maxwell relations. Using an appropriate Maxwell relation, derive thermodynamic relationship for effect of temperature and pressure on entropy and enthalpy of a real gas. **16**

4. Write notes :

   a) Throttling effect **6**

   b) Carnot cycle for refrigeration **6**

   c) Irreversible and reversible processes. **4**

P.T.O.

SECTION – II

5. a) Discuss with reference to pertinent equation(s) how fugacity is related to pressure and temperature for a real gas. **6**

   b) Estimate fugacity of gaseous propane at 11.7 bar and 300 K using the following data : **12**

P bar	1.7	3.4	6.8	10.2	11.7	13.6
V m^3/kg	0.3313	0.1609	0.0754	0.0468	0.0382	0.021

6. a) Define partial molal Gibbs free energy. State its significance. **4**

   b) State Gibbs Duhem equation in its different forms. Comment on their importance. **12**

7. a) State the modified form of Raoult's law applicable to VLE between nonideal solution and nonideal vapor. Explain the terms involved. **6**

   b) Distinguish between minimum and maximum boiling azeotropes. **4**

   c) Discuss any two models of activity coefficients of solutions. **6**

8. a) State the criterion for chemical reaction equilibrium. State how equilibrium conversion can be calculated from basic thermodynamic data. **6**

   b) Equilibrium constant for the ammonia formation reaction $N2 + 3\ H2 \rightarrow 2\ NH3$ is given as 0.00013 at 675 K. For stoichiometric feed and 10 bar pressure. Calculate equilibrium conversion of N2 and composition of equilibrium mixture on mol% basis. Report the partial pressures at equilibrium. **10**

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T.E. Petrochemical (Semester – II) Examination, 2011
MASS TRANSFER OPERATIONS
(2003 Course)

Time : 3 Hours Total Marks : 100

Instructions : *1) Answer any **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. Answer from the following : **18**

   a) What is the operating line equation for the rectifying and stripping section ? How it is derived ? Does it have anything to do with equilibrium.

   b) Derive Raleigh's equation for simple distillation.

   c) What is the equation for q line ? What are the five possible feed conditions ?

   OR

2. Solutions of methanol and ethanol are substantially ideal. Compute the vapour liquid equilibrium data for this system at 1 atm. pressure and plot x-y and t-x-y diagrams. Compute also relative volatilities determine an average value. The vapour pressure-temperature relationships are :

   $$\log PM_c\ OH\ (mmHg) = 7.84863 - \frac{1473.11}{230 + t°C}$$

   $$\log PE + OH\ (mmHg) = 8.04494 - \frac{1554.3}{222.65 + t°C}.$$ **18**

P.T.O.

3. A continuous fractionating column has to be designed for separating a liquid mixture of 4500 kg/hr containing equimolar amounts of methanol and water into an overhead product of 95% methanol and residue containing 4% methanol. The feed is 25% vaporized.

   Calculate :

   i) Molar flow rate of overhead and bottom products

   ii) The number of actual plates assuming tray efficiency of 0.75

   iii) Use a reflux ratio of 1.5 times the minimum reflux, locate the feed tray

   Equilibrium data : **16**

x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
y	0.41	0.57	0.66	0.72	0.78	0.82	0.87	0.91	0.95

OR

4. a) Explain in brief the procedure to determine the number of stages by Ponchon-Savarit method. **8**

   b) Discuss the principles and applications of Azeotropic and Extractive Distillation. **8**

5. Carbon disulphide is to be absorbed from a dilute gas mixture of $CS_2 - N_2$ into pure non-volatile oil at atm. pressure in a counter-current absorber. The mole fraction of CS_2 in inlet gas stream is 0.05 and the flow rate of gas stream, G is 1500 k mole/hr. the equilibrium relation is given by $y = 0.5\ x$

   where x = mole fraction of CS_2 in liquid stream. It is desired to reduce the mole fraction of CS_2 in the exit gas stream to 0.005.

   i) Calculate the minimum value of $\frac{L}{G}$ where L is the liquid flow rate in k mole/hr.

   ii) Derive the equation for the operating line if $\frac{L}{G}$ is equal to 1.5 times the minimum value. **16**

OR

6. a) A mixture of acetone vapour and air containing 5% by volume of acetone is to be freed of its acetone content by scrubbing it with water in a packed bed absorber. The flow rate of the gas mixture is 600 m^3/hr of acetone-free air measured at NTP and that of water is 1500 kg/hr. The absorber operates at an average temperature of 20 °C and a pressure of 101 kPa. The scrubber absorbs 97% acetone. The equilibrium relation for the acetone vapour-water system is given by :

   $Y^* = 1.60\ x$

   Where, Y = k mole acetone/k mole dry air

   X = k mole acetone/k mole water

   Calculate :

   a) Mean driving force for absorption

   b) Mass transfer area if the overall mass transfer coefficient is given by : k_G = 0.5 k mole of acetone/m^2. hr(k mole acetone/per k mole dry air). **10**

   b) Write down Kremser-Brown-Souders Equations for absorption and stripping operations. **6**

SECTION – II

7. In a continuous countercurrent cascade 200 kg/hr of a liquid mixture of 40:60 acetone-water solution is to be treated by extraction with pure 1, 1, 2–trichloroethane (TCE) at 25°C.

Weight % in water layer			**Weight % in trichloroethane layer**		
TCE	**Water**	**Acetone**	**TCE**	**Water**	**Acetone**
0.52	93.52	5.96	90.93	0.32	8.75
0.73	82.23	17.04	73.76	1.10	25.14
1.02	72.06	26.92	59.21	2.27	38.52
1.17	67.95	30.88	53.92	3.11	42.97
1.60	62.67	35.73	47.53	4.26	48.21
2.10	57.00	40.90	40.00	6.05	53.95
3.75	50.20	46.05	33.70	8.90	57.40
6.52	41.70	51.78	26.26	13.40	60.34

1) Plot the triangular diagram showing the tie lines. If only one settler-mixture is used with 50 kg of solvent (TCE)
2) What is the % recovery ((kg acetone in L_1/kg acetone in L_0) x 100 ?)
3) If a raffinate composition of 10% acetone can be obtained in one stage, what solvent rate enables this ?
4) If the final extract has a composition of 45% acetone and its amount is 100 kg/hr.
5) What is the number of stages ?
6) What is the amount of solvent feed ?
7) What is the final raffinate composition ? **18**

OR

8. a) 60 tons per day of oil-snd (25 mass % oil and 75 mass % sand) is to be extracted with 40 tons per day of naphtha in a counter-current extraction battery. The final extract from the battery is to contain 40 mass % oil and 60 mass % naphtha and the underflow from each unit is expected to consist of 35 mass % solutions and 65 mass % sand. If the overall efficiency of the battery is 50%, how many stages will be required ? **10**

   b) Discuss the triangular diagram for liquid-liquid extraction by taking suitable example. **8**

9. a) 1200 ml of water has 144 grammes of glucose dissolved in it. If the solution is mixed with 500 grammes of virgin activated alumina, how much glucose will remain in solution when equilibrium has been reached ? **8**

   b) Discuss the process principles involved in PSA and TSA by giving suitable examples. What do mean by parametric pumping ? **8**

OR

10. a) State the applications of leaching operation in industry. **8**

    b) Write a note on: “Equipments for Extraction”. **8**

11. The equilibrium adsorption of acetone Vapor on activated carbon at 30°C with partial pressure of acetone 100 mm Hg. Two grams of fresh activated carbon is introduced into the flask, and it is sealed. Compute the final Vapor concentration at 30°C and the pressure inside the flask. Neglect the adsorption of air. **16**

OR

12. Write short notes on : **16**
    a) UF, MF and NF-Principles and applications
    b) Tray Efficiency
    c) Membrane Modules.

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T.E. (Mechanical) (Semester – I) Examination, 2011
HEAT TRANSFER
Common with Mech. S/W for Semester – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

Unit – 1

1. a) A furnace wall lining is made up of a material of thermal conductivity 2.5 W/mK. The temperatures of the inner and outer surfaces of this plane wall lining are 810°C and 330°C respectively. The outer surface is exposed to ambient air at 30°C with convective heat transfer coefficient of 10 W/m^2K. Calculate
   i) The heat flow rate per unit area
   ii) Lining thickness for this situation
   iii) The thickness of lining required if the heat flow rate is to be reduced to 50% of the original. **10**

   b) Differentiate between heat conduction and convection. **6**

OR

2. a) Write the general 3-D heat conduction equation in Cartesian co-ordinates. Reduce this equation to

   i) Steady state condition

   ii) Unsteady state without heat generation

   iii) Steady state without internal heat generation. **6**

   b) An ice box (20 cm × 20 cm × 10 cm height) is filled with 3 Kg of ice at 0°C. The bottom and all vertical sides are well insulated. The top cover of the box is 1 cm thick and is made up of a with K = 0.33 W/mK. The cover is exposed to ambient air at 25°C with h = 10 W/m^2K. The heat transfer coefficient between inner surface of cover and air inside the box is 8 W/m^2K. Calculate the time required for the ice in the box to melt completely.

   Take latent heat of fusion of ice = 330 kJ/kg. **10**

Unit – 2

3. a) Derive the expression for critical thickness of insulation for a sphere. **6**

   b) A truncated cone 30 cm high is made of a material of K = 220 W/mK. The diameter at the two ends are 7.5 cm and 12.5 cm. The temperatures at the two ends are 540°C (7.5 cm dia.) and 93°C (12.5 cm dia.). The curved lateral surface is insulated. Determine the rate of heat flow at steady state assuming one dimensional axial heat flow. **12**

OR

4. a) Explain the terms (with sketch)

   i) Economic thickness of insulation

   ii) Thermal contact resistance. **8**

   b) Derive an expression for the temperature distribution in a plane wall having uniformly distributed heat source with one face maintained at temperature T_1 and the other face maintained at T_2. Take thickness of plate as 2L. **10**

Unit – 3

5. a) Explain the principle of temperature measurement for a fluid flowing through a pipe using a thermowell. Obtain an expression for error in temperature measurement. **8**

   b) Steel balls of 12 mm diameter are annealed by heating to 877°C and then slowly cooling to 127°C in an environment where temperature is 52°C. The heat transfer coefficient is 20 W/m^2K. Calculate the time required by the balls to reach the desired temperature. If this time is to be reduced to 10 minutes, how much should be the heat transfer coefficient ? Justify the formula used.

   Use following properties for steel.

   Density = 7800 Kg/m^3; C_p = 600 J/kg K; K = 40 W/mK. **8**

OR

6. a) Show that the heat transfer from a thin, long, fine, insulated at tip is given by,

   $Q = \sqrt{hPKA}\ (T_0 - T_\infty) \tanh (mL)$.

   Notations have usual meaning. **8**

   b) One end of a long rod is inserted into a furnace while the other end projects into ambient air. Under steady state condition, the temperature of the rod is measured at two points 75 cm apart and found to be 125°C and 88.5°C respectively. The ambient air temperature is 30°C. If the rod is 25 mm in diameter and convective heat transfer coefficient is 24 W/m^2K, determine the thermal conductivity of the rod material. **8**

SECTION – II

Unit – 4

7. a) Explain the following :

   i) Thermal boundary layer for fluid flow over flat plate

   ii) Hydrodynamic boundary layer for fluid flow through a conduit. **8**

   b) Air at 20°C is flowing along a heated plate at 134°C with a velocity of 3 m/s. The plate is 2 m long. Heat transferred from first 40 cm from the leading edge is 1.45 kW. Determine the width of the plate. Take air properties at 77°C :

   $\rho = 0.998$ kg/m^3; $v = 20.76 \times 10^{-6}$ m^2/s; $C_p = 1.009$ kJ/kgK; $k = 0.03$ W/mK.

   Use the following correlation :

   $N_{ux} = 0.332\ Re^{0.5}\ Pr^{0.33}$. **8**

OR

8. a) Explain the following with their applicability :

   i) Nusselt Number

   ii) Grashoff's Number

   iii) Raleigh Number

   iv) Buckingham π-Theorem. **8**

b) A circular disc of dia of 25 cm is exposed to air at 20°C. If the disc is maintained at 120°C, estimate the heat transfer rate from it, when;

i) Disc is kept horizontal

ii) Disc is kept vertical

For air at 70°C, k = 0.03 W/mK; Pr = 0.697; v = 2.076×10^{-6} m^2/s

Use the following correlations :

$Nu = 0.14 (Gr.Pr)^{0.334}$ for upward/top surface

$Nu = 0.27 (Gr.Pr)^{0.25}$ for downward/bottom surface

$Nu = 0.59 (Gr.Pr)^{0.25}$ for vertical surface

Use characteristic length as A/P when the plate is horizontal. **8**

Unit – 5

9. a) Explain :

i) Lambert Cosine Law

ii) Planck's Law

iii) Wien's Displacement Law

iv) Stefan Boltzmann's Law. **8**

b) Steady state temperature of a body having an area of $0.12m^2$ is 527°C. Calculate the following :

a) Rate of radiation energy emission

b) Intensity of normal radiation

c) Wavelength of max monochromatic emissive power. **8**

OR

10. a) Find out heat transfer rate due to radiation between two long parallel plates. One plate has emissivity of 0.4 and is maintained at 200°C. Other plate has emissivity of 0.2 and is maintained at 30°C. If a radiation shield ($\varepsilon = 0.5$) is introduced between the two plates, find percentage reduction in heat transfer rate and steady state temperature of the shield. **8**

b) A sphere of radius 5 cm is concentric with another sphere. Find the radius of the outer sphere so that shape factor of outer sphere wrt inner sphere is 0.6. **4**

c) The filament of a 75 W light bulb may be considered a black body radiating in to black enclosure at 70°C. The filament dia is 0.1 mm and length is 5 cm. Considering radiation, determine the filament temperature. **4**

Unit – 6

11. a) Derive the expression for effectiveness of parallel flow heat exchanger by using NTU method using standard notations. **9**

b) A counter flow shell and tube type heat exchanger is used to heat water at a rate of 0.8 kg/sec from 30°C to 80°C with hot oil entering at 120°C and leaving at 85°C. Over all heat transfer coefficient is 125 W/m^2°C. Calculate the size of heat exchanger required. Take specific heat for water as 4180 J/kg°C. **9**

OR

12. a) Saturated steam at 80°C condenses on the outside of a horizontal tube of 10 cm diameter maintained at temperature of 70°C. Latent heat λ for steam is 2300 kJ/kg. When the tube was kept vertical, it was observed that the rate of condensation was same as before ? Find the length of the tube and rate of condensation per hour.

Take properties of condensate in the film at 75°C as :

$\rho = 977.8$ kg/m^3; k = 0.668 W/mK; v = 0.415×10^{-6} m^2/s. **9**

b) Write short notes : **9**

i) Nucleate boiling region

ii) Burn out point

iii) Forced convection boiling.

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T.E. (Petrochemical Engg.) (Semester – II) Examination, 2011
PROCESS EQUIPMENT DESIGN
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Que. **5** and Que. **10** are **compulsor**y questions.*
*2) Answers to the **two** sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*6) **Assume** suitable data, **if necessary**.*

SECTION – I

1. a) Enlist the different fabrication methods used in chemical equipment design and explain any two with neat sketch. **6**

   b) Discuss about 'Creative Design'. **4**

   c) What are the activities to be preformed by design engineer in process equipment design ? **6**

OR

2. a) How will you reduce stress concentration ? Discuss various techniques in details. **7**

   b) Write in details about code and standards. Enlist the names of organizations which develop these codes and standards. **6**

   c) Differentiate between mechanical design and process design. **3**

3. a) Two pulleys, one 450 mm diameter and other 200 mm diameter, on parallel shafts 1.95 m apart are connected by crossed belt. Find the length of belt required and angle of contact between each belt and pulley.

   What power the belt can transmitted when larger pulley rotates at 200 r.p.m., if max^m permissible tension in the belt is 1 KN, and the coefficient of friction between belt and pulley is 0.25 ? **10**

P.T.O.

b) A leather belt 9 mm × 250 mm is used to drive a cast iron pulley 900 mm in diameter at 336 rpm. If the active arc on the smaller pulley is 120°C and the stress in tight side is MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg/m^3 ; find the coefficient of friction of leather on cast iron is 0.35. **6**

OR

4. a) Design a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 rpm. The allowable shear stress in the shaft is 40 MPa. The allowable shear stress in the coupling bolts is 30 MPa. The diameter of shaft is 80 mm. Width and thickness of key is 25 mm and 14 mm respectively. **10**

b) The load on a member consists of an axial pull of 30 KN, with shear force of 15 KN, find the diameter of member according to :

a) Maximum normal shear stress theory

b) Maximum principal strain theory

c) Maximum strain energy theory.

Assume permissible tensile stress of 100 N/mm^2 and poison's ratio 0.3. **6**

5. a) Design a shell of pressure vessel with following data

Shell Data :

Internal diameter (Approx)	= 1400 mm
Material	= stainless steel
Permissible stress at 150°	= 140 N/mm^2
Internal pressure	= 0.35 N/mm^2
Weight	= 38000 N
Joint efficiency	= 0.85
Torque Offset piping	= 500 N-m

12

b) What are the different types of heads used in design of pressure vessel ? **6**

SECTION – II

6. a) What are types of pitches used in shell and tube heat exchanger ? Write equation for design of these pitches. **7**

b) Discuss advantages and disadvantages of fixed tube, floating head and U tube heat exchangers. Draw neat sketch of any two. **6**

c) Why baffles and Tie rods are used in shell and tube heat exchanger ? **5**

OR

7. a) How the fouling can be controlled in shell and tube heat exchanger. What additional care should be taken for fouling while designing heat exchanger ? **8**

b) Calculate the shell diameter and nozzle thickness of shell and tube heat exchanger : Data :

Permissible stress = 95 N/mm^2

No. of passes = 2

No. of tubes = 54 (with 2 pass U-Bundle)

Spacing between tubes = 2.5 cm (square pitch)

B = 0.7

Joint efficiency = 85%

Pressure = 0.5 N/mm^2

Nozzle inlet and outlet diameter = 75 mm. **10**

8. a) Discuss the various types of welded joints used in design of storage tanks for shell, roof and bottom plate along with neat sketch. **4**

b) A cylindrical storage tank has diameter 30 meter and the tank height is 15 meter. Liquid stored in tank has density 810 kg/m^3. Material of construction is carbon steel having permissible stress 1300 kg/cm^2. Density of material used for fabrication is 7700 kg/cm^3.

The plates of size 3 m × 1.2 m in varying thickness are available for fabrication. Welded joint efficiency is 85% and corrosion allowance is not necessary. Calculate the cylindrical shell thickness of tank at different heights. Also estimate total number of plates required. **12**

OR

9. a) Discuss the Hortonsphere in details for storage of gas with neat sketch. How ammonia is stored ? What are problem associated with ammonia storage ? **6**

   b) Design a shell of circular cylindrical tank for storage of crude oil of 34° API.

   Tank diameter = 16 m (Approx)

   Tank Height = 12 m

   Material mild steel with permissible stress = 90 N/mm^2

   Joint efficiency = 85%

   Plate size available are (6300 mm × 1800 mm, 5000 mm × 2500 mm, 5600 mm × 1100 mm) **10**

10. Write a note on (**any four**) : **16**

   a) Critical speed of shaft

   b) Pipeline design considerations

   c) ASME & TEMA codes

   d) Different types of condensers and evaporators

   e) Types of roofs in storage vessel.

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T.E. (Polymer Engineering) (Semester – I) Examination, 2011
POLYMER CHEMISTRY – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answer to the ***two*** *Sections should be written in* ***separat****e books.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) Define with suitable examples. **8**
   i) DP
   ii) Oligomer

   b) Discuss with suitable examples the IUPAC based nomenclature of polymers. **8**

OR

2. a) Derive Carother's equation. Discuss its significance. **8**

   b) Discuss classification of polymers. **8**

3. a) Discuss the concept of molecular weight in polymers. Explain how and why it is different from that of LMW compounds. **8**

   b) Write a note on various average molecular weight of polymers. Draw a graph showing the relationship between them. **8**

OR

4. a) Explain any one method to determine $\overline{Mn}$. **8**

   b) Explain any one method to find out MW and MWD of given polymer sample. **8**

5. a) Define polydispersity. What is the origin of polydispersity in polymers ? Why can't it be seen in LMW products ? **9**

   b) How will you determine the broad MW range using fractional precipitation technique ? **9**

OR

P.T.O.

6. a) A given polymer shows variation in its molecular weight in the same sample. What could be the possible reasons ? Discuss. **9**

   b) Discuss the various principles on which MWD determination techniques are based. **9**

SECTION – II

7. a) Write a note on phase transfer catalyst. **8**

   b) In a polymerization technique when the monomers were subjected to polymerization the stoichiometry was not maintained but still the MW obtained was very high. Which polymerization technique is being discussed ? Explain. **8**

OR

8. a) This polymerization technique leads to formation of highly cross-linked product. The surface characteristics of the polymer obtained is superior than other techniques. Discuss the technique. **8**

   b) The temperature involved in this polymerization technique is very high. The product must be removed from the reactor when still hot. Which technique is it ? Discuss. **8**

9. a) What is chain transfer reaction ? What is its effect of MW ? Discuss the reaction mechanism. Give any two examples of CTA. **8**

   b) Discuss the mode of action of any inhibitor and retarder with suitable mechanism. **8**

OR

10. a) Explain group transfer polymerization. **8**

    b) Based on the structure how will you predict which type of monomer will undergo which type of addition polymerization mechanism ? **8**

11. a) Explain why polycondensation reactions are also called as step mechanism ? Why there is a need of maintaining stoichiometry ? **9**

    b) Discuss gelation and crosslinking with suitable examples. **9**

OR

12. a) In a polymerization reaction two moles of pentaerythritol were reacted with four moles of pthalicanhydride. Calculate the functionality of the reaction mixture. **9**

    b) Why is it observed that the three membered ring easily undergoes ROP while six membered does not ? Explain the ROP mechanism for any three-membered ring monomer. **9**

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
POLYMER MATERIALS – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1)* ***All*** *questions are* ***compulsory****.*
2) Answer to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. Give the formulation and compounding for the following : **16**
   i) Phenolic resin.
   ii) Amino resin.

OR

2. Discuss the properties and applications of : **16**
   i) Vinyl ester resin.
   ii) USPE resin.

3. Compare the properties and discuss the specific applications of : **16**
   i) Allyl resin.
   ii) Furan resin.

OR

4. Explain the various products obtained by changing the formulation and adding different additives to the following : **16**
   i) PU resins.
   ii) Silicone resins.

P.T.O.

5. a) Explain the basic difference between the paints, varnishes and lacquers. Discuss the need for each of them. **9**
   b) Define bonding. Explain various theories of adhesion. **9**

OR

6. a) Write a note on various additives and pigments used in the manufacture of paint. **9**
   b) Discuss various types of adhesives and their functions. What are structural adhesives ? **9**

SECTION – II

7. a) Discuss the various stages involved in the recovery of rubber from latex. **8**
   b) Explain mastication. Discuss the structural changes taking place during the same and its effect on properties. **8**

OR

8. a) Discuss in detail the compounding of rubber. Explain the effect of each additive on the properties of the rubber. **8**
   b) Write a note on molecular requirement of rubbery polymers. **8**

9. a) Explain the role and working mechanism of antioxidants and antiozonants for rubber. **8**
   b) Write a note on various vulcanizing systems in rubber. **8**

OR

10. a) What are peptizers ? Explain their role with reference to mastication. **8**
    b) Write a note on reinforcing fillers used in rubbers. **8**

11. a) What are thermoplastic elastomers ? Explain their chemical structure and uses with suitable examples. **9**
    b) Write a note on manufacture and curing behavior of SBR. **9**

OR

12. Write in brief manufacture, compounding and properties of
    i) Ethylene-propylene rubber. **9**
    ii) Nitrile rubber. **9**

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
INSTRUMENTATION AND PROCESS CONTROL
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Draw neat diagrams **wherever** necessary.*
*3) Numbers to the **right** indicate **full** marks.*
*4) Assume suitable data, **if** necessary.*
*5) **Use** of logarithmic table, electronic pocket calculators is **allowed**.*

SECTION – I

1. a) Define the following terms and give suitable examples. **10**
   i) Indirect measurement
   ii) Primary Element
   iii) Functioning Element
   iv) Sensitivity
   v) Drift.

   b) A thermometer is calibrated from 25°C to 200°C. The accuracy of the thermometer is specified to be within :
   i) Within ± 0.25% of Span
   ii) Within ± 0.125% of actual reading of 100°C.

   What is the maximum static error in both the cases ? **6**

OR

2. a) Explain the various Static and Dynamic characteristics of measuring instruments. **8**

   b) Discuss the following with one example :
   Transducer, Signal Conditioner and Display element. **8**

P.T.O.

3. a) Explain different principles, effects and laws on which thermoelectric temperature measurements depend. **8**

   b) What are elastic element transducers to measure pressure and explain any one in detail. **10**

OR

4. a) Draw the diagram and explain the principle of **10**
   1) Photoelectric pyrometers
   2) Strain gauge

   b) What is LVDT and explain its construction and working. **8**

5. a) Draw the diagram and explain construction, working, advantages and disadvantages of Orifice meter. **10**

   b) Differentiate between Differential Pressure flow meters Vs Variable Area Flow meters. **6**

OR

6. a) With a neat sketch explain construction, working, advantages and disadvantages of Rota meter. **10**

   b) Write short-note on Viscosity measurement. **6**

SECTION – II

7. a) State any three benefits that can be achieved via process control system.
   Explain the following terms with one example :
   Input Variable, Output Variable, Manipulated Variable, Disturbances. **10**

   b) Write a note on the response of Interacting system. **8**

OR

8. a) Define the term transfer Function and derive applicable transfer equation for U tube Manometer. **10**

   b) Write a note on the response of non-interacting system. **8**

9. a) Discuss with neat diagram the behavior of feedback control system using different kinds of control action when it is subjected to disturbance. **10**

   b) Discuss :

      i) Negative and Positive Feedback Control System

      ii) Servo and Regulator Based Control Problem. **6**

OR

10. a) Discuss the Stability analysis of for closed loop control system. **10**

    b) Explain the following terms with applicable diagram : Set point, Load variable and Controlled variable. **6**

11. a) Discuss the effect of Proportional, Integral, Derivative Control action. Discuss the Single Input Single Output (SISO) and Multiple Input Multiple Output (MIMO) feedback control system. **16**

OR

12. a) Write a note on : **16**

      i) Programmable Logic Control

      ii) Digital Control System.

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T.E. Polymer (Semester – II) Examination, 2011
POLYMER THERMODYNAMICS AND REACTION ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) **Assume** suitable data, **if necessary**.*

SECTION – I

1. Give the statement of 1st law of thermodynamics and derive the expression for same for 'flow' and 'non-flow' systems. **16**

OR

2. a) Write short note on 'Enthalpy'. **8**
   b) Explain with neat sketch 'carnot cycle'. **8**

3. a) Derive an expression for 'entropy of mixing'. **9**
   b) State 'Raults law of mixture' and explain the importance of same. **9**

OR

4. a) Derive the expression for coefficient of thermal expansion gas. **9**
   b) Discuss the concept of fugacity. **9**

5. Write short note :
   a) Flory-Huggins theory
   b) Gibb-Duhem equation. **16**

OR

6. a) Explain in detail 'Solubility parameter'. **8**
   b) Discuss the importance of thermodynamics in polymer engineering field. **8**

P.T.O.

SECTION – II

7. Derive the expression for rate constant for first order reversible reaction. **16**

OR

8. Discuss the importance of ‘reaction engineering’ to chemical engineering field. **16**

9. a) Derive the performance equation for plug ‘flow recutor’. **10**

   b) Write steps of obtaining rate equation by differential analysis. **8**

OR

10. a) Differentiate between the integral and differential analysis with example. **10**

    b) Write short note on ‘half life method’. **8**

11. Prove that $\left(\frac{\partial G}{\partial E}\right)_{TP} = \mu_B - \mu_A$ **16**

OR

12. a) Derive the expression for equilibrium constant. **8**

    b) Explain in brief ‘reaction co-ordinate’. **8**

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T.E. (Mechanical) (Semester – I) Examination, 2011
THEORY OF MACHINES AND MECHANISMS – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II.***

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*

*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) State the laws of dry friction. **3**

   b) Define friction axis of the link, show friction axis and friction circles of the link. **3**

   c) Following data referes to a screw with v-thread and nut arrangement.

   Angle of Vee = 54°

   Pitch of Screw = 8 mm.

   Mean diameter and screw = 56 mm

   Axial load = 45 kN

   Coefficient of friction = 0.14.

Find the turning moment required on the nut in order to move axially

a) Against load

b) With load

Also find efficiency in each case. **10**

OR

2. a) What is the effect following on maximum power transmission capacity of belt

i) Centrifugal tension

ii) Coefficient of friction

iii) Creep

iv) Initial tension. **4**

b) Power is transmitted by an open belt drive from a pulley 300 mm diameter running at 240 rpm. to a pulley of 500 mm diameter. Angle of lap on small pulley is 160°. The belt is on the point of slipping when 2.6 kW is being transmitted. $\mu = 0.25$.

If the initial tension is increased by 10% what is the power transmitted ? Comment on your result. **10**

c) Suppose a power of 8 kW is required to be transmitted by belt drive, with the distance between center is 3 m. Suggest a suitable belt drive with reason. **2**

3. a) Drive an equation for frictional torque for truncated conical pivot considering uniform pressure condition. **8**

b) In the band and block break, the band is lined with ten blocks. Each block subtends an angle of 16° at the centre of the wheel. For the arrangement calculate the maximum force 'F' required at the lever end for the break to absorb 225 kW at 300 rpm.

Take $\mu = 0.4$, Effective diameter is 80 cm
(Ref. fig. No. 1) **8**

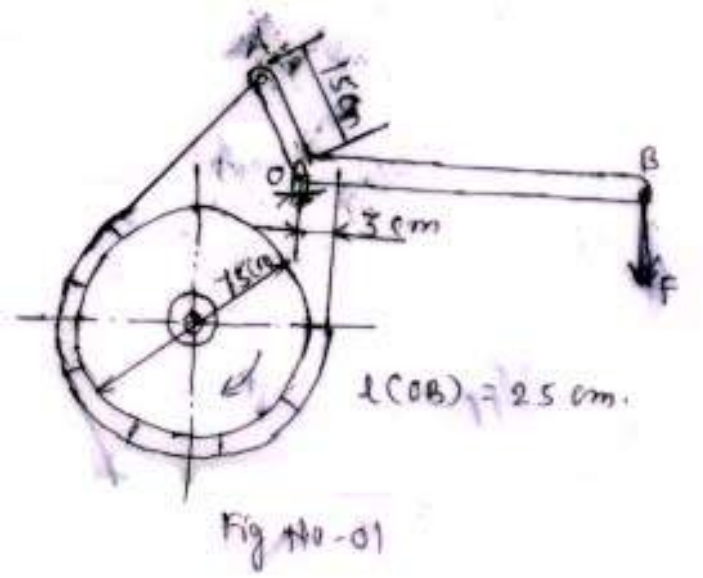

Fig No-01

OR

4. a) Draw a simple sketch of Bavis-Gibson torsion dynamometer and explain it. **6**

   b) A multiple disc clutch has five plates having four active parts of frictional surfaces. Determine the maximum axial intensity of pressure in bar, between the discs for transmitting 18 kW at 500 rpm, if the outer and inner radii of friction surface are 12.5 cm and 7.5 cm respectively.

   Assume uniform wear and coefficient of friction as 0.3. **5**

   c) Write short note on internal expanding shoe break with its applications. **5**

5. a) Draw the follower displacement, velocity and accleration plot for a cam having uniform acceleration and retardation motion of follower and explain it. **6**

   b) Explain the pressure angle of the cam and discuss how it is influenced by the base circle of the cam. **3**

c) Draw the profile of the cam to give the following motion to the follower :

i) Follower to move outwards through 32 mm during 180° of cam rotation with cycloidal motion.

ii) Follower to return with cycloidal motion during 180° of cam rotation.

With base circle of the cam is 30 mm in diameter and the roller diameter of the follower is 12 mm.

The axis of the follower is offset by 9 mm to the right. **9**

OR

6. a) A cam operating a mushroom ended follower has the following dimensions :

Base circle radius = 16.5 mm, lift of the follower = 7.25 mm radius of nose = 1.6 mm.

If the total period of opening and closing of the valve is 110° of cam shaft rotation, determine the radius of the flank and maximum velocity, acceleration and retardation of the follower. Cam shaft speed is 900 rpm. **8**

b) What is kinematic equivalent of cam-follower system, explain it with suitable sketch. **4**

c) Write short note on :

i) Cam jump and cam jerk.

ii) Advantages and disadvantages of centric cam. **6**

SECTION – II

7. a) Compare Flywheel and Governor. **6**

b) A torque exerted on the crank shaft of a two stroke engine is given by

$T = 15{,}000 + 2{,}000 \sin 2\theta - 1800 \cos 2\theta$ N.M.

Assuming the resisting torque to be constant determine

i) Draw T - θ diagram

ii) Power of Engine running at 200 rpm

iii) Moment of Inertia of the flywheel if the speed variation from the mean speed of 200 rpm is not to exceed $\pm 0.75\%$

iv) Angular acceleration of flywheel for angle of rotation of 30°. **10**

OR

8. a) Explain the working of Proell governor with neat sketch and derive the expression for speed of the Proell governor. **8**

b) Define the terms sensitiveness, hunting , isochronism and stability with respect to governor. **4**

c) Explain the controlling force of a governor by a appropriate graph for porter and hartnell governor for stable, isochronous and unstable condition. **4**

9. a) Two mating spur gears have 20 and 40 teeth of module 10 mm and 20° pressure angle. The addendum on each wheel is to be made of such a length that line of contact on each side of the pitch has half the maximum possible length. Determine the addendum for each gear, length of path of contact, arc of contact and contact ratio. **10**

b) A spur gear drive having pinion of 30 teeth and speed reduction ratio of 8/3 is to be replaced by helical gear in such a way that centre distance, gear ratio should remain same and helix angle should be minimum. The spur gear is cut by a hub of 1.5 mm module and same hub is used for cutting the helical gear. Determine the number of teeth on helical pinion and gear and helix angle. **8**

OR

10. a) Define the term interference and undercutting related to gears and derive the expression for minimum number of teeth to avoid the interference. **8**

    b) Find the minimum number of teeth to avoid interference when addendum for stub teeth is 0.84 module and when power transmission component is 0.95 times the normal thrust if

    i) the gear ration is unity

    ii) the gear ratio is 3 : 1.

    In each case also find out length of path of contact in terms of module. **10**

11. a) Elaborate the following terms related to worm and worm wheel

    i) axial pitch

    ii) circular pitch

    iii) lead

    iv) lead angle. **4**

    b) Derive the expression for centre distance and efficiency of worm gear. **6**

    c) The centre distance between two meshing spiral gear is 260 mm and angle between the shaft is 65° . The normal circular pitch is 14 mm and gear ratio is 2.5. The driven gear has a helix angle of 35°. Find :

    i) the number of teeth for each wheel

    ii) the exact centre distance

    iii) the efficiency if friction angle is 5.5°. **6**

OR

12. a) Explain the concept of differential wheel action with neat sketch and tabulation method. **6**

b) An epicyclic gear train consists of a sun wheel S, a stationary internal wheel E and three idendical Planet wheel P carried on a star shaped carrier (arm) C. The size of the different toothed wheel are such that the planet carrier C rotates at $1/5^{th}$ of speed of sunwheel S. The number of teeth for sunwheel are 16 and driving troque on sunwheel is 150 Nm. **10**

i) Sketch the sun, planet, carrier (c) and annular wheel E. S and E is concentric and planet P engages with sun S on one side and internal gear E on other side.

ii) Number of teeth on each wheel

iii) Holding torque on fixed wheel.

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T.E. (Polymer) (Semester – II) Examination, 2011
POLYMER RHEOLOGY AND PROCESSING
(2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define the following terms : **10**

i) Rheology ii) Flow

iii) Viscosity iv) Newtonian fluids

v) Non-Newtonian fluids and their classification.

b) What are the different types of forces that lead to flow. **4**

c) Explain Weissenburg effect. **4**

OR

2. a) Explain any one mechanical model in detail and significance of the two mechanical elements used in it. **10**

b) Explain following terms : **8**

(i) Elastic effect (ii) Extrudate swell (iii) Creep compliance (iv) Stress strain plot for polymer, showing creep and stress relaxation.

P.T.O.

3. a) Give the effect of following parameters on polymer rheology : **10**
   (i) Molecular weight (ii) Molecular branching (iii) Shear rate (iv) Temp (v) Fillers.

   b) Explain what is meant by superimposed pressure flow and when can it be encountered. **6**

OR

4. a) Explain how capillary rheometer is used to find shear stress and shear rate and thus viscosity. Also mention all the corrections required while using capillary rheometer. **12**

   b) What is cone and plate viscometer ? Give the calculations to find viscosity. **4**

5. a) Give the derivation to find continuity equation. **8**

   b) What is the importance of a', a'' and $\tan\delta$; and which machine is used to find the mentioned data ? **8**

OR

6. a) What is meant by matrix notation. Also give significance of all the co-ordinates it has ? What happens when $\tau_{ij} = \tau_{ji}$? **8**

   b) Write a short note on Tensors and significance of vectors. Also explain how tensors can be used to study rheology with egs. **8**

SECTION – II

7. a) Explain contiguous solids melting model. **6**

   b) Explain dispersive and distributive mixing. **6**

   c) Write a note on vented screw barrel system. **6**

OR

8. a) Explain various devices used to promote steady flow in a feed hopper. **6**

   b) Explain the different types of extender drives. **6**

   c) Write a note on groved barrel used in an extruder. **6**

9. a) Derive an expression for drag flow and pressure flow through a single screw extruder. **8**

   b) Explain the effect of channel depth on pressure fluctuation and heat energy required. **8**

OR

10. a) Discuss the effect of helix angle on melting in case of single screw extruder. **4**

   b) Give applications of vented screw-barrel systems. **4**

   c) Explain with a neat sketch, the screw geometry in a single screw extruder. **8**

11. a) List the various techniques used for velocity pressure switch over. Explain any one in detail. **8**

   b) Compare injection molding of thermoplastics and thermosets. **8**

OR

12. a) Explain the significance of melt cushion in injection molding. **6**

   b) Explain the difference between a perfectly sequential machine and a parallel operating m/c. **6**

   c) Explain the cavity profile for injection molding showing various stages. **4**

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T.E. (Computer) (Sem. – I) Examination, 2011
DATA COMMUNICATIONS (2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *i) Answer **any three** questions from each Section.*
*ii) Answers to the **two** Sections should be written in **separate** books.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) Assume **suitable** data, if **necessary**.*

SECTION – 1

1. a) Explain the working of superhetrodyne AM receivers with suitable block diagram.
What are advantages of this receiver ? **8**

b) Explain in short the need of Pre-emphasis and De-emphasis. **4**

c) Explain in short the SSB and VSB modulation technique. **6**

OR

2. a) Describe the terms ASK, FSK, PSK. What is the significance of these types of Modulation system ? **6**

b) Explain the operation of Phase Locked Loop Circuit. Why it has an important significance in Analog Modulation. **8**

c) A carrier wave of frequency 1 MHz and Peak value 10 V is amplitude modulated by a 5 KHz sine wave of amplitude 6 V. Determine the modulation index and sideband frequencies. **4**

P.T.O.

3. a) Explain the terms PWM, PPM and PAM. **6**

   b) Encode the following binary data stream into Bipolar RZ, NRZ (On-Off) and Manchester codes

   Data Stream : 11000010. **6**

   c) Explain the sampling theorem. Comment on the effect of sampling frequency on reconstruction of the signal. **4**

OR

4. a) Explain Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) along with their suitable applications. **8**

   b) Explain in short what is Crosstalk and Guard Time. **4**

   c) Using Shannon's Theorem compute the maximum bit rate for a channel having Bandwidth 3100 Hz and signal to noise ratio 20 dB. **4**

5. a) What is the significance of Quantization in A/D Conversion. What is Uniform Quantization ? What is the drawback associated with it and how to overcome this drawback. **10**

   b) A signal m (t) of Bandwith B = 4 KHz is transmitted using a binary companded PCM with μ = 100. Compare the case of L = 64 with the case of L = 256 from the point of view of transmission bandwidth and the output SNR. **6**

OR

6. a) Explain in detail Delta Modulation system. Draw diagram for Delta transmitter and receiver . What are its advantages over PCM ? **10**

   b) Draw and explain schematic diagram of T1 carrier system. What is the Data rate supported ? **6**

SECTION – 2

7. a) Describe the following terms :
   i) Hamming weight of a code word
   ii) Hamming distance
   iii) Code efficiency
   iv) Entropy and Information rate. **8**

   b) Describe in short the importance of Huffman Encoding. How the entropy is calculated ? **8**

OR

8. a) What is ARQ ? Explain selective repeat mechanism with suitable example. What is the advantage over go back n approach ? **8**

   b) What is CRC ? Compute the polynomial checksum for a Frame 1101011011 using the generator G (x) = $X^4 + X + 1$. **8**

9. a) Comment on the transmission structure used in ISDN ? **6**

   b) Draw and explain the ATM Cell header structure. **6**

   c) Draw and explain the Basic SONET Frame structure. **6**

OR

10. a) Write a short note on Frame Relay Technology. **6**

    b) Draw and explain the ATM protocol Stack. Comment on the significance of AAL Layer. **6**

    c) Explain in short Virtual Path and Virtual Channel ? What are the advantages of Virtual path. **6**

11. a) Describe the CSMA/CD protocol and its working in Ethernet Network. **8**

    b) Explain in short various physical topologies. Which topology is widely used today and why ? **8**

OR

12. a) Differentiate between Circuit Switching and Packet Switching. **4**

    b) An organization is required to setup a network of 25 PCs. Comment on the various components required. Which physical medium is suitable ? Also draw the topology of this network. **6**

    c) Differentiate between Peer-To-Peer and Client-Server architecture. **6**

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T.E. (Computer Engineering) (Sem. – I) Examination, 2011
MICROPROCESSORS AND MICROCONTROLLERS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) In Section **I**, attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**.*
*2) In Section **II**, attempt Q. No. **7** or Q. No. **8**, Q. No. **9** or }Q. No. **10**, Q. No. **11** or Q. No. **12**.*
*3) Answers to the **two** Sections should be written in **two separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*
*6) Assume suitable data **if necessary**.*

SECTION – I

1. a) With the help of neat block diagram, explain the architecture of Pentium Processor. **8**

   b) Explain Branch Prediction in Pentium with diagram. **6**

   c) List RISC features of Pentium. **4**

OR

2. a) Which features makes Pentium, a superscalar processor ? Explain in detail. **6**

   b) Describe the Floating Point Unit in Pentium. **6**

   c) What is the function of each of the following pins ? **6**

      i) $\overline{\text{BOFF}}$ ii) $\overline{\text{APCHK}}$ iii) $\overline{\text{KEN}}$

3. a) Describe different addressing modes in Pentium along with suitable examples. **8**

   b) Draw and explain timing diagram of non-pipelined write cycle with one wait state. **8**

OR

P.T.O.

4. a) What is BIST ? Explain in detail. **8**

   b) Draw and explain timing diagram of non-pipelined read cycle. **8**

5. a) What is TLB ? Describe its use in Pentium in detail. **8**

   b) Explain the process of Logical to Linear address translation in Pentium. Draw the required data structures. **8**

OR

6. a) Explain the process of linear to physical address translation in Pentium. Draw the required data structures. **8**

   b) What is the use of Control Registers ? Explain significance of CR0 in working of Cache and Paging Unit. **8**

SECTION – II

7. a) What is IDT ? Explain the various mechanisms to handle interrupts in Pentium. **8**

   b) Explain the significance of GDT and LDT for multitasking. **6**

   c) Define exception and list any two instructions causing exceptions. **4**

OR

8. a) What do you mean by virtual mode ? What are the different ways to enter into virtual mode ? **8**

   b) Name and explain any three interrupts that are available in virtual mode. **6**

   c) Explain task register in Pentium. **4**

9. a) Describe the Internal and External memory organization for Program and Data memory in 8051 Microcontroller. **8**

   b) Explain timer structure in 8051 Microcontroller and SFRs used in timer programming. **8**

OR

10. a) Describe Serial port structure in 8051 Microcontroller. **8**

    b) Write assembly language program for 8051 microcontroller to copy five numbers from internal data memory (starting at address 50H) to external data memory (starting at address 5000H). **8**

11. a) Explain architectural block diagram of PIC 16C61/71. **8**

    b) Explain memory organization of PIC 16C61/71. **8**

OR

12. a) Explain the significance of Watchdog Timer in PIC Microcontroller. **6**

    b) Name different SFRs used for interrupt handling in PIC 16C61/71. **6**

    c) Explain the following instructions : **4**

       i) DECFSZ

       ii) BTFSC

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T.E. (Computer) (Sem. – I) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume **suitable** data, if **necessary**.*
*5) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*

SECTION – I

1. A) What is a DT System ? With example describe the causality and stability property of DT system. **8**

   B) State the linear convolution formula and hence obtain it for DT signals
   $x(n) = \{1, 0, \underset{\uparrow}{-2}, 1\}$ $h(n) = \{-1, \underset{\uparrow}{2}, -1, 1\}$. **10**

   OR

2. A) With example, explain the quantization process in ADC. **8**

   B) Define:
   i) Sampling ii) Impulse Response iii) Aliasing
   iv) Odd signal v) Natural Response. **10**

3. A) Derive the relationship between Fourier Transform (FT) and Z-Transform (ZT). State the significance of ROC. **8**

   B) Obtain FT of a DT signal :– $x(n) = (a)^n u(n)$, $|a| < 1$. How we obtain the magnitude response ? **8**

   OR

4. A) State and prove the following properties of FT:
   i) Time shifting, ii) Periodicity. **8**

   B) Obtain IZT using PFE method : $X(z) = \frac{Z}{Z^2 - 3Z + 2}$ **8**

5. A) What is a pole zero plot ? Define system function H(z) and describe the properties of a DT system using H(z). **8**

   B) Determine the Impulse Response of a system described by a difference equation:- $y(n) + 4y(n - 1) + 4y (n - 2) = x(n)$. **8**

OR

6. A) What is frequency Response of a System ? Explain the simple Geometric Construction method for the same. **8**

   B) Draw a pole zero plot for a system –

   $y(n) = x(n) + \frac{1}{3}x(n-1) + \frac{3}{4}y(n - 1) - \frac{1}{8}Y(n - 2)$

   What do you mean by multiple order poles and zeros ? **8**

SECTION – II

7. A) Draw the signal flow graph w.r.t. DIT and DIF FFT algorithm for N = 8. Compare both the algorithms. **12**

   B) Obtain the twiddle factors $\{W_N\}$ for N = 4 and state its properties. **6**

OR

8. A) Define N – point DFT and IDFT. State any 4 properties of DFT. What is the significance of N in N – point DFT ? **10**

   B) Compute a 5 – point circular convolution for DT sequences:

   $x_1(n) = \{1, 1 -1, -1\}$

   $x_2(n) = \{1, 0, -1, 0, -1\}$

   How it is different than linear Convolution ? **8**

9. A) Define a DT filter and state its ideal frequency response characteristics. Compare between FIR and IIR filter. **8**

   B) Describe the Gibbs phenomenon observed in FIR filter design. How the filters are designed using Window method ? **8**

OR

10. A) Explain the Impulse Invariance method used for the design of IIR filter. **8**

    B) Write the transformation formula used in BLT method and explain the frequency warping effect. **8**

11. A) Name the filter structures used for FIR and IIR systems. Discuss the Direct Form Realization for FIR filter. **8**

    B) Obtain and realize Direct Form I and Direct Form II IIR filter structures for

$$H(z) = \frac{3z^5 + 5z^4 - 8z^3 + 4}{2z^5 + 3z^4 + 6z^2}$$ **8**

OR

12. A) Explain the different features of ADSP 21 XX DSP processor. **8**

    B) Draw a suitable IIR filter structure for a system

$y(n) + \frac{3}{4}\, y(n-1) + \frac{1}{8}\, y(n-2) = x(n) + x(n-1).$ **8**

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T.E. (Computer) (Semester – I) Examination, 2011
THEORY OF COMPUTATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *1) Answer **three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** answer books.*
*3) **Neat** diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Construct a NFA that accept any positive number of occurrences of various strings from the following language L given by **6**

L = { x ∈ {a, b} | x ends with aab).

b) Construct DFA's equivalent to NFA's **8**

a) ({p, q, r, s}, {0, 1}, δ1, p, {s})

b) ({p, q, r, s}, {0, 1}, δ2, p, {q, s})

δ1 :

	0	1
p	p, q	p
q	r	r
r	s	--
s	s	s

P.T.O.

$\delta 2$:

	0	1
p	q,s	q
q	r	q,r
r	s	p
s	--	p

c) Explain Moore machine and Mealy machine with suitable example. How do we construct equivalent Mealy machine for given Moore machine ? **4**

OR

2. a) Give the Mealy and Moore machine for the following processes. **8**

"For input from (0 + 1)*, if inputs ends in 101, output X; if input ends in 110, output Y, otherwise output Z"

b) For each of the following regular expression, draw an Finite Automata recognizing the corresponding language **10**

1) (1 + 10 + 110) *0

2) 1 (01 + 10)* + 0(11+10)*

3) (010 + 00)* (10)

4) 1 (1+10)* + 10(0+01)*

3. a) Construct DFA for the following regular expression (RE); RE = (a+b)* abb. **6**

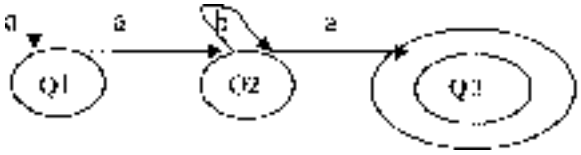
   b) Use the pumping lemma to show that each of these languages are not regular **10**

      a) L = {ww/w ∈ {0, 1}*}

      b) L = {xy/x, y ∈ {0, 1} * and y is x}.

OR

4. a) Consider the following transition diagram convert it to equivalent regular expression using Arden's theorem. **10**



   b) Let L = $\{0^n \mid n \text{ is prime}\}$ show that L is not regular. **6**

5. a) Construct the right linear grammar corresponding to the regular expression. **8**

   R = (1 + (01) *) 1 * (0+1)

   b) Convert the following grammar to Greibach Normal form to the following CFG **8**

   $S \rightarrow AA \mid 0, A \rightarrow SS \mid 1$

OR

6. a) Convert the following grammar to Chomsky Normal form (CNF)

   $S \rightarrow Aba,\ A \rightarrow aab,\ B \rightarrow Ac.$ **8**

b) Let G be the grammar **8**

$S \rightarrow aB|bA$

$A \rightarrow a|aS|bAA$

$B \rightarrow b|bS|aBB$

For the string aaabbabbba find

1) leftmost derivation

2) rightmost derivation

3) parse tree

4) is the grammar unambiguous.

SECTION – II

7. a) Let G the grammar given by **8**

$S \rightarrow aABB|aAA, A \rightarrow aBB|a, B \rightarrow bBB|A.$

Construct NPDA that accepts the language generated by this grammar.

b) Give the CFG generating the language accepted by the following PDA : **10**

$M = (\{q0, q1\}, \{0, 1\}, (Z0, X\}, \delta, q0, Z0, \phi)$ where δ is given below :

$\delta(q0, 1, Z0) = \{(q0, XZ0)\}$

$\delta(q0, 1, X) = \{(q0, XX)\}$

$\delta(q0, 0, X) = \{(q1, X)\}$

$\delta(q0, \in, Z0) = \{(q0, \in)\}$

$\delta(q1, 1, X) = \{(q1, \in)\}$

$\delta(q1, 0, Z0) = \{(q0, Z0)\}$.

OR

8. a) Find whether the string x = aabbb is in L = L (G), where G is given by **8**

   $S \rightarrow XY, X \rightarrow YY \mid a, Y \rightarrow XY \mid b.$

   b) Construct pushdown automata for each of the following language. **10**

   1) the set of palindromes over alphabet {a, b}

   2) the set of all string over alphabet {a, b} with exactly twice many a's as b's.

   3) $\{a^i b^j c^k \mid i \neq j \text{ or } j \neq k\}$.

9. a) Compare finite automata, pushdown automata, post machine and turing machine with each other with suitable example. **6**

   b) Construct turing machine that recognizes the language. **10**

   (a) $L = \{0^n 1^m : n, m >= 0\}$

   (b) $L = \{x \in \{0, 1\}^* \mid x \text{ ends in } 00\}$.

OR

10. a) Let T be the turing machine defined by the 5- tuples. **12**

$(S_0, 0, 0, S_1, L)$

$(S_0, 1, 0, S_0, L)$

$(S_0, B, B, Halt, L)$

$(S_1, 0, 1, S_0, L)$

$(S_1, 1, 1, S_0, R)$

For each of the following initial tapes, determine the final tape when T halts, assuming that T begins in initial position.

a) 110B

b) 0011B

c) 0101B.

b) Show that it is undecidable whether a TM halts on all inputs. **4**

11. a) Define the term : **8**

i) Complete problem
ii) NP complete problem
iii) Intractable problem
iv) Post correspondence problem.

b) If L1 and L2 are two recursive languages and if L is defined as : **8**

L = {w | w is in L1 and not in L2, or w is in L2 and not in L1}. Prove or disprove that L is recursive.

OR

12. a) Show that the following problems about programs in a real programming language are undecidable. **12**

a) whether a given program can loop forever on some input

b) whether a given program ever produces an output

c) whether two programs produce the same output on all inputs

b) Show that any subset of a countable set is countable. **4**

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T.E. Computer (Semester – II) Examination, 2011
PRINCIPLES OF PROGRAMMING LANGUAGES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary.***

SECTION – 1

1. a) Explain how Testing and Debugging facility supported by programming languages with respect to

   1) Execution Trace Function

   2) Break points

   3) Assertions. **8**

   b) Explain in detail the syntactic elements of programming language. **8**

   OR

2. a) What are different criteria of evaluation of program ? Explain properties of following data types

   1) Structured

   2) Derived

   3) Scalar

   4) Composite **8**

   b) Explain in detail significance of readability of a programming language. What is the impact of user defined operator overloading on the reliability of the program. **8**

P.T.O.

3. a) Consider following C Code

```
void foo (int n, int * sum)
{
    int k = 0, j = 0 ;
    if (n = = 0) return ;
    k = n % 10 ;  j = n/10 ;
    *sum = *sum + k ;
    foo (j, sum) ;
    printf ("%d   ",k) ;
}
void main ( )
{
    int a = 2048, sum = 0 ;
    foo (a, and sum) ;
    printf (“%d  “,sum) ;
}
```

What does the above program print ? **4**

b) Explain significance of following keywords of exception handling with examples

1) Try 2) Catch 3) Throw 4) Throws **8**

c) What do you mean by checked exceptions ? What are Pros and Cons of the same ? **6**

OR

4. a) Comment on :

1) Lexical Scope and Renaming of local variable.
2) Macro Expansion and Dynamic scope. **8**

b) What is role of heap in storage management and explain importance of local and non-local variables ? **8**

c) What do you mean by Build in Exception ? **2**

5. a) What do you mean by operator ? Explain all types of operators used in PASCAL. **6**

   b) Describe Runtime Organization for dynamic block structured lang. Justify with suitable example. **8**

   c) Does the statement p++ increment p or value pointer by p ? Justify. **2**

OR

6. a) Differentiate C and PASCAL with respect to following points : **8**
   1) Variable declaration
   2) Data types
   3) Types check
   4) Loops and Conditions.

   b) Explain following structured data types of PASCAL. **8**
   1) Records
   2) Sets
   3) Files and Input output.

SECTION – 2

7. a) What is difference between Abstraction, Encapsulation and Data Hiding ? **6**

   b) What do you mean by strongly typed language ? Comment on “C # is strongly typed language”. **6**

   c) Explain in brief following constructs with respect to .NET framework **6**
   1) Arrays
   2) Interfaces
   3) Assemblies.

OR

8. a) With respect to JAVA, what is use of string buffer over string ? **4**

   b) What is use of following JAVA methods ? **6**
   1) IndexOf (String S, int i)
   2) toCharArray ( )

   c) How to create our own exception handling mechanism in JAVA ? **6**

   d) What do you mean by Garbage Collection ? Why it is important ? **2**

9. a) Explain the data types and operations supported by following Prolog Data types. **8**
   1) Atoms
   2) Variables
   3) Numbers.

   b) What is difference between Instantiation, Matching and Unification ? **8**

OR

10. a) Draw and explain typical program structure of PROLOG. **4**

    b) Explain control structure and variable declaration used in PROLOG. **8**

    c) Why recursions are so naturally applies to defining relations in PROLOG ? Justify with suitable example. **4**

11. a) Write a LISP functions : **8**
    1) To identify last Element of Non-Null list.
    2) To calculate factorial of a given number.

    b) What do you mean by association list with respect to LISP ? **4**

    c) Write short note on Binding in LISP. **4**

OR

12. a) Explain in brief functions for reading and writing from files in LISP. **6**

    b) Write simple DO LOOP in LISP to count down from N to 0. **4**

    c) Write a LISP program to check whether given number is prime or not. **6**

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T.E. Computer (Sem. – II) Examination, 2011
MANAGEMENT INFORMATION SYSTEMS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) Figures to the **right** indicate **full** marks.*
*3) From Section **1**, Answer (Q **1** or Q **2**) and (Q **3** or Q **4**) and (Q **5** or Q **6**).*
*4) From Section **II**, Answer (Q **7** or Q **8**) and (Q**9** or Q **10**) and (Q **11** or Q **12**).*
*5) **Neat** diagrams must be drawn **wherever** necessary.*
6) Make suitable assumptions wherever appropriate and relevant.

SECTION – I

1. a) Explain the various types of information systems. Describe in detail the Information Systems (IS) hierarchy. **9**

   b) Define management. Explain the various levels of management. **8**

OR

2. a) Define Management Information Systems (MIS) and explain the role of the Management Information Systems (MIS). Explain the various functions of the manager. **9**

   b) What is infrastructure management ? Explain the broader classes of strategies. **8**

3. a) Explain the applications of Management Information Systems (MIS) in :
   i) Production Management
   ii) Materials Management. **9**

   b) Explain cross-functional enterprise systems. What are its benefits ? **8**

OR

4. a) What is personal management ? What are its objectives ? Explain the components of Enterprise Collaboration System. **9**

   b) Explain in detail accounting and finance management as an application of Management Information Systems. **8**

P.T.O.

5. a) What is Enterprise Resource Planning (ERP) ? Describe standard Enterprise Resource Planning (ERP) modules. **8**

   b) What is Business Process Re-engineering ? Explain.

   What is process and value stream model of organization ? Explain. **8**

OR

6. a) Explain in detail the Enterprise Resource Planning (ERP) solution structure. What are the benefits of Enterprise Resource Planning (ERP) solutions ? **8**

   b) What is call centre ? What is the scope of Business Process Outsourcing (BPO)? Which factors decide the success of Business Process Outsourcing (BPO) industry ? **8**

SECTION – II

7. a) Explain the role of Supply Chain Management (SCM). List the components of Supply Chain Management and explain them briefly. **9**

   b) What is Customer Relationship Management ? How does it change the way companies do their business ? **8**

OR

8. a) What are the three phases of Customer Relationship Management ? Explain the trends and benefits in Customer Relationship Management (CRM). **9**

   b) Explain the following concepts:

   i) Electronic fund Transfer

   ii) B2B and C2C types of e-Commerce. **8**

9. a) List the different domains of Artificial Intelligence. Explain the various analysis methods in decision support system. **9**

   b) Write short notes on :

   i) Geographical Information Systems (GIS).

   ii) Expert system. **8**

OR

10. a) What is Decision Support System (DSS) ? Explain the benefits and risks of decision support system ? **9**

    b) What is Data Warehouse ? Explain the steps involved in implementation of a Data Warehouse. **8**

11. a) What is the Need of Information Security ? Explain biometric security. List the different hacking techniques. **8**

    b) Explain the following :

    i) Cyber theft

    ii) Computer crime **8**

OR

12. a) Explain Disaster recovery. What is disaster recovery plan ? Explain the steps involved in developing a disaster recovery plan. **8**

    b) Explain the following :

    i) Global IT strategies

    ii) Encryption and Firewalls as the aspects of security management. **8**

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T.E. (Computer) (Semester – II) Examination, 2011
SYSTEMS PROGRAMMING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Assume suitable data, **if** necessary.*
*4) Write answer in **separate** answer book for **each** Section.*

SECTION – I

1. a) Explain and compare two variants of intermediate code generated by an assembler. **8**

   b) Define language processor. Also explain various language processing tools. **8**

   OR

2. a) Explain with example various parameter passing methods to a macro. **8**

   b) Explain the design of a single pass assembler. **6**

   c) With example explain use of LTROG instruction. **2**

3. a) Explain compile and go loader. Also state its advantages and disadvantages. **8**

   b) What is a callback function ? Explain need for the same. **6**

   c) What do you mean by static and dynamic linking ? **2**

   OR

4. a) What information must be provided by an assembler to the direct linking loader ? Explain significance of this information with respect to design of direct linking loader. **8**

   b) Explain design of a absolute loader. **6**

   c) Explain need of DLLs. **2**

P.T.O.

5. a) Compare Compiler and Interpreter. **8**
   b) Explain in detail various phases of compiler. **8**
   c) Define what is a pass and a phase. **2**

OR

6. a) Explain top down parsing in detail. What type of grammar is required by this parser ? **8**
   b) Explain the need of a lexical analyzer ? With example explain how it works. **8**
   c) Define Bootstrap compiler and cross compiler. **2**

SECTION – II

7. a) Explain functions of operating system. **6**
   b) Write the algorithm for FCFS process scheduling. **6**
   c) Draw and explain structure of Operating System. **4**

OR

8. a) For the following set of processes calculate average waiting time using preemptive shortest job first scheduling. Also draw the Gantt chart. **8**

Process	**Arrival time**	**Burst time**
P1	0	8
P2	1	4
P3	2	9
P4	3	5

   b) Describe the difference between short term, medium term and long term scheduling. **8**

9. a) Explain concept of segmentation. **6**
   b) What do you mean by compaction ? Explain with example. **8**
   c) What is paging ? **2**

OR

10. a) For the following reference string how many page faults will occur using FIFO and LRU page replacement scheme. Compare the results. **8**

    1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2

    b) What is a page table ? Explain how it is used in paging. **8**

11. a) With diagram explain indexed allocation. **8**

    b) Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143. The queue of pending requests in FIFO is : **10**

    86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

    Starting from the current head position what is the total distance that the disk arm moves to satisfy all the pending requests for FCFS and SSTF disk scheduling algorithm.

OR

12. a) With example explain various free space management techniques. **9**

    b) Explain directory structure in detail. **9**

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T.E. (Computer Engineering) (Sem. – II) Examination, 2011
SOFTWARE ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any 3** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – 1

1. a) Define terms 'Software' and 'Software Engineering'. "Software does not wear out". – State whether this statement is true or false. Justify your answer. **8**

   b) Explain prototyping process model. State its advantages and disadvantages. **9**

   OR

2. a) Explain different umbrella activities in software process framework. **8**

   b) What is Process Assessment and how it can be performed ? Explain with suitable diagram. **5**

   c) Write short note on : Process Pattern. **4**

3. a) What is Software Engineering Practice ? Explain the essence of practice. **8**

   b) Explain the importance of Modeling Practices. Explain the Principles of Analysis Modeling. **9**

   OR

4. a) Compare 'Business Process Engineering' and 'Product Engineering'. **8**

   b) Write short note on : UML. **4**

   c) What are the elements of computer based system ? Explain with suitable diagram. **5**

P.T.O.

5. a) Explain the importance of Requirement Engineering. Explain the tasks done during Elicitation and Requirement Management. **8**

   b) Explain Data Flow Model and draw Level 0 and Level 1 DFD for Library Management System. **8**

OR

6. a) Explain the following elements of Analysis Modeling. **8**
   - Class based elements
   - Scenario based elements
   - Behavioral elements.

   b) Draw class diagram for Inventory Management System. **8**

SECTION – 2

7. a) What is software Architecture ? What is architectural context diagram ? What are archetypes ? **8**

   b) Explain the following architectural styles with merits/demerits. **8**
   i) Data : centered Architecture
   ii) Data : flow architecture.

OR

8. a) Explain the relation between analysis and design. What are types of design classes ? **8**

   b) What do you mean by interface ? What is the role of interfaces in a Class-based component level design ? **8**

9. a) Explain in detail basic path testing with following details : **8**
   i) Flow-graph notation.
   ii) Cyclomatic complexity.

   b) Explain the following testing strategies for conventional software : **8**
   i) Regression Testing.
   ii) Smoke Testing.

OR

10. a) Compare and contrast. **8**

    i) White box and black box testing.

    ii) Verification and validation.

    b) Explain Object Oriented Testing. **8**

11. a) What is the difference between Measure and Metric ? What are attributes of effective software metric ? **9**

    b) Explain Object Oriented metrics and its significance. **9**

OR

12. a) What is metrics baseline ? What benefits does it provide to a Software Engineer ? **9**

    b) What is an indirect measure ? Why are such measures common in Software metrics ? **9**

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T.E. (Information Technology) (Semester – I) Examination, 2011
OPERATING SYSTEMS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **all** questions for **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Assume suitable data **wherever** necessary.*

SECTION – I

1. A) Discuss about the role of O.S. as Resource Manager. **4**

   B) What are the basic functions of Operating System ? Discuss. **4**

   C) Write short notes on : **10**

      i) Batch System

      ii) Multi Programming System

      iii) Time Shared System

      iv) Real Time System.

OR

2. A) Explain the Architecture of Windows 2000. **8**

   B) Which services of O.S. are useful to user ? **6**

   C) Write short note on System Calls. **4**

P.T.O.

3. A) Consider the snapshot of the system given in following matrices. **12**

	MAX	ALLOC	AVAILABLE
P1	3 2 2	1 0 0	1 1 2
P2	6 1 3	5 1 1	
P3	3 1 4	2 1 1	
P4	4 2 2	0 0 2	

i) Calculate Need Matrix.

ii) Determine the state of the system.

iii) Determine whether the following request will be granted or not

a. Process P1 requests 1 0 1

b. Process P4 requests 1 1 0

B) Discuss methods of recovering from deadlocks. **4**

OR

4. A) Explain the important of Producer -Consumer Problem using monitor. **8**

B) Explain the deadlock prevention technique in brief. **8**

5. A) Draw and explain the five State Process Transition Diagram. **6**

B) What is thread ? Explain different types of threads. **6**

C) What is the drawback of Priority Scheduling ? How to overcome this drawback ? **4**

OR

6. A) Consider the Set of Processes with Arrival Time, Burst Time and Priority **12**

Process	A.T	B.T	Priority
P1	1	8	2
P2	0	3	4
P3	2	7	1
P4	6	3	3

Find Average Turn around Time and Average Waiting Time for SJF (Non-Preemptive). Priority (P) and Round Robin (Q = 2) with the help of Gantt chart.

B) Write short note on Real Time Scheduling. **4**

SECTION – II

7. A) For the given reference string, determine the number of Page Faults for FIFO, Optimal and LRU page Replacement Policies. **9**

   5 4 2 4 6 5 3 6 2 3 2 4 5 2 6

   B) Write short note on Fixed Partitioning. Compare Fixed and Dynamic Partitioning. **9**

   OR

8. A) Explain with the help of neat diagram how TLB is used to improve Performance of Paging Technique. **10**

   B) Explain the use of Modify bit, discuss with diagram steps in handling the page fault. **8**

9. A) Write short note on Free Space Management Techniques. **8**

   B) Explain Record Blocking. **8**

   OR

10. A) For the give sequence of disk request, determine the total distance travelled of disk head in satisfying the entire request for FCFS, C-SCAN and SSTF algorithms. Initial head position is 120 and total number of cylinders in the disk is 200.

    120, 130, 180, 150, 25, 10, 105, 90. **12**

    B) Short note on Evolution of I/O Functions. **4**

11. A) State and explain different methods for user authentication for security. **8**

    B) Write a shell script to find whether a given number is palindrome or not. **4**

    C) Write a shell script to find the largest among three given numbers. **4**

    OR

12. A) How is security implemented in Windows 2000 ? **8**

    B) Explain authentication and authorization in detail. **8**

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T.E. (Information Technology) (Sem. – I) Examination, 2011
MULTIMEDIA SYSTEMS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) From Section **I** answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**.*
*3) From Section **II** answer Q. **7** or Q. **8**, Q.**9** or Q.**10**, Q.**11** or Q. **12**.*
*4) Neat diagrams must be drawn **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Name the various types of authoring tools that exist for multimedia. Explain any one in detail. **10**

   b) With the help of suitable example explain the Bresenham's circle drawing algorithm. **8**

   OR

2. a) Explain the steps involved in Flood fill and Boundary fill algorithm. **8**

   b) What is shading ? List the salient features of different types of shading methods. **10**

3. a) What is a homogeneous coordinate system ? What do you mean by composite coordinates ? **8**

   b) Derive the transformation matrix for rotating a point M(x,y) about a point $P(x_0, y_0)$ in two dimensions. **8**

   OR

4. a) What is line clipping ? Explain the steps in the Cohen Sutherland line clipping algorithm. **8**

   b) Explain the steps of Sutherland Hogman polygon clipping algorithm. **8**

5. a) What is aliasing and antialiasing ? Explain with a suitable example. **10**

   b) What are the various storage media for multimedia ? **6**

   OR

P.T.O.

6. Write short notes on the following :

   a) Vector scan and raster scan display. **4**

   b) 3D Rotation about X-axis. **6**

   c) Scan line seed fill algorithm. **6**

SECTION – II

7. a) What is MIDI file and explain commands of MIDI file. **8**

   b) Explain characteristics of sound. **8**

OR

8. a) Describe audio file format supported by windows OS. **8**

   b) What are the compression techniques in audio ? Explain PCM in detail. **8**

9. a) What are the steps in designing an animation sequence ? **6**

   b) What are different types of animation techniques ? Explain in brief. **6**

   c) Explain color model used for CRT display. **6**

OR

10. a) Explain the salient points of color models RGB, YUV, CMY. **9**

    b) What is computer controlled animation ? What is segmentation in animation ? **9**

11. a) Explain different types of loss less data compression techniques. **8**

    b) Explain MPEG compression. **8**

OR

12. Write short notes on

    a) BMP file format. **6**

    b) LZW encoder. **4**

    c) Quantization in JPEG. **6**

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T.E. (Information Technology) (Semester – I) Examination, 2011
DATA COMMUNICATION AND NETWORKING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Assume suitable data, **if necessary**.*

SECTION – I

1. A) Explain different analog to digital modulation techniques with suitable diagram and constellation patterns (ASK, FSK, PSK). **9**

   B) Define : forward error correction and backward error correction. Discuss the hamming code technique. Calculate the hamming code if the data to be sent is 1001101. **9**

OR

2. A) Define modulation and draw the typical diagram for modulated signals for frequency and amplitude modulation. **9**

   B) Explain the following error detection methods with suitable examples. Comment on the performance of each method. **9**
   1) Vertical redundancy check
   2) Longitudinal redundancy check
   3) Cyclic redundancy check
   4) Checksum.

3. A) Explain T3/E3 carrier system. **8**

   B) Compare message switching, circuit switching and packet switching. **8**

OR

4. A) Describe the working of DSL technology ? Also state the various technologies. **8**

   B) Describe time division multiplexing. Explain the specifications of T1 carrier system. **8**

P.T.O.

5. A) Explain the twisted pair cable and its various categories. Also state the data rate and the use of every category. **8**

   B) Compare : **8**
   1) Step index and graded index fibers
   2) Single mode and multimode fibers.

OR

6. A) Explain with suitable examples guided transmission media and unguided transmission media. **8**

   B) Discuss the principle used in transmitting light waves through a fiber optic cable. **8**

SECTION – II

7. A) What is the significance of using networking topologies ? Justify your answer with suitable examples. **8**

   B) Describe four ways of organizing a local area network with neat diagram. **8**

OR

8. A) Describe the functions of all the layers of the TCP/IP model in short. **8**

   B) Compare Bridge, Switch, Hub, Repeater. **8**

9. A) Discuss high level data link control protocol with its appropriate frame formats. **9**

   B) Discuss CSMA/CD Random access techniques. How is collision avoidance achieved in the same. **9**

OR

10. A) Discuss the Link Control Protocol (LCP) of the point-to-point (PPP) stack in brief. **9**

    B) Explain ALOHA, Slotted ALOHA and CSMA. Comment on the efficiency of each random access technique. **9**

11. A) What is Virtual LAN ? State the advantages of VLAN's. Explain how to set up VLAN's using layer 2 switches. **8**

    B) Differentiate 10Base5, 10Base2 and 10BaseT specification. **8**

OR

12. A) Write a short note on Gigabit Ethernet. Compare Gigabit Ethernet with Traditional Ethernet. **8**

    B) Discuss SONET with reference to the following : **8**

    1) Devices types
    2) Payloads and frame.

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T.E. (Information Technology) (Semester – I) Examination, 2011
THEORY OF COMPUTATION
(2003 Course)

Time : 3 Hours | Max. Marks : 100

Instructions: *1) Answer **any three** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** answer books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Construct DFA that accepts all binary numbers which are divisible by 3. **8**

   b) Design a FA for binary adder. **6**

   c) Find the transitive closure and symmetric closure of a relation (1, 2), (2, 3), (3, 4), (5, 4). **4**

OR

2. a) Construct the Mealy machine that takes all strings of 0's and 1's as input and produces A if input ends with 10 or produces B if input ends with 11 other wise produces C. **8**

   b) What is a major drawback of a basic machine ? **2**

   c) Design a FA that reads strings defined over $\Sigma = \{a, b\}$ and accept only those strings which end up in either "aa" or "bb". **8**

P.T.O.

3. a) Describe in simple english the language defined by following regular expression :
   i) $(a + b)^* aa (a + b)^{**}$ ii) $(b + ba)^*$
   iii) $a (a + b)^* b$ iv) $a^+b^*c^+$ **8**
   b) State and prove theorem of Pumping Lemma. **8**

OR

4. a) Give a recursive definition of Regular expression. Enlist with the properties of Regular languages. **8**
   b) Write the regular expressions for :
   i) $\Sigma = \{a, b, c\}$ the language containing strings, such that each string has "any number of a's followed by any number of c's".
   ii) $\Sigma = \{0, 1, 2\}$, and language set L (r) = {0, 2, 01, 21, 011, 211, 0111, ...}
   iii) $\Sigma = \{0, 1\}$ and language set L (r) = {00, 010, 0110, 01110, ...}
   iv) Language defined over $\Sigma = \{a, b\}$ has to have the strings beginning with 'a' and not to have two consecutive a's.
   v) $\Sigma = \{a, b\}$ such that each of string do not have aa or bb as a substring in it.
   vi) $\Sigma = \{0, 1\}$ the language such that it contains strings with even number of 0's. **8**

5. a) Find the grammar given as
   i) CFG which generates all palindromes over {a, b}.
   ii) Regular grammar that generates all strings over {0, 1} where first and last symbols are same. **8**
   b) Check whether the following languages are regular or not
   i) $L = \{a^n b^m \mid m, n \geq 1\}$
   ii) $L = \{a^{n2} \mid n \geq 1\}$. **8**

OR

6. a) Construct an equivalent Chomsky Normal Form (CNF) for the given grammar.
   $S \rightarrow bA \mid aB$
   $A \rightarrow bAA \mid aS \mid a$
   $S \rightarrow aBB \mid bS \mid b$ **6**
   b) Explain different types of grammars with suitable example for each type. **10**

SECTION – II

7. a) Design PDA for the following language
$L = \{a^n b^{2n} : n > 0\}$ **10**

b) Construct an equivalent PDA for the following CFG

$S \rightarrow 0BB$

$B \rightarrow 0S \mid 1S \mid 0$ **8**

OR

8. a) Design PDA for the following languages :

$L = \{a^n b^{m+n} c^n \mid m, n \geq 1\}$ **10**

b) Construct an equivalent PDA for following CFG.

$S \rightarrow aAA$

$A \rightarrow aS \mid bS \mid a$ **8**

9. a) Construct a Turing Machine that accepts all strings of a's and b's where third input symbol from LHS is 'a' **8**

b) Write a short note on Universal Turing Machine. **6**

c) What are advantages of TM over FM ? **2**

OR

10. a) Design Turing Machine (TM) that accepts the language

$L = \{a^n bb \mid n \geq 1\}$ **8**

b) Write a short note on Post Machines. **8**

11. a) Compare PDM and PM. **6**

    b) What are the major advantages and disadvantages of Turing machine w.r.t computational capabilities ? Explain in brief. **8**

    c) State **True** or **False** :
    i) FSM is a special case of the TM.
    ii) TM can be deterministic. **2**

OR

12. a) Compare FSM and TM. Let your answer include : computational abilities, available memory and types of problems that can be addressed. **8**

    b) Enlist the applications of regular expressions and explain any one in detail. **8**

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T.E. (I.T.) (Semester – II) Examination, 2011
SYSTEM SOFTWARE
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Sections.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Compare the following :
   i) Compiler and interpreter
   ii) Macros and functions
   iii) Machine-opcode and Pseudo-opcode
   iv) Phase and pass. **8**

   b) Which of the following features are machine dependent and which are machine independent ? Justify your answer. **8**
   i) Addressing modes
   ii) Program relocation
   iii) Literals.

   c) Enlist different system programs. **2**

OR

2. a) Comment on the statement, "Static binding leads to more efficient execution of a program than dynamic bindings". **4**

   b) Write the significance of debug monitor. **6**

   c) With the help of a neat block diagram explain the structure of screen editor. **8**

P.T.O.

3. a) Write an algorithm for PASS-I of two pass assembler. **8**

   b) Can a one pass macro processor successfully handle a macro containing conditional macro pseudo-ops ? If not what modifications are necessary to enable it to handle such situations ? **8**

OR

4. a) What are the different ways in which we can specify the arguments to a macro call ? Briefly explain with the help of suitable examples. **6**

   b) Write an algorithm for PASS-II of a two pass macro processor. **10**

5. a) Enlist the different tables that are created or generated by the lexical analyzer. Give the format of fixed tables used. **10**

   b) State **true** or **false** :

   i) A recursive descent parser is a bottom up parser.

   ii) Backtracking is needed in recursive descent parser.

   iii) Top down parser is also called as shift reduce parser.

   iv) Right most reduction is used in top down parser.

   v) Bottom-up parser is more efficient than top down parser.

   vi) To down parser is much easier to implement as compared to bottom-up parser. **6**

OR

6. a) What are the major problems faced by shift reduce parser ? Explain it with suitable example. **8**

   b) Consider the following grammar :

   $A \rightarrow aB$

   $B \rightarrow Ab$

   $B \rightarrow b.$

   Show stepwise procedure for recognizing the input string “aabb” using bottom up parsing technique. **6**

   a) What do you mean by bootstrapping of compiler ? **2**

SECTION – II

7. a) Differentiate between machine dependent and machine independent optimization techniques in compiler. Explain in brief any one of these techniques. **10**

b) Write an intermediate code in the form of triple and quadruple for the following expressions : **8**

$P = P \rightarrow next$

$P \rightarrow next = NULL$

(Clearly mention assumptions made if any).

OR

8. a) What kinds of errors that can be detected in a source program during **8**

i) SYNTCATIC ANALYSIS

ii) CODE GENERATION

b) Write the triple form for the following : **6**

$X = ++Y * Z$

c) What is the need for generating intermediate code ? Explain. **4**

9. a) What is loader ? Enlist the basic functions of a loader ? **6**

b) Why are library routines usually relocatable ? What would happen if these routines are made non-relocatable ? **6**

c) What is the benefit of treating an undefined external symbol to be the name of library routine. **4**

OR

10. a) Explain the design issues of an absolute loader. **8**

b) Compare absolute loader and direct linking loader with respect to basic functionalities of loader. **8**

11. a) Explain in brief how an OLE functions. **8**

    b) What is the need of Dynamic Link Library over conventional linking ? What is a class library ? **8**

OR

12. a) Explain the term Dynamic Data Exchange. **8**

    b) Write short note on : **8**

    i) Different methods of specifying link

    ii) Data formats for clip board.

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T.E. (Information Technology) (Semester – II) Examination, 2011
COMPUTER NETWORK TECHNOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Assume** suitable data, **if necessary**.*

SECTION – I

1. A) Explain any two congestion prevention policies with suitable example. **8**

   B) Discuss the design issues of the network layer. **8**

   OR

2. A) Differentiate between distance vector and link state routing. **8**

   B) Consider 192.168.50.0/24 network. How will you divide this network to have minimum 6 equal subnets ? How may nodes each subnet will have ? What will be new subnet mask ? **8**

3. A) Suggest any two methods to overcome Silly Window Syndrome problem. **8**

   B) What is NAT ? Explain its operation with an example. **8**

   OR

4. A) Describe the format of TCP header. **8**

   B) Define a socket. Explain important primitives used in socket programming. **8**

5. Write short notes on : **18**

   1) LDAP

   2) MIME

   3) Electronic mail.

   OR

6. Write short notes on :
   1) ICMP
   2) IP frame format
   3) Static and dynamic pages. **18**

SECTION – II

7. A) Explain RTSP protocol with suitable example. **8**

   B) What is MIB ? Explain its structure. **8**

   OR

8. A) Differentiate SIP and H.323 protocols. **8**

   B) What is the need of scheduling and policing techniques in multimedia networking ? **8**

9. A) What is the purpose of SMI and MIB in relation with SNMP ? **8**

   B) Differentiate DHCP and BOOTP. **8**

   OR

10. A) List and explain the principle components of network management architecture. **8**

    B) How DHCP assigns addresses dynamically ? Explain stepwise procedure carried out by DHCP server and DHCP client. **8**

11. Write short notes on : **18**
    1) ATM 2) B-ISDN 3) 802.11 architecture

    OR

12. Write short notes on : **18**
    1) SMDS 2) Bluetooth 3) WLAN architecture.

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T.E. (Information Technology) (Semester – II) Examination, 2011
HUMAN COMPUTER INTERFACE
(2003 Course)

Time: 3 Hours Max. Marks: 100

Instructions** : 1) Answer Question **1** or **2**, **3** or **4** and **5** or **6** from Section **I** and question **7** or **8, 9** or **10** and **11** or**12** from Section **II.

*2) Answers to the **two** Sections should be written in **separate** answer sheet.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Discuss human factors related metrics to evaluate any interface. **8**

   b) Explain the difference between slips and mistakes with the help of suitable example. **8**

OR

2. a) How the Human Computer Interaction and user Interface design are related ? Explain in detail. **8**

   b) Describe design principles for input devices. **8**

3. a) List and explain Shneiderman Eight Golden Rules of interface design. **8**

   b) Explain task objects and task actions as well as interface objects and interface actions to build computer interface for medical store. **10**

OR

4. a) As screens grow larger, some designers are tempted to increase the number of menu items displayed at once. Give three strategies for organizing the layout and justify them briefly based on user tasks and knowledge. **8**

   b) What is key stroke-level model (KLM) ? Explain with suitable example. **10**

5. a) Draw and explain three Pillars of Interface Design. **8**

   b) Describe Heuristic Evaluation method: What steps comprise it, how and where is it used, how many evaluators are recommended, and where do the heuristics come from ? **8**

OR

6. Write short note on (**any two**) : **16**
   - Participatory Design
   - Scenarios and Patterns
   - LUCID.

SECTION – II

7. a) Explain different dialog design notations. **8**

   b) Evaluate Microsoft Word interface using the “Eight golden rules of interface design”. **8**

OR

8. a) List and explain any two interaction styles. **8**

   b) Describe various command organization strategies. **8**

9. a) Explain how following CSCW systems are useful for co-operative working. **8**
   i) Video Conference System
   ii) Shared Editor.

   b) List and explain advantages and disadvantages of online help and off line help. **8**

OR

10. a) Specify four error messages encountered by you in GUI based interactive system. What guidelines can you suggest for presenting these error messages in an effective style ? **8**

   b) How CSCW is useful for education ? Discuss in detail. **8**

11. a) Discuss and elaborate the issues to be considered in designing web pages. **10**

   b) Explain role of HCI in animation industry. **8**

OR

12. Write short notes on : **18**

   - Information Visualization
   - Organization design to support usability
   - Comparisons of pointing devices.

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T.E. (Information Technology) (Semester – II) Examination, 2011
SOFTWARE ENGINEERING
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) From Section **I** answer Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** and answer Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12**.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Define Software Engineering. **2**

   b) State the customer's myths. **4**

   c) Explain the failure curve of software. **4**

   d) Explain CMMI in details. **8**

   OR

2. a) Explain the Prototype software process model in brief. **6**

   b) Explain the Inception and Elaboration phases of Unified Processing model in brief. **6**

   c) State the software process framework activities and write the importance in brief. **6**

3. a) What is the essence of software engineering best practices ? **2**

   b) State best practices in communication in the context of software development. **6**

   c) What is the focus of construction practices ? Explain coding principles. **8**

   OR

P.T.O.

4. a) What is the objective of software testing ? **2**

   b) Explain the testing principles. **6**

   c) What are the elements of product engineering hierarchy ? Explain in brief. **8**

5. a) Explain the use case diagram and activity diagram in detail. **8**

   b) Define the following in the context of data modelling : **8**

      i) Data attributes

      ii) Relationships

      iii) Cardinality

      iv) Modality.

OR

6. a) Draw a data flow diagram (level 0, level 1 and level 2) for pizza ordering system to a pizza shop. **(1+2+5=8)**

   b) Write a note on class diagram the analysis model. **8**

SECTION – II

7. a) State design principles. Explain modularity in detail. **8**

   b) Explain data centred architecture design in detail. **10**

OR

8. a) Narrate the steps in User interface design. **6**

   b) Explain the call return architecture in brief. **6**

   c) Explain the pipe and filter in brief. **6**

9. a) What are the categories of software resources ? List the details of each type. **8**

   b) What are the four P in software project management spectrum ? Explain the people factor towards the success of the project. **8**

OR

10. a) What is the software measurement objective ? What is OO metric ? **8**

    b) Explain the FP based software estimation in detail. **8**

11. a) What is the need of SCM ? What is the role of SCM repository in SCM ? **8**

    b) What is configuration audit ? **4**

    c) What is status reporting ? **4**

OR

12. a) What is forward engineering and reverse engineering ? Explain in brief. **8**

    b) How is reverse engineering used in understanding data and process ? **8**

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T.E. (Mech.) (Semester – I) Examination, 2011
COMPUTER ORIENTED NUMERICAL METHODS
(2003 Course)
(Common with Mech. S/W for Semester – II)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) Black figures to the **right** indicate **full** marks.*

*4) Assume suitable data, **if necessary**.*

SECTION – I

Unit – 1

1. A) Maximize $Z = 3x_1 - x_2$

Subject to $x_1 - 2x_2 \leq 2$

$2x_1 - x_2 \leq 4$

$x_1 + x_2 \leq 5$

$x_1, x_2 \geq 0,$

using Simplex method. **10**

B) Explain :

i) Truncation error

ii) Round-off error with the help of suitable examples. **6**

OR

2. A) In a triangle, length of base = 10 cm $\pm$ 2 mm, and height = 20 cm $\pm$ 1 mm. What is the i) absolute error and ii) percentage error in computation of its area ? **6**

B) Write a flow-chart for maximizing a function 'z' subject to 2 given conditions using 2 different non-negative variables, using Simplex method. **10**

P.T.O.

Unit – 2

3. A) Fit a curve $y = ax^b$ using following data points.

x	2000	3000	4000	5000	6000
y	15	15.5	16	17	18

8

B) Write a program for calculating 'y_k' at any given 'x_k' using Lagrange's interpolation method.

Given : A set of 'n' points, namely,

$(x_1, y_1).....(x_n, y_n)$ **8**

OR

4. A) Following table lists the thermal conductivity of a material at different temperatures.

Temp. (^{0}C) :	100	150	200	250
Conductivity (W/mK) :	215	213.2	212	211.2

Estimate the conductivity at 120°C, using Newton's forward difference interpolation method. **8**

B) Write a flow-chart for fitting a straight line $y = a_0 + a_1x$ to given set of data points, namely $(x_1, y_1)..... (x_n, y_n)$ (Total no. : 'n'). **8**

Unit – 3

5. A) Solve the following equations using Gauss-Seidel iteration method, correct upto 3 decimal places. **9**

B) Write an algorithm (Step-by-step) procedure for computing $'\frac{dy}{dx}'$ at $x = x_k$ using backward difference differentiation technique. **9**

Given : A set of (n + 1) points, viz $(x_0, y_0).....(x_n, y_n)$

OR

6. A) Population of a village is given below. Find the rate of growth of population in year 1997. **9**

Year	1980	1985	1990	1995	2000
Population in thousands	40.62	60.8	79.95	103.56	132.65

B) Write a flow-chart to solve 4 linear simultaneous equations using Gauss-Jordan method. **9**

SECTION – II

Unit – 4

7. a) Find root of equation $x^3 + x - 1 = 0$ using Newton Raphson method. Initial Guess value $x_0 = 0$, accuracy desired is 3 digit accuracy. **8**

b) Write a computer program for integration by Simpson's $3/8^{th}$ Rule for $y = \sin(x)$ in between limits $\pi/4$ and $3\pi/8$, step size $h = \pi/32$. **8**

OR

8. a) Determine numeric value of the integration for the function $x^3 - 2x^2 + 7x - 5$ assuming 8 strips in between limits 2.2 to 3.4. Use trapezoidal Rule. **10**

b) Draw flowchart for Bisection method to obtain root of $x\,e^x - 5\cos(x) = 0$ with initial guess – 1.5 and –2.0. Desired accuracy 0.01. **6**

Unit – 5

9. a) Given $dy/dx = (x+y)$ with initial condition $y(0) = 1$. Find $y(0.05)$ and $y(0.1)$ correct upto 5 decimal places by using Modified Euler's method. Take $h = 0.05$. **10**

b) Write a computer program to solve the above problem. **6**

OR

10. a) Solve the simultaneous differential equations dy/dx=yz+x and dz/dx=xz+y, where y(0)=0, z = (0) = –1, Find y(0.1) and z(0.1) using Runge-Kutta 4^{th} order method. Take h = k = 0.1 **10**

    b) Write a computer program to solve the above equation. **6**

Unit – 6

11. a) A steel plate of 150 mm ×150 mm has its four sides held at 100°C (upper edge), 80°C (left edge), 50°C(lower edge) and 0°C (right edge). Estimate the steady state temperature distribution at interior points assuming grid size of 50 mm. **12**

    b) Draw a flowchart to solve the Poisson's equation $\partial^2 u/\partial x^2 + \partial^2 u/\partial y^2 = 2x^2y^2$ over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with u = 0 on all the boundaries and h = 1, k =1. **6**

OR

12. a) Given that $\partial u/\partial t = \partial^2 u/\partial x^2$ subjected to u(0, t) = u(5, t) = 0 and $u(x, 0) = x^2(25-x^2)$. Find values of 'u' upto 1 second. Take h = 1 and Δt = 0.5 second. **12**

    b) Draw flowchart to solve numerical in Q-12a. **6**

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T.E. (Biotechnology) (Semester – I) Examination, 2011
BIOCHEMISTRY – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *i) Answer Q.No. **1** or Q.No. **2**, Q.No. **3** or Q.No. **4**, Q.No. **5** or Q.No. **6** from Section **I** and Q.No. **7** or Q.No. **8**, Q.No. **9** or Q.No. **10**, Q.No. **11** or Q.No. **12** from Section **II**.*

*ii) Answer to the **two** Sections should be written in **separate** answer books.*

*iii) **Neat** diagrams must be drawn **wherever** necessary.*

*iv) Use of logarithmic tables, slide rule, electronic pocket calculator is **allowed**.*

SECTION – I

1. Explain in detail (**6**M **each**) : **18**

   1) Reversible inhibition of enzyme

   2) Enzymatic activity of molecule other than protein

   3) Multienzyme complex.

   OR

2. Explain the catalytic mechanism of any enzyme with reference to specific examples. **18**

3. Describe in detail the reaction mechanism of pyruvate dehydrogenase and the role of TPP as catalytic cofactor. **16**

   OR

4. Decipher the role of coenzyme A as acyl group carrier. **16**

5. Enlist the four main types of receptors. Explain in detail the role of each receptor with one example. **16**

   OR

P.T.O.

6. Describe the following terms with suitable example (**8**M **each**) : **16**
   1) G-protein coupled receptors
   2) Nuclear receptors.

SECTION – II

7. Answer the following (**9**M **each**) : **18**
   1) Tertiary structure of protein with one example
   2) Structure and function of nucleic acids.

OR

8. Illustrate the structure function correlation of proteins α - keratin, collagen, and silk fibroin. **18**

9. Answer the following (**8**M **each**) : **16**
   1) Role of Cyt p450 reductase in drug metabolism
   2) Role of myosin in muscle contraction.

OR

10. Depict the different signaling pathways and describe any one in detail : **16**

11. Answer the following (**4**M **each**) : **16**
   1) Tests used for monitoring cardiac dysfunction
   2) State the role of any two fat soluble vitamins
   3) Functions and deficiency of vit C
   4) Functions of sodium.

OR

12. Write in brief (**8**M **each**) : **16**
   1) Role of any two minerals in the body and its dietary sources
   2) Metabolism of any one branched amino acids.

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T.E. Biotechnology (Semester – I) Examination, 2011
BIOSEPARATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Answer to the **two** Sections should be written in **separate** answer books.*
*iii) **Neat** diagrams should be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*

SECTION – I

1. Describe in detail various methods of chemical cell disruption. **18**

OR

2. What are methods of mechanical cell disruption ? Describe in detail High Pressure homogenizer. **18**
3. What is liquid chromatography ? Write its principle, technique and application. **16**

OR

4. Write notes on (**8** marks **each**):
   a) Bioaffinity chromatography
   b) Ion exchange chromatography.
5. Explain cross flow filtration. Discuss five methods of membrane cross flow filtration. **16**

OR

6. Write notes on : **16**
   a) Sedimentation
   b) Flocculation.

SECTION – II

7. What is the importance of Bioseparation in Biotechnology ? What are chemical, physical and biochemical parameters of Bioseparation ? Discuss. **18**

OR

P.T.O.

8. What are Biomolecules ? Give classification of Biomolecules. Discuss secondary metabolites in detail. **18**

9. Write notes on (**8** marks **each**):
   a) Crystallization
   b) Freeze Drying.

OR

10. What is the principle behind solvent extraction ? Describe in detail various methods of solvent extraction. **16**

11. What are various stages of recovery of a product in downstream processing ? Which factors contribute to primary recovery stage ? Discuss. **16**

OR

12. Draw a neat-labeled flow chart of production of Vitamin C in industry. Briefly describe steps involved. **16**

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T.E. (Biotechnology) (Semester – II) Examination, 2011
IMMUNOLOGY
(2003 Course)

Time: 3 Hours Max. Marks: 100

N.B. *: i) Answer to **two** Sections should be written in **separate** answer books.*

*ii) Draw **neat** diagrams **wherever** necessary.*

*iii) Maximum marks for each question is given in **parentheses**.*

SECTION – I Max. Marks: 50

1. Innate and adaptive immunity act in cooperative and interdependent ways to protect the host. Discuss the collaboration of these two forms of immunity. **18**

OR

2. The CD3 complex of the T-Cell receptor and Ig-α/Ig-β heterodimer of the B cell have similar functions. Briefly describe the functions of these protein complexes. **18**

3. Describe the role of thymus in T cell maturation. What is meant by negative selection of T cells ? **16**

OR

4. Explain why a VH segment cannot join directly with a JH segment in heavy-chain gene rearrangement. **16**

5. Name the pathways of antigen presentation which involve (i) Proteosome and TAP, and (ii) Invariant chain. Differentiate between these pathways. **16**

OR

6. Explain the co-stimulatory and adhesive interactions leading to T Cell activation. **16**

P.T.O.

SECTION – II Max. Marks: 50

7. Explain why natural killer cells (NK-cells) will kill many types of virus-infected cells but do not kill normal cells. **16**

OR

8. Explain the role of cytokines in differentiation of Naive T cells and B cells. **16**

9. Complement activation can occur via the classical, alternative or lectin pathway. Elaborate. **18**

OR

10. Define each of the following terms and explain why these terms are important in understanding the immune response to influenza. (i) Original antigenic sin, (ii) Antigenic drift, (iii) Antigenic shift. **18**

11. What is meant by immunological tolerance ? Describe four mechanisms by which tolerance can occur. **16**

OR

12. With suitable example describe Type IV (T cell mediated) autoimmunity. How could there be T cells specific for self antigen present after negative selection in the thymus ? **16**

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T.E. Biotechnology (Semester – II) Examination, 2011
INSTRUMENTATION AND PROCESS CONTROL
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Answer to the **two** Sections should be written in **separate** answer books.*
*iii) Neat diagrams should be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
v) Use of electronic pocket calculator is allowed.
*vi) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Describe the operating principle, construction and working of optical pyrometer. **8**

   b) Compare and contrast the advantages and limitations of :
      i) RTD and thermistor
      ii) Thermocouples and resistance thermometers. **8**

OR

2. Write short notes on : **16**
   i) Pirani Vacuum Gauge
   ii) Seebeck effect
   iii) Composition analysis of gases
   iv) Bellow Pressure Gauge

3. a) In a typical mixing process, a stream of solution containing dissolved salt flows at a constant volumetric flow rate q into a tank of constant hold up volume V. The concentration of salt in the entering stream x (mass of salt/ volume) varies with time. Derive the transfer function for this process relating the outlet concentration y to the inlet concentration x. **6**

   b) Describe the response of a second order system for a step forcing function. Explain the different response curves with the help of graph. **6**

P.T.O.

c) A thermometer is suddenly subjected to a step input of 200°C from 0°C. Calculate the temperature indicated by the thermometer after a time of 1.5 sec. The thermometer may be idealized as a first order system with a time constant of 2.5 sec. Would there be any change in the indicated temperature if the thermometer was initially held at 25°C ? **6**

OR

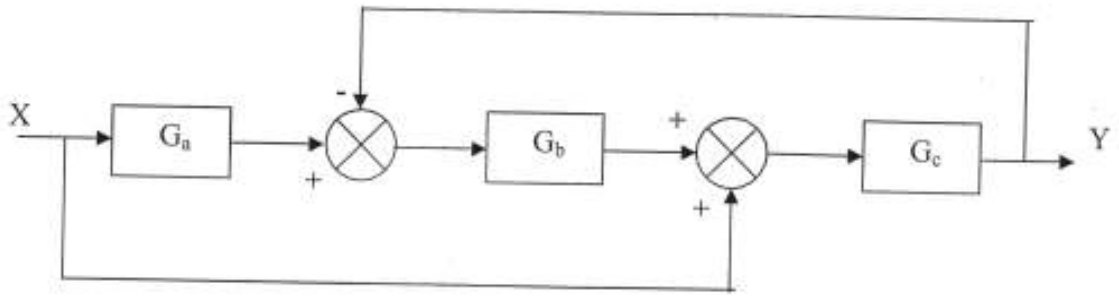
4. a) Derive the transfer function for a liquid level system having a linear resistance. How does the response of the above system change if it is having a constant flow output ? **8**

b) Determine y(5) if $Y(s) = \frac{5}{s^2 + 3s + 2}$. **5**

c) Explain the concept of transportation lag in process industries. Derive its transfer function. **5**

5. a) Describe with the help of a neat sketch the control actions of P, PD, PI and PID controllers. **6**

b) Determine the overall transfer function Y(s)/X(S) for the following control system. **5**



c) The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{K}{s(s+3)(s^2+s+1)}$$

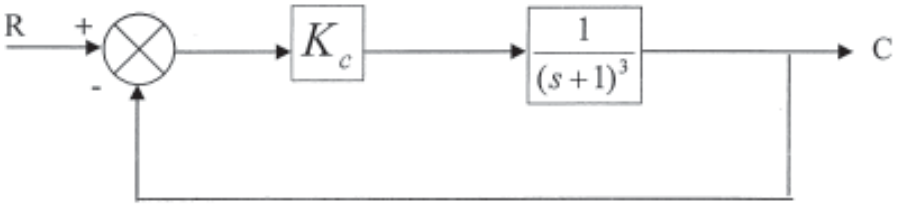
Determine the range of values of K for which the system would be stable. **5**

OR

6. a) Explain the working of the following controllers :
   i) PI controller
   ii) PID controller.

   Also derive their transfer functions. **8**

   b) For the control system given in the figure below, find the value of K_c for which the system is on the verge of instability. **8**



SECTION – II

7. a) Sketch the root locus plot for the following system : **9**

$$G(s) = \frac{(s+1)}{(s+1)(s+2)(s+3)}.$$

   b) Given the ultimate gain as 30 and ultimate period of oscillation as 1 min, tabulate the Z-N tuning parameters for different controllers. **9**

OR

8. a) What is a Bode plot ? Also explain the Bode stability criteria. **5**

   b) With respect to root locus analysis define the following terms : **5**
   i) Poles of a transfer function
   ii) Zeroes of a transfer function
   iii) Breakaway point
   iv) Asymptotes and centre of gravity

c) Sketch the Bode diagram for the system having transfer function : **8**

$$G(s) = \frac{1}{(4s+1)(2s+2)}.$$

9. Write short notes on **any four** : **16**

a) Cascade control system

b) Difference between feed back and feed forward control

c) Selective control systems

d) Ratio control and its applications

e) Over ride control and its applications.

10. Write short notes on (**any four**) : **16**

a) Dissolved oxygen measurement and control in fermenters

b) Temperature measurement and control in fermenter systems

c) Adaptive control

d) Neural networks in control systems

e) Redox measurement

f) Expert control system.

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T.E. Mechanical (Semester – II) Examination, 2011
TRIBOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **All** questions carry **equal** marks.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*7) Assume **suitable** data, if **necessary.***

SECTION – I

1. a) Explain following properties of lubricants in brief :
   i) Viscosity ii) Viscosity index
   iii) Pour point iv) Flash point and fire point. **8**

   b) What are additives ? **2**

   Explain their role in lubrication. **2**

   Explain in brief :
   i) VI improver ii) Pour-point depressant. **4**

OR

2. a) Compare sliding and rolling contact bearing on the basis of
   i) Load carrying capacity ii) Space requirement
   iii) Suitability to shock loads iv) Accessories required
   v) Frictional power loss vi) Quietness of operation
   vii) Maintenance cost viii) Overall cost. **8**

P.T.O.

b) An oil of density 800 kg / m^3 has a viscosity of 4 poise. Determine its viscosity in centistokes, SVS and centipoise. **4**

c) Explain with neat sketch 'Hydrodynamic Lubrication'. **4**

3. a) Explain following theories of friction
   i) Adhesion theory
   ii) Asperity interlocking theory
   iii) Stick-slip theory. **12**

b) Explain in brief the 'laws of friction'. **4**

OR

4. a) Explain in brief 'Solid Particle Erosion'. **4**

b) Explain the following :
   i) Two-body and Three-body abrasive wear
   ii) Corrosive wear
   iii) Surface fatigue wear. **12**

5. a) Starting with 2D Reynold's equation, show that for infinitely short journal bearing with usual notations, the pressure is given by

$$P = \frac{3\omega\mu \in \text{Sin}\phi}{C^2(1+\in \text{Cos}\phi)^3}\left[\frac{l^2}{4} - z^2\right]$$

Hence show that maximum pressure is obtained at ϕ_m such that

$$\text{Cos}\phi_m = \frac{1 \pm \sqrt{1+24\in^2}}{4\in}.$$ **10**

b) State the parameters of bearing design. Explain any two in detail. **8**

OR

6. a) With usual notations, derive an expression for oil-film thickness, $h = C(1+\in \text{Cos}\phi)$. **6**

b) Derive two dimensional Reynold's equation with usual notations. **12**

SECTION – II

7. a) Draw a neat sketch of hydrostatic thrust bearing showing all the accessories required. **3**

   What is restrictor or compensator ? **2**

   Differentiate between capillary restrictor and orifice restrictor. **3**

   b) What do you mean by 'optimum design of hydrostatic step bearing' ? For given fixed outside diameter of the shaft and neglecting frictional power loss, show that the condition for minimum power loss is

   $$ln\left(\frac{R_o}{R_i}\right)=\frac{1}{4}\left[\frac{R_o^{\,2}}{R_i^{\,2}}-1\right].$$ **6**

   c) Explain in brief 'Hydrostatic Lift'. **4**

OR

8. a) Derive an expression to find load-carrying capacity for a circular stop bearing from fundamental equation of viscous flow and hence determine load carrying capacity for following data :

   i) Shaft diameter = 500 mm

   ii) Recess diameter = 300 mm

   iii) Supply pressure = 6 MPa. **18**

9. Derive an expression for time required to squeeze the oil film when rectangular plate approaches a plane and hence find the same for following data.

   Dimensions of rectangular plate : 75 mm long $\times$ 225 mm wide

   Load supported = 1.5 KN

   Viscosity of lubricant = 90 cP

   Initial oil film thickness = 75 μm

   Final oil film thickness = 25 μm. **16**

OR

10. a) Explain lubrication requirements in case of :
    i) Rolling ii) Forging
    iii) Drawing iv) Extrusion. **10**

    b) Explain merits, demerits and applications and gas bearings. **6**

11. a) Write short notes on :
    i) Oil seals ii) Gaskets iii) Bearing Materials. **9**

    b) Compare elastohydrodynamic lubrication with hydrodynamic lubrication. **7**

OR

12. For fixed inclined slider bearing with usual notations derive an expression for :

    i) Pressure distribution P. **6**

    ii) Dimensionless pressure P*. **3**

    iii) Dimensionless peak pressure P_m^*. **3**

    iv) Maximum load carrying capacity W_{max}. **4**

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T.E. (Mechanical) (Semester – II) Examination, 2011
FLUID MACHINERY
(2003 Course)

Time : 3 Hours Total Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary.***

SECTION – I

Unit – I

1. a) Which are the different components of velocity of the fluid flowing through a hydrodynamic machine ? What is the role of each component ? **8**

   b) A jet of water having a velocity of 40 m/s enters a series of vanes having a velocity of 20 m/s. The jet makes an angle of 30° to the direction of vanes at inlet and leaves the vanes at an angle of 120°. The entry and exit of water is shockless on vanes. Find :
   i) Vane tip angles,
   ii) Work done/kg of water,
   iii) Efficiency. **8**

OR

2. a) Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semicircular in section and the velocity of the vane is half that at the jet. **8**

   b) A single moving vane having an inlet angle of zero degrees and an outlet angle of 30° receives water at a velocity of 60 m/s. The vanes is moving at a velocity of 25 m/s in the direction of jet. For a mass flow rate of water as 40 kg/s, Find :
   i) The resultant force on vane in magnitude and direction,
   ii) Power developed. **8**

P.T.O.

Unit – II

3. a) Explain construction and working of Pelton wheel with a neat sketch. **6**

   b) A Pelton turbine develops 1000 KW power under a gross head of 200 m from a reservoir. 30% of head is lost in friction in penstocks. Exit angle of buckets is 15°. The mechanical and generator efficiencies are 90% and 95% respectively. The coefficient of velocity of nozzle is 0.98 and jet ratio is 12. Desgining for maximum efficiency calculate :

   i) Power supplied,
   ii) Discharge in m^3/s,
   iii) Jet velocity,
   iv) Diameter of jet,
   v) Diameter of buckets
   vi) Speed of turbine,
   vii) Jet power.

   Assume friction factor for buckets as 0.85. **12**

OR

4. a) Define and explain the following terms as applied to impulse turbine :

   i) Hydraulic efficiency
   ii) Mechanical efficiency
   iii) Jet ratio
   iv) Speed ratio. **8**

   b) A single pelton wheel of runner diameter 2.4 m runs at 360 rpm under a net head of 500 m. The jet diameter is 20 cm and its deflection angle is 165°. The relative velocity at exit of bucket is reduced by 14% due to friction. With coefficient of velocity of nozzle as 0.98, determine :

   i) Jet velocity,
   ii) Bucket velocity,
   iii) Speed ratio
   iv) Water power,
   v) Resultant Force on buckets,
   vi) Power developed by wheel
   vii) Overall efficiency, assuming mechanical efficiency of 88%. **10**

Unit – III

5. a) An inward flow reaction turbine develops 1200 kW power having the vane velocity at inlet as 30 m/s and the corresponding whirl velocity of 24 m/s. The ratio of outer to internal diameter is 2. The velocity of flow remains at 6 m/s through out and discharge at exit is radial. The head available on wheel is 75 m, calculate :
   i) Vane angles,
   ii) Power developed by wheel per N/s of water,
   iii) Discharge in m^3/s,
   iv) Hydraulic efficiency. **8**

   b) What is Cavitation ? Describe the methods to avoid cavitation in water turbines. **8**

OR

6. a) What is draft tube ? Why it is used in a reaction turbine ? Describe with sketch two different types of draft tubes. **8**

   b) Determine the efficiency of a Kaplan turbine developing 3000 kW under a net head of 5 m. It is provided with a draft tube with its inlet diameter of 3 m set 1.6 m above the tail race level. A vacuum gauge connected to the draft tube indicates a reading of 5 m of water. Draft tube efficiency is 78%. **8**

SECTION – II

Unit – IV

7. a) Explain the governing of Francis turbine with neat sketch. **8**

   b) A Kaplan turbine works under a head of 10 m. The design speed is 50 rpm and turbine develops 40 MW while discharging at the rate of 550 m^3/s. Determine its unit speed, unit power, unit discharge and its specific speed. **8**

OR

8. a) Why the model testing is necessary ? What are the similarity considerations of a model and prototype machines ? **8**

   b) A model of a turbine develops 13 kW at a speed of 450 rpm under a head of 12 m. The scale ratio for the model is 10. Determine for actual turbine speed and power developed if the overall efficiency of model and actual turbine are equal. State the turbine for which the model was tested. **8**

Unit – V

9. a) Explain the performance characteristics of the centrifugal pump. **8**

   b) A centrifugal pump discharges 0.15 m^3/s of water against a head of 12.5 m, the speed of pump being 600 rpm. The outer and inner diameters of impeller are 500 mm and 250 mm respectively. The vanes are bent back at 35° to the tangent at exit. If the area of flow remains 0.07 m^2 from inlet to outlet, Determine :

   i) Manometric efficiency of pump,

   ii) Vane angle at inlet,

   iii) Loss of head at inlet to impeller when the discharge is reduced by 40% without changing the speed. **10**

OR

10. a) A centrifugal pump running at 1000 rpm gave the following relations between head and discharge :

Discharge, m^3/min	0.0	4.5	9.0	13.5	18.0	22.5
Head, m	22.5	22.2	21.6	19.5	14.1	0.0

The pump is delivering water against a static head of 15 m. The total required system head (static + friction + velocity head) is given by $H_m = 15 + 19.98 \times 10^{-3} Q^2$ where Q is in m^3/min. Determine the discharge in m^3/min and power required to drive the pump if its overall efficiency is 75%. **10**

   b) What is priming ? What are the different methods of priming ? **8**

Unit – VI

11. a) The water is supplied at the rate of 0.025 m^3/s from a height of 3 m to a hydraulic ram, raises 0.003 m^3/s of water to a height of 8 m from the ram. Calculate both efficiencies of the hydraulic ram. **8**

   b) Explain the torque converter and its characteristic curves. **8**

OR

12. a) Explain construction, working and performance characteristics of a regenerative pump. **8**

   b) Explain working of a fluid coupling with the help of neat sketch. **8**

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T.E. (Mechanical) (Sem. – II) Examination, 2011
REFRIGERATION AND AIR-CONDITIONING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I
UNIT – I

1. a) Differentiate between open and closed air-refrigeration systems. **4**

   b) A businessman after feasibility study found the ice consumption in a locality to be 300 kg/hr. He wants to manufacture ice at – 10°C from water available at 30°C. What should be the capacity of machine in TR if it should be 10% over capacity.

   Take C_{pw} = 4.18 KJ/kg. C_p of ice = 2.1 kJ/kg and latent heat of fusion of ice is 335 KJ/kg. **4**

   c) Explain with a neat sketch the reduced ambient air-refrigeration System. **8**

OR

2. a) Explain with neat sketch thermoelectric refrigeration. **6**

   b) Explain the term "Dry air rated temperature" (DART). **4**

   c) An air refrigeration system having pressure ratio of 5 takes air at 0°C. It is compressed and then cooled to 19°C at constant pressure. If the efficiency of the compressor is 95% and that of expander is 75%

   Determine :

   1) The refrigerating capacity of the system, if the flow of air is 75 kg/min.
   2) The power required of the compressor.
   3) COP of the system.

   Assume compression and expansion processes to be isentropic.

   Take γ = 1.4, C_p = 1.005 KJ/kg. **6**

P.T.O.

UNIT – II

3. a) What is sub-cooling and superheating ? Discuss the effect of vapour superheating and liquid sub-cooling on performance of vapour compression refrigeration system. **8**

   b) Compare the COP of an ammonia refrigeration cycle operates between – 20°C and 30°C. in following two cases.

   1) Wet compression, in which vapour leaving the compressor is dry saturated.

   2) Dry Compression, in which vapour entering the compressor is dry saturated.

   Assume compression to be isentropic and no subcooling of liquid refrigerant. Take C_{pl} = 4.6 kJ/kgk, C_{pv} = 2.8 kJ/kgk. Use following properties for refrigerant. **8**

Ts (°C)	**Specific Enthalpy (KJ/kg)**			**Specific Entropy (kJ/kg)**	
	h_f	h_{fg}	h_g	S_f	S_g
–20	89.8	1330.2	1420.0	0.3684	5.6244
30	323.1	1145.8	1468.9	1.2037	4.9842

OR

4. a) Write short notes on :

   1) Desirable properties of ideal refrigerant for vapour compression cycle.

   2) Ozone depletion and Global warming issues. **10**

   b) Explain briefly Montreal Protocol and Kyoto protocol. **6**

UNIT – III

5. a) Enumerate the limitations and drawbacks of a single stage vapour compression plant required to operate between high condenser temperature and low evaporator temperature. **6**

   b) Sketch the actual vapour compression cycle on P-V and T-S diagram. How does it deviates from the theoretical vapour compression cycle ? **9**

   c) Which components of the simple vapour-absorption system replaces the compressor of a vapour compression system ? **3**

OR

6. a) Describe briefly, with neat schematic the operation of a Lithium-bromide water absorption system. **8**

   b) Derive an expression for the COP of an ideal vapour absorption system and show that

   $(COP)_{max} = (COP)_{carnot} \times (\eta)carnot$. **6**

   c) What is the purpose of Heat exchanger employed in Practical vapour absorption system between.

   1) Generator and Absorber. 2) Condenser and evaporator. **4**

SECTION – II

UNIT – IV

7. a) What is a sling psychrometer ? Make a neat sketch and explain its use. **4**

   b) Describe various methods of humidification and dehumidification of air. **4**

   c) For a sample of air having 22°C DBT, relative humidity 30% at barometric pressure of 760 mm of Hg, calculate :

   i) vapor pressure, ii) humidity ratio

   iii) vapour density and iv) enthalpy. **8**

OR

8. a) Sketch 'comfort chart' and show on it the 'comfort zone' ? **4**

   b) State factors governing optimum effective temperature. **4**

   c) 1 kg of air at 40°C DBT and 50% RH is mixed with 2 kg of air at 20°C DBT and 20°C DPT. Calculate temperature and specific humidity of the mixture. **8**

UNIT – V

9. a) Explain the concept of RSHF, GSHF, ERSHF with the help of psychrometric chart. **8**

   b) Explain All-water air conditioning systems with schematic diagram. **8**

OR

10. a) Enumerate main types of compressors used in refrigeration system. Explain working of centrifugal compressor. **8**

    b) Explain installation and charging procedure of small capacity refrigeration system. **8**

UNIT – VI

11. a) Discuss classification of ducts. **8**

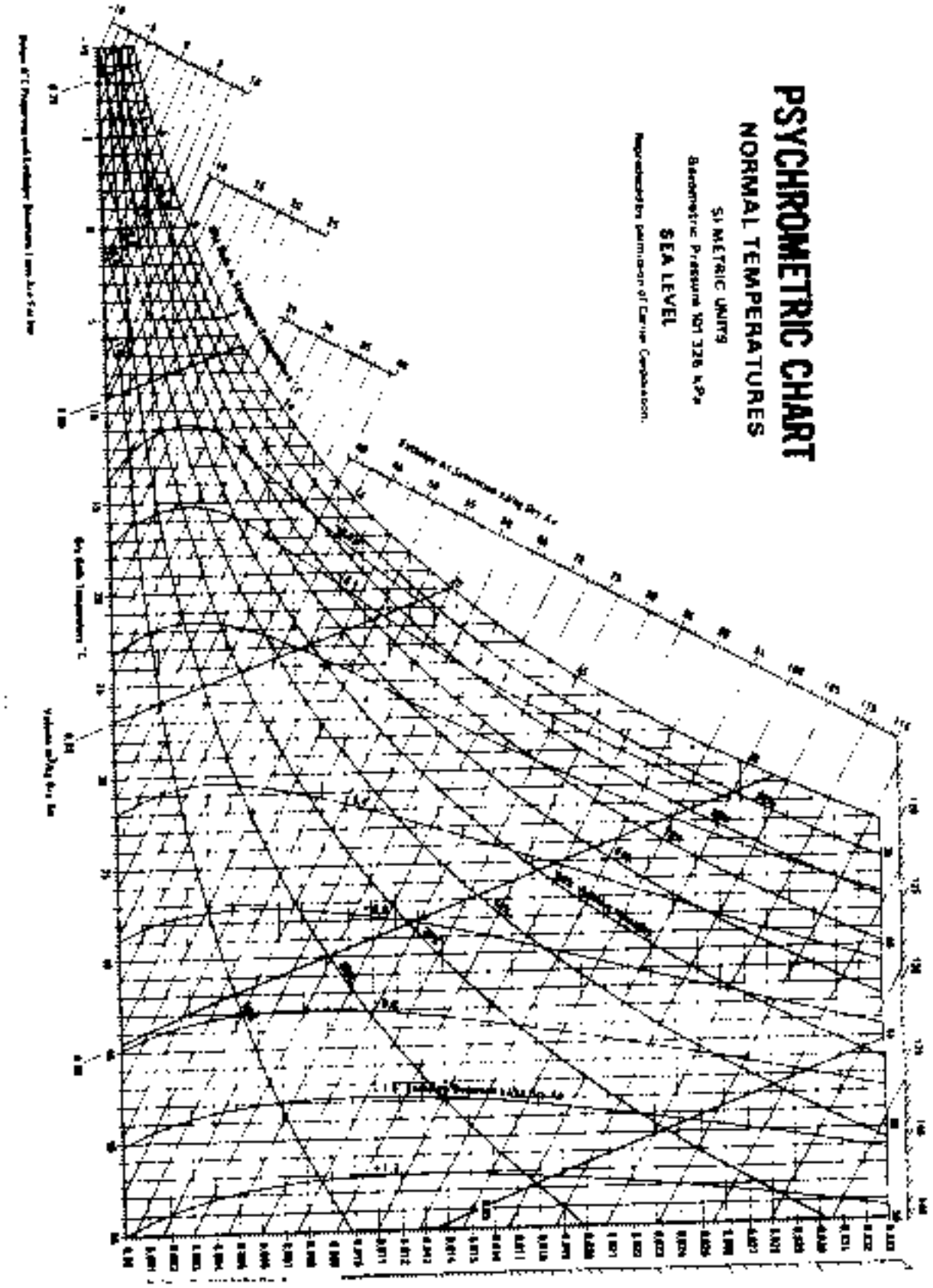
    b) Explain distribution patterns of outlets. **10**

OR

12. a) State design considerations of cold storage. **6**

    b) Explain freezing methods of food preservation. **6**

    c) Explain the causes of food spoilage. **6**


PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
SEA LEVEL

T.E. Civil (Semester – I) Examination, 2011
FLUID MECHANICS – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if** necessary.*

SECTION – I

1. a) Define the following terms :
   i) Drag coefficient
   ii) Lift coefficient. **2**

   b) What are the types of unsteady flow ? Give one example of each. **6**

   c) Explain the purpose of a surge tank. What are the different types of surge tank ? **6**

   d) Discuss in brief effect of free surface on drag. **4**

OR

2. a) Write a short note on : **6**
   i) Polar diagram
   ii) Magnus Effect.

   b) Distinguish between : **4**
   i) Circulation and lift
   ii) Bluff bodies and stream lined bodies.

c) Experiments were conducted in a wind tunnel at 60 Kmph on a flat plate of size (2×1.5)m. The specific weight of air is 11.28 N/m^3. The plate is kept at such an angle that coefficients of lift and drag are 0.75 and 0.15 respectively. Determine.

i) Lift Force

ii) Drag Force

iii) Resultant Force

iv) Power exerted by air stream on plate. **(2+2+2+2=8)**

3. a) Derive an expression for work done and efficiency on a series of radial vane fixed on periphery of a wheel, with jet striking tangentially at one tip. Draw required velocity triangle. **8**

b) A jet of water 20 mm diameter working under a constant head of 7 m strikes a flat plate hinged at top. If the axis of jet is normal and 5 cm below the upper edge of plate, find the horizontal force to be applied at the bottom of plate to keep it in verticle position. The Jet is 10 cm × 8 cm and weighs 60 N. If the horizontal force is removed, what will be the deflection of plate ? Take $C_V = 0.96$. **6**

c) What is the force exerted by jet on :

1) Stationary flate vane

2) Moving curved vane and jet striking at one tip ? **2**

OR

4. a) Why is model testing of turbine necessary ? With respect to model testing list out the non dimensional numbers used for analysis. **6**

b) A model of a turbine is built to a scale of 1:6, develops 5 kN at a speed of 250 rpm under a head of 1.5 m. Determine speed and power developed by actual turbine when running under a head of 10 m. Efficiency is same for both model and prototype. **6**

c) List out any 4 classification of turbine with example. **4**

5. a) What are the different types of efficiencies of an Pelton turbine ? Give necessary equation. **4**

   b) An outward flow reaction turbine has an internal diameter of 0.75 m and external diameter of 1.50 m. The velocity of flow is constant and equal to 6m/s. If the guide blade angle is 25° at inlet and turbine runs at a speed of 350 rpm, under a head of 50 m, calculate the :

      i) Vane angle at inlet and outlet

      ii) Workdone/unit weight of water

      iii) Hydraulic efficiency.

   Assume radial discharge at outlet. **8**

   c) Explain the necessity of draft tube. What are the different types of draft tube ? **4**

OR

6. a) Explain any 2 characteristic curves of centrifugal pump. **4**

   b) An centrifugal pump has the following characteristics.

      i) Internal and external diameter = 30 cm and 40 cm respectively

      ii) Inlet and outlet vane angle = 15° and 25° respectively

      iii) Speed of pump = 150 rpm,

      iv) Head under it works = 48 m.

   Assuming constant velocity and radial entry, determine work done/unit weight and monometric efficiency. **8**

   c) On starting a centrifugal pump, if no water is delivered what is the probable reason ? What corrective measure needs to be taken ? **4**

SECTION – II

4. a) Derive the Chezy's Equation for flow in open channel. **6**

   b) What is an open channel ? Compare open channel flow with pipe flow. Also state different types of channels. **6**

   c) Explain briefly : **6**

      i) Velocity distribution in open channel flow

      ii) Factors affecting Manning's roughness coefficient.

OR

8. a) Derive the condition for most economic trapezoidal section. **8**

   b) Explain in brief :

      i) Specific energy diagram and flow classification on specific energy diagram. **8**

      ii) Conveyance, section factor, hydraulic radius.

   c) Sketch depth. discharge diagram. **2**

9. a) A wide rectangular channel carries a flow of 8 $m^3/s/m$ width of the channel with a bed slope of 1 in 2400 and Manning's n = 0.02. If the depth at a section is 4 m, determine how for upstream or downstream of the section, the depth of flow would be within 5% of the normal depth. Use step by step method, with two steps. **10**

   b) Write a short note on Graphical Integration method. **6**

OR

10. a) Derive the equation of Gradually varied flow profile. **8**

    b) Explain Ven te Chow method of computation of GVF. **8**

11. a) In a hydraulic jump near the toe of a spillway, the pre jump depth is 0.27 m and velocity is 15 m/s determine : **8**

       i) The post jump depth

       ii) Energy lost in the jump

       iii) Length of the hydraulic jump.

    b) i) Write any four practical applicaiton of hydraulic jump.

       ii) Differentiate between venturiflume and standing wave plume. **8**

OR

12. a) Derive the relation between initial and sequent depth in a hydraulic jump. **6**

    b) Classify various types of hydraulic jump based on Froude Number of flow. **4**

    c) Explain any one method of discharge measurement. **6**

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T.E. (Civil) (Semester – I) Examination, 2011
STRUCTURAL ANALYSIS – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any 3*** *questions from* ***each*** *Section.*

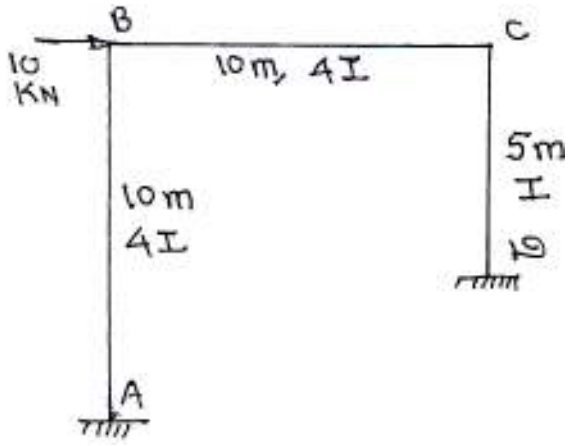
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) Black figures to the ***right*** *indicate* ***full*** *marks.*

4) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*

SECTION – I

1. Using slope deflection method analyse and draw BMD for the portal frame shown in Fig. 1 in which support D sinks by 50/EI, moves horizontally to right by 77/EI and rotates anticlockwise through 6.5/EI. **16**

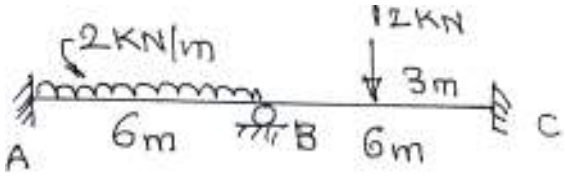


Q. No. 1, fig. 1

OR

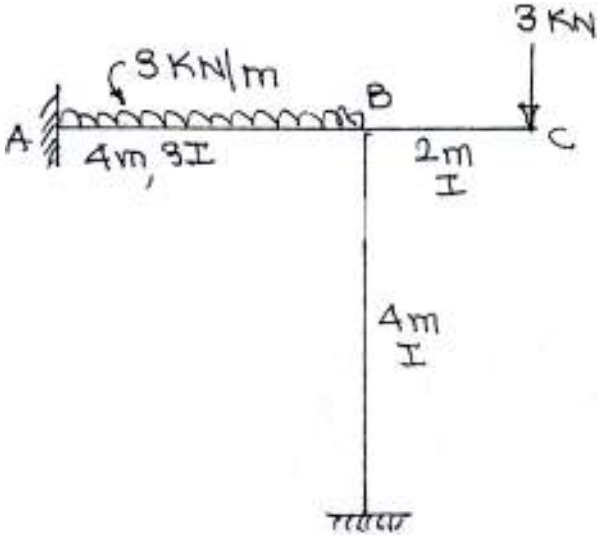
P.T.O.

2. a) Analyze the beam by slope deflection method. Draw BMD and SFD. Refer Fig. 2a. **8**



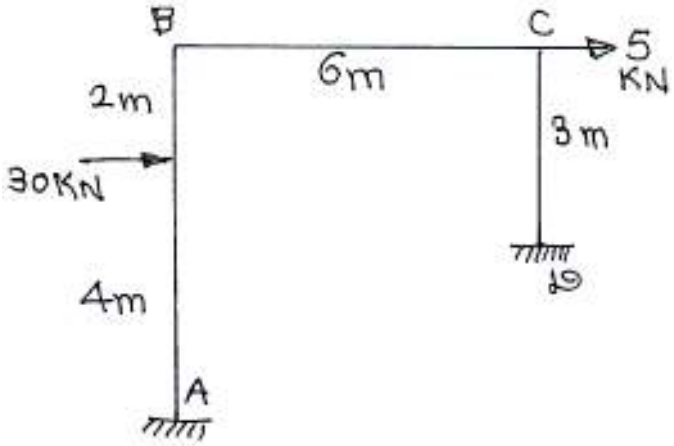
Q. No. 2(a) Fig. 2a

b) Analyze the frame by slope deflection method. Draw BMD. Refer Fig. 2b. **8**



Q. No. 2(b) Fig. 2b

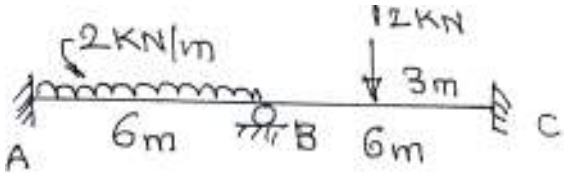
3. Analyze frame in Fig. 3 by MDM. Draw BMD. **18**



Q. No. 3 Fig. 3

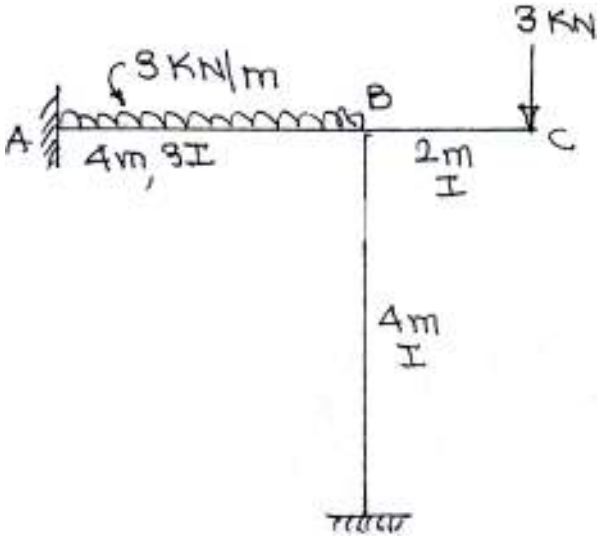
OR

4. a) Analyze the beam shown in Fig. 2a by MDM. Draw BMD and SFD. **8**



Q. No. 4(a) Fig. 2a

b) Analyze the frame shown in Fig. 2b by MDM. Draw BMD. **10**



Q. No. 4(b) Fig. 2b

5. The equation of a three hinged arch with origin at left support is $y = x - \frac{x^2}{40}$. The span of the arch is 40 m, spingings at the same level and third hinge is at 20 m from left hand support. The arch carries a load of 3 KN/m over left half. Calculate central rise of arch. Also calculate normal thrust and radial shear at 5 m from left support. Draw BMD. **16**

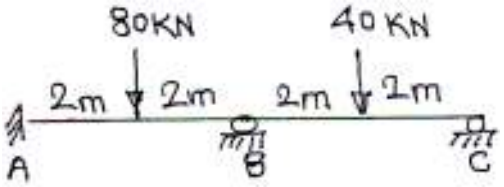
OR

6. Show that the horizontal thrust developed in a two hinged parabolic arch of span 'L' and rise 'h' subjected to load 'W' at a distance 'a' from a springing is given by **16**

$$H = \frac{5}{8}\frac{W}{hL^3} \cdot a(L-a)\,(L^2 + aL - a^2)$$

SECTION – II

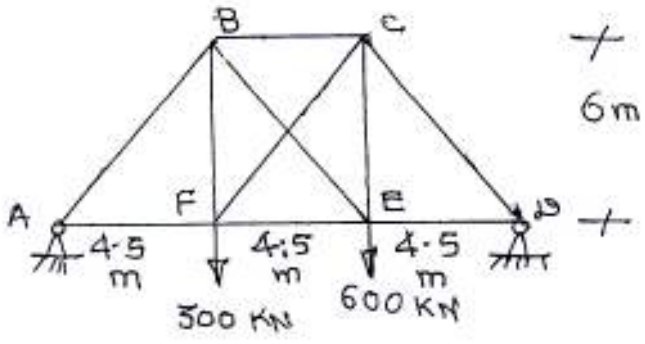
7. Treating vertical reactions at B ↑ and C ↑ as redundants, analyze beam shown in Fig. 4 for vertical settlement of supports B and C as 10 mm and 5 mm resp. Take EI = 18×10^{11} N/mm^2. Use flexibility matrix method. **18**



Q. No. 7 Fig. 4

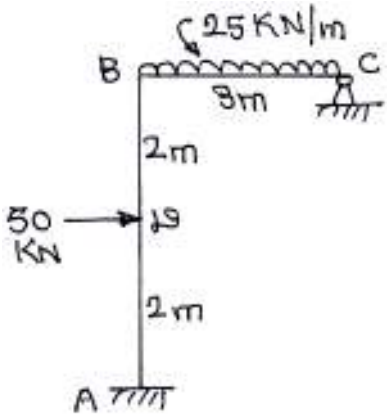
OR

8. Using flexibility matrix method, calculate force P_1 in member FC and horizontal reaction P_2 at D of a truss shown in Figure 5. Member AB, BC and CD have c/s area of 6000 mm^2 and others 3000 mm^2 each. Assume P_1 tensile and P_2 towards right. **18**



Q. No. 8 Fig. 5

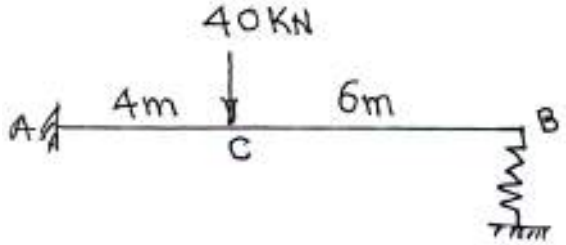
9. Analyze the frame shown in Fig. 6 by stiffness matrix method. Draw BMD. **16**



Q. No. 9 Fig. 6

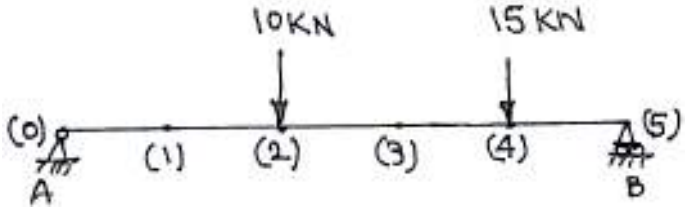
OR

10. Analyze the beam by stiffness matrix method. The stiffness of spring is 0.01 EI. Refer Fig. 7. **16**



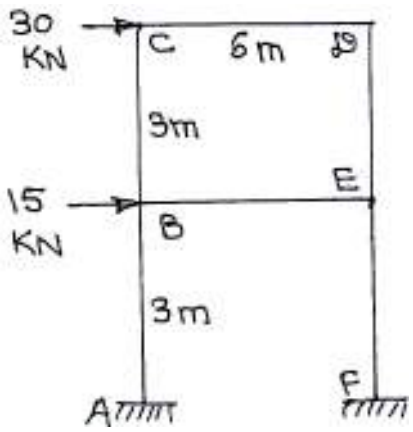
Q. No. 10 Fig. 7

11. a) A simple beam 10 m long is divided into five equal panels of 2 m each. Calculate deflections at each nodal point using central difference way. Refer figure 8. **10**



Q. No. 11(a) Fig. 8

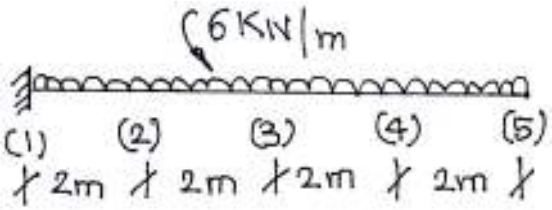
b) Analyze frame by Portal method. Write the summary of beam moments and column moments. Refer Fig. 9. **6**



Q. No. 11(b) Fig. 9

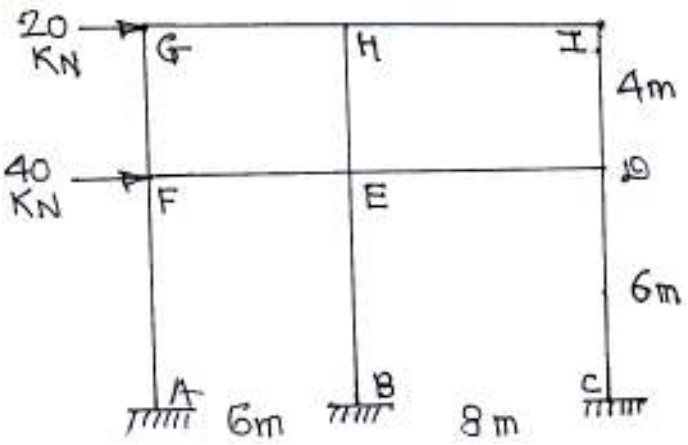
OR

12. a) Using finite difference method find nodal displacements for cantilever as shown in fig. 10 **8**



Q. No. 12(a) Fig. 10

b) Using cantilever method of approximate method find axial force in each column. Assume c/s area same for all columns. Refer fig. 11. **8**



Q. No. 12(b) Fig. 11

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T.E. (Civil) (Semester – I) Examination, 2011
INFRASTRUCTURE ENGINEERING AND CONSTRUCTION TECHNIQUES
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Compare railway transportation with Road transportation and mention characteristics of railway transportation. **6**

   b) Define gauge of a railway track. State different gauges used in India. Why the uniformity of gauges is desirable in any country ? **6**

   c) Describe the functions and requirements of rail in a railway track. **4**

OR

2. a) Explain the necessity of sleepers in railway track. What are the requirements of good sleepers ? **6**

   b) Draw a Typical cross section of a B.G. Track in Embankment. **4**

   c) Define Ballast. State the functions and requirements of good ballast. **6**

P.T.O.

3. a) What is superelevation ? Why it is necessary to provide this on curves of a railway track ? **6**

   b) Explain the following terms and state the circumstances under which they occur ? **4**

      i) Negative superelevation

      ii) Grade compensation

   c) Draw a neat sketch of simple right hand turn out and name the various component parts. **6**

OR

4. a) What is the necessity of Track maintenance ? Also state the advantages of proper track maintenance. **6**

   b) Write a short note on Elevated Railway and Mono Rail. **6**

   c) Define the following terms : **4**

      i) Equilibrium cant

      ii) Cant Defeciency

      iii) Cant excess

      iv) D.T.M.

5. a) State the circumstances under which Tunnelling operation is desirable. **6**

   b) State the various methods of Tunnelling in soft ground. Explain Needle beam method in brief. **6**

   c) Distinguish between the following : **6**

      i) Main Tunnel and Pilot Tunnel

      ii) Mucking and Hauling

      iii) Heading and Bench

OR

6. a) What is the object of Tunnel ventilation ? What are the requirements of ventilating system ? **6**

   b) What are Dolphins ? Describe their types. **6**

   c) Define a port and bring out the difference between a port and harbour. **6**

SECTION – II

7. a) Highlight the importance of construction sector in India, economic development with help of example and statistical figures. **6**

   b) Explain in brief the following : **8**

      i) Concrete pumps and advantages of pumping concrete

      ii) Role of MHADA.

   c) Draw a neat labelled sketch of a Derrick Crane. **3**

OR

8. a) Explain the classification of cranes and describe any one of them. **6**

   b) i) Explain Siporex Technology. **3**

      ii) Explain in brief Holopan System. **3**

   c) "Planning a construction of any high rise structure is very challenging job". Justify by the statement by giving suitable example. **5**

9. a) Explain in brief Dumpers. **4**

   b) Write a short note on following : **8**

      i) Factors affecting output of shovel

      ii) Factors affecting selection of equipment for project.

   c) Explain Sum of the Year's Depreciation Method. **4**

OR

10. a) Differentiate between Rope operated shovel and Hydraulically operated shovel. **6**

    b) Explain in brief Tunnel Boring Machine with neat sketch. **4**

    c) i) Explain salient features of Dragline. **3**

       ii) Record keeping of equipment. **3**

11. a) Explain in brief the Dredging systems and what do you mean by water jet booster system ? **6**

    b) Explain any one dewatering system. **5**

    c) Write short note on : **6**

    i) Jaw crusher

    ii) Dry mix process is shotcreting.

OR

12. a) Explain Role of Epoxy Resin in Industrial Flooring. **6**

    b) Explain in brief vertical slip form and its advantages. **5**

    c) Draw a systematic layout of RMC plant. Also state the advantages of RMC plant. **6**

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T.E. Civil (Semester – II) Examination, 2011
PROJECT MANAGEMENT AND ENGINEERING ECONOMICS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answer to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Write a note on Gantt Chart and its limitations. **5**

   b) Explain with sketch Matrix Organisation structure. **5**

   c) Write in brief about the concept of Delegation of Authority. **4**

   d) Define :

   to, tm, tp, te, Slack. **4**

OR

2. A school building project consists of 12 activities. The duration of the activities and their relationship is as under - **18**

Activity	Predecessor	Duration (Days)
A	---	7
B	---	5
C	A	10
D	A	5
E	B	8
F	B	6
G	C	5
H	C	4
I	D&E	10
J	F	5
K	G	8
L	H	9

Draw a CPM network and calculate project duration and highlight the critical path

Calculate EST, EFT, LST, LFT, TF, FF, INDF, INTF for all the activities.

3. Following table shows the cost duration data for a construction project. Carry out step by step crashing.

Indirect cost may be taken as Rs. 300/day

Activity	Normal duration (days)	Normal Cost (Rs.)	Crash duration (days)	Crash cost (Rs.)
1–2	6	700	3	1450
1–3	8	400	5	850
2–3	4	600	1	900
2–4	5	800	3	1500
3–4	5	500	3	1100
4–5	2	500	1	400

Draw a network and highlight the critical path. **4**

Calculate normal project duration and cost of the project. **2**

Calculate optimum project duration and optimum cost of the project. **10**

Also give all crash solution.

OR

4. The requirement of manpower for ABC construction company is as under -

Activity	Duration (Days)	Men required per day
1–2	7	10
2–3	7	5
2–4	8	10
2–5	7	6
3–5	12	4
4–5	8	10
5–6	9	4

Draw a network and calculate project duration. Show critical path by heavy ruling line. **6**

Draw EST squared network, prepare histogram and calculate EFR and IFR. **5**

Draw LST squared network, prepare histogram and calculate EFR and IFR. **5**

5. a) Write detailed note on Break Even Point analysis. **6**

b) Explain the following concepts-Inventory, Lead time, Buffer stock, Stock out, Ordering Cost, Inventory Carrying Cost. **6**

c) A construction company requires 1500 door frames per year. Cost of each door frame is Rs. 1800 per frame. Ordering Cost is Rs. 2000 per order and holding cost is 18%. Calculate EOQ. **4**

OR

6. a) Perform ABC Analysis for the following data - **12**

Sr. No.	**Item**	**Annual Expenditure (Rs.)**
1.	Cement	4,90,000
2.	Tiles	90,000
3.	Bricks	95,000
4.	Sand	2,60,000
5.	Steel	1,20,000
6.	Oil	2,000
7.	Timber	30,000
8.	Nails	3,000
9.	Dry distemper	15,000

Categorise the above items and plot ABC curve.

b) Enlist any 4 functions of materials management and explain inventory control. **4**

SECTION – II

7. a) Give the details of layout for the site you have visited. Mention the stage of work, approximate dimensions of the site, flow of vehicles, flow of materials, labour camp etc on it. Write the salient features of the site. Also mention your observations. **8**

b) Define Injury Frequency Rate and Injury Severity rate. **4**

c) As a project manager on site, mention the safety precautions you will take for the labours working at height. **6**

OR

8. a) For the site you have visited, write a report on the safety policy adopted on site. Mention the safety gadgets used. **6**

   b) What are the common accidents that may take place at the time of excavation ? Write the measures to be taken on site to avoid them. **6**

   c) What is the importance of site layout ? What are the important points to be followed while planning the site layout ? **6**

9. a) Define Economics. State its importance from Civil Engineering point of view. **8**

   b) Explain the term Utility. With the help of example, state the law of Diminishing Marginal Utility. **8**

OR

10. a) State the Demand and Supply curve with the help of an example. **8**

    b) What are the types of demands ? Explain them in short. **8**

11. a) Define Project. What are the requirements of a project for its successful completion ? **8**

    b) Find IRR for the project with following details **8**

       i) Duration of project - 5 years

       ii) Initial investment - Rs. 10,000/-

       iii) Periodic return - Rs. 5,000 per year.

OR

12. a) What is Cash Flow Diagram ? Explain various terms used in it with the help of neat diagram. Draw cash flow diagrams for recurring deposit scheme and housing loan. **8**

    b) Write short notes on **any two** of following : **8**

       i) Time value of money

       ii) Annuity

       iii) Net present value.

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[3963] – 21

T.E. (Mechanical Sandwich) (Sem. – I) Examination, 2011
Elective – I (1) :WELDING TECHNOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Attempt **one** question of **each** Unit from Section – **I** and Section – **II**.*

*2) Answer to the questions should be written in **separate** books.*

*3) **Draw neat** diagram **wherever** necessary.*

*4) Assume **suitable** data, if **required**.*

SECTION – I

UNIT – I

1. a) Explain different methods for minimising residual stresses induced in welded parts. **8**

   b) What is meant by Arc ? Explain the characteristics of arc and also explain how arc is generated in arc welding. **8**

OR

2. a) Explain different welded joints with sketch and application. **8**

   b) Explain pre process and post process operation to be carried out while welding. **8**

P.T.O.

UNIT – II

3. a) What are the effects of DCSP, DCRP and AC on deposited welding bead ? **9**

   b) Discuss the concept of the transferred and non transferred arc processes in plasma arc welding. **9**

OR

4. a) Explain with neat sketch submerged metal arc welding (SMWA) process along with advantages, limitations and applications. **9**

   b) Explain with neat sketch TIG welding process with self adjusted arc and self controlled arc. **9**

UNIT – III

5. a) Compare soldering and brazing process. Also describe different types of soldering joints with neat sketches. **8**

   b) What is oxy fuel cutting ? How it affects properties of welded metal ? **8**

OR

6. a) Explain in short any two brazing processes on the basis of method of heating. **8**

   b) Suggest a suitable process and explain it for welding of Aluminium and its alloy. **8**

SECTION – II

UNIT – IV

7. a) Explain with suitable sketches a thermit welding process along with advantages, limitations and applications. **8**

   b) Compare gas welding and gas cutting with suitable sketches. **8**

OR

8. a) Explain the principle of resistance spot welding with heat balance and heat shrinkage in spot welding. **8**

   b) Compare percussion welding and Butt welding with suitable sketches. **8**

UNIT – V

9. a) With neat sketch explain laser beam welding and comment on metallurgical aspect of laser beam welding. **9**

   b) Explain with neat sketch the ultra sonic welding along with their advantages, limitation, application. **9**

OR

10. a) What is meant by explosive welding ? Explain the types of explosive welding. **9**

    b) Explain in short two techniques for lap and butt-welding. **9**

UNIT – VI

11. a) Explain four defects in welding along with their remedies. **8**

    b) Write note on :

       i) liquid penetrate testing,

       ii) weldability. **8**

OR

12. a) Explain different components in calculating weld cost. **6**

    b) Explain any two destructive testing for testing of a welded part. **10**

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[3963] – 210

T.E. (Civil) (Semester – II) Examination, 2011
FOUNDATION ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** from Section-**I** and Q.**7** or Q.**8**, Q.**9** or Q. **10**, Q.**11** or Q.**12** from Section-**II**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Your answer will be **valued** as a whole.*
*6) **Use** of pocket calculator is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) What is sub-surface exploration ? What is purpose of soil exploration programme ? **6**

   b) Explain standard penetration test. What are the various connections ? What is importance of test in foundation engineering ? **6**

   c) Enlist the factors affecting the sample disturbance. Determine area ratio of shelby tube sampler having inside and outside diameter 111 mm and 114 mm respectively. **5**

2. a) Enlist different types of Geophysical methods. Explain seismic method in accordance with
      1) Principle
      2) Procedure with sketch
      3) Limitations. **6**

   b) Describe features of good sub-soil investigation report. **6**

   c) What is R.Q.D. ? How quality of rock can be decided on R.Q.D. ? During field exploration coring of rock was required. The core barrel was advanced 1.5 m during coring. The length of the core recovered was 0.98 m. What was recovery ratio ? **5**

P.T.O.

3. a) Explain with neat sketches different bearing capacity failures in soil. **6**

   b) Write short notes on :

      1) Hansen's bearing capacity theory

      2) Skepton's analysis for cohesive soil. **6**

   c) A strip footing 1.2 m wide is located at a depth of 1.5 m in non cohesive soil deposit for which the corrected N value of SPT is 20. Water table is located at a depth of 2 m. below the ground surface. Find allowable bearing pressure for the soil. **5**

4. a) Explain effect of water table on bearing capacity of soil. **6**

   b) With neat sketch explain plate load test. What are the different limitations of test ? **6**

   c) A square foundation 1.5 m × 1.5 m in plan. The soil supporting the foundation has a friction angle ϕ = 20° and C = 152.2 Kn/m^2. The unit weight of soil, γ = 17.8 kN/m^3. Determine the allowable gross load on the foundation with F.O.S. 4. assume that the depth of foundation is 1 m and general shear failure occurs in soil. Take N_e = 17.69, N_q = 7.44, $N\gamma$ = 3.64. **5**

5. a) Explain logarithm of time method for determination of coefficient of consolidation. **6**

   b) What are the different types of foundation settlement ? Explain in detail. **6**

   c) A rectangular footing 3 m ×2 m exerts a pressure of 100 kN/m^2 on a cohesive soil having $E_S = 5 \times 10^4$ Kn/m^2 and μ = 0.50. Determine elastic settlement at the center.

      Assuming

      1) Footing is flexible

      2) Footing is rigid. **4**

6. a) Explain laboratory consolidation test with
   1) Neat sketch with procedure
   2) Different consolidation parameters obtain during test. **6**

   b) Define preconsolidation pressure. How it is determined ? **6**

   c) A clay stratum 5 m thick has the initial void ratio of 1.50 and effective overburden pressure of 120 Kn/m^2. When the sample is subjected to increase of pressure of 120 Kn/m^2 the void ratio reduces to 1.44. Determine the coefficient of volume compressibility and final settlement of stratum. **4**

SECTION – II

7. a) Enlist the methods of determining pile capacity. Explain any two methods in short. **6**

   b) Write a short note on negative skin friction. **6**

   c) A group of 9 piles with 3 piles in a row was driven in to soft clay. The diameter and length of pile were 30 cm and 10 m respectively the unconfined compressive strength of clay is 70 kN/m^2. If piles were spaced 90 cm center to center, compute allowable load on pile group take F.O.S. = 2.5 and M = 0.6. **5**

8. a) Sketch and describe the various components of well foundation, indicating functions of each component. **6**

   b) What is Caisson ? How Caissons are classified based on methods of construction ? **6**

   c) What is pier ? Explain methods of installation of pier. **5**

9. a) What is sheet pile wall ? Differentiate between cantilever sheet pile wall and anchored sheet pile wall. **6**

   b) Discuss the earth pressure distribution for cantilever sheet pile wall. **6**

   c) What is Diaphragm wall ? Explain with neat sketch construction of Diaphragm wall. **5**

10. a) Write a short note on problems of expansive soil. **6**

    b) Explain vibro-floatation and stone column techniques of soil improvement. **6**

    c) With neat sketch explain how swelling pressure of soil is determined. **5**

11. a) With neat sketch explain reinforced earth embankment. **6**

    b) Explain with neat sketches various functions of Geotextiles. **6**

    c) Write a short note on classification of Geosynthetics. **4**

12. a) Write a short note on :

        1) Ground shaking

        2) Surface rupture. **6**

    b) What is liquefaction ? Explain effects of liquefaction. **6**

    c) Explain intensity and magnitude of earthquake. **4**

[3963] – 212

T.E. (Mechanical) (Semester – I) Examination, 2011
HEAT TRANSFER
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if** necessary.*

SECTION – I

Unit – I

1. a) Identify the mode(s) of heat transfer in the following :
   i) Heat transfer from a room heater
   ii) Hot plate exposed to atmosphere
   iii) Heat loss from thermos flask
   iv) Coding of Activa scooter engine
   v) Heat loss from automobile radiator
   vi) Heat transfer of sun energy to your classroom. **6**

   b) A steel pipe (K = 50 W/mk) of ID 100 mm and OD 110 mm is to be covered with two layers of insulations, each having a thickness of 50 mm. The thermal conductivity of first insulation is 0.06 W/m°C and that of the second is 0.12 W/mK. Calculate the loss of heat per meter length of pipe and the interface temperature between the two layers of insulations, when the temperature of the inside tube surface is 250°C and that of the outside surface of the insulation is 50°C.

   If the order of insulations is reversed, find the change in heat loss and comment on the result from insulation point of view. **10**

OR

2. a) Derive the expression for Logarithmic Mean Area (LMA) for hollow cylinder as;

   $A_m = \dfrac{A_o - A_i}{ln(A_o / A_i)}$; where A_m is LMA, A_o outer surface area and A_i inner surface area of the cylinder. **8**

b) Calculate the rate of heat loss for a red brick wall of length 5 m, height 4 m and thickness 25 cm. Temperature of the inner surface is 110°C and that of the outer surface is 40°C. Thermal conductivity of the red brick is 0.7 W/mK. Also, calculate the temperature at an interior point of the wall (in the thickness), 20 cm away from the inner surface of the wall. **8**

Unit – II

3. a) Prove that critical radius of insulation for cylinder is k/h and that for sphere is 2k/h; where k is conductivity of insulation and h is heat transfer coefficient between insulation and surroundings. Use standard notations. **8**

b) A hollow sphere of inside radius 30 mm and outside radius 50 mm is electrically heated at its inner surface at a constant rate of 10^5 W/m^2. The outer surface is exposed to a fluid at 30°C with heat transfer coefficient of 170 W/m^{2}K. Thermal conductivity of the sphere material is 20 W/mK. Calculate the inner and outer surface temperatures. **8**

OR

4. a) The inside and outside surfaces of a hollow sphere $a \le r \le b$ at r = a and r = b are maintained at temperatures T_1 and T_2 respectively. The thermal conductivity of the sphere material varies with temperature as :

$k(T) = k_0(1 + \alpha T + \beta T^2)$. Prove that the total heat flow rate Q. through the sphere is given as :

$$Q = \frac{4\pi k_o ab}{(b-a)}(T_1 - T_2)\left[1 + \frac{\alpha}{2}(T_1 + T_2) + \frac{\beta}{3}(T_1^2 + T_1T_2 + T_2)^2\right].$$ **8**

b) Nichrome wire, having a resistivity of $100\ \mu\Omega - cm$, is to be used as a heating element in a 10 kW heater. The wire surface temperature should not exceed 1220°C. Take surrounding air temperature as 20°C. Convective heat transfer coefficient on 1.15 kW/m^{2}K and thermal conductivity of Nichrome as 17 W/mK. Find out what diameter of Nichrome wire is necessary for 1 m long heater. **8**

Unit – III

5. a) Derive the expressions for heat transfer rate Q and temperature distribution for a short fin using standard notations. **9**

b) In an experiment to determine the thermal conductivity of a very long solid rod of 2.5 cm diameter, its one end is placed in a furnace and rod is projecting into a room with ambient air at 22°C. After steady-state conditions are achieved, the temperatures at two points 10 cm apart, are found to be 110°C and 85°C respectively. Convective heat transfer coefficient between the rod surface and the surrounding air is 28.4 W/m^{2}K. Determine the thermal conductivity of the rod material. **9**

OR

6. a) State the assumptions made in Lumped Heat Capacity Method for analysis of transient heat conduction. Derive the expression for temperature variation during quenching of a billet by this method. **9**

   b) A stainless steel rod of 1 cm diameter initially at 320°C is suddenly immersed in a liquid at 120°C, for which the convective heat transfer coefficient is 100 W/m^2K. Determine the time required for the rod to attain a temperature of 200°C. Steel properties : density = 7800 kg/m^3, C = 460 J/kgK, K = 40 W/mK.

   Assuming above rod of 1 m length, it is converted into sphere and same process repeated with no change in any condition, will there be any change in time required for this steel sphere to achieve the same temperature of 200°C. Find out. **9**

SECTION – II

Unit – IV

7. a) Compare natural and forced convection heat transfer. **4**

   b) Name and write formulae of 4 dimensionless numbers each for natural and forced convection using standard symbols/notations. **4**

   c) Liquid metal at the rate of 5 kg/s flows in a tube of 6 cm diameter. It enters at 400°C into the tube and leaves at 430°C. A constant heat flux is maintained along the tube. The tube surface temperature is 22°C higher than the temperature of liquid metal. Calculate the length of tube required for the purpose. Take properties of liquid metal : $\mu = 1.35 \times 10^{-3}$ kg/ms, Cp = 150 J/kgK, Pr = 0.011, k = 16 W/mK. Use the following correlation : $Nu = 4.82 + 0.0185 (Re.Pr)^{0.83}$. **8**

OR

8. a) A circular disc of 25 cm diameter is exposed to air at 20°C. If the disc is maintained at 120°C, estimate the heat transfer rate from it, when :

   i) Disc is kept horizontal

   ii) Disc is kept vertical.

   For air at 70°C : k = 0.03 W/mK; Pr = 0.697; $\nu = 2.076 \times 10^{-6}$ m^2/s

   Use the following correlations :

   $Nu = 0.14 (Gr.Pr)^{0.334}$ for top/upward surface

   $Nu = 0.27 (Gr.Pr)^{0.25}$ for bottom/downward surface

   $Nu = 0.59 (Gr.Pr)^{0.25}$ for vertical surface

   Use characteristic length as A/P when the plate is horizontal. **8**

   b) Give 4 practical examples of natural and 4 practical examples of forced convection. Do not include lab practicals. **8**

Unit – V

9. a) Explain :
   i) Wien's Displacement Law
   ii) Lambert's Law of Radiation
   iii) Planck's Law of Radiation
   iv) Radiation Shield. **8**

   b) Determine the rate of heat loss by radiation from a steel tube of outside diameter 70 mm and 3 meter long at a temperature of 227°C, if the tube is located within a square brick conduit of 30 cm side which is at 27°C. Take emissivity of steel as 0.79 and that of brick as 0.93. **8**

OR

10. a) Derive the expression for net heat transfer rate by radiation between two parallel gray plates placed closely having a third parallel plate kept between these two plate having emissivities as $\in_1, \in_2$ and $\in_3$ at temperatures T_1, T_2 and T_3 respectively. **8**

    b) Three hollow thin walled cylinders having diameters 10 cm, 20 cm and 30 cm are arranged concentrically. The temperatures of the inner most and outer most cylinders are 100 K and 300 K respectively. Assuming vacuum between the annular spaces, find the steady state temperature attained the 20 cm diameter cylinder. Take emissivities of all cylinders as 0.05. **8**

Unit – VI

11. a) Derive the expression for LMTD of counter flow heat exchanger using standard notations. **9**

    b) In a shell and tube counter flow heat exchanger, water flows through a copper tube 20 mm ID and 23 mm DD, while oil flows through the shell. Water enters at 20°C and comes out at 30°C, while oil enters at 75°C and comes out of heat exchanger at 60°C. Water and oil side film coefficients are 4500 and 1250 W/m^2K respectively. Thermal conductivity of copper is 355°C and fouling factors on water and oil sides may be taken as 0.0004 and 0.001 m^2K/W. If the length of the tube is 2.4 m, calculate the heat transfer rate in the heat exchanger. **9**

OR

12. a) With the help of neat curve, explain six regimes of pool boiling. **9**

    b) Explain dropwise and filmwise condensation. **4**

    c) Tubes may be arranged horizontally or vertically in a condenser. Workout the relation of tube diameter and its length, when condensation rate will not change, whether tubes are arranged vertically or horizontally. **5**

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11. a) What are the advantages and disadvantages of straight bevel gears and spiral bevel gears ? **4**

    b) In a single stage straight bevel gear box, the shafts are at right angles and transmits 7 kW power at 1440 rpm. Determine the required module and gear dimensions for the following specifications :

    i) No. of teeth on pinion = 25
    ii) No. of teeth on gear = 60
    iii) Plain carbon steel material for pinion with Ultimate tensile strength = 650 N/mm^2 and BHN = 250.
    iv) Grey cast iron material for gear with Ultimate tensile strength = 270 N/mm^2 and BHN = 210.
    v) Gear ratio = 3:1
    vi) Over load torque = 130% of the rated torque
    vii) Pressure angle = 20° full depth system
    viii) Pitch line velocity = 8.0 m/s
    ix) Service factor = 1.5
    x) Factor of safety = 2
    xi) Deformation factor, C = 11400 for steel and 7900 for cast iron
    xii) Finished Grade 4, $e = 3.20 + 0.25\Phi$, where $\Phi = m + 0.25\ (d)^{1/2}$
    Here, m-module in mm and d = PCD of pinion / gear in mm.

    Estimate the dynamic load using Buckingham's equation and also find the effective load and corrective factor of safety for bending. **13**

OR

12. a) What are the types of failures in worm gearing and what remedies you propose to avoid such failures ? **2**

    b) Why two dissimilar materials are used for worm and worm wheel ? **3**

    c) A pair of worm gear is designated as 1/52/10/8. A 5 kW power at 900 rpm is supplied to worm shaft. The coefficient of friction of 0.04 and pressure angle is 20°.

    Determine –

    i) the tangential, axial and radial components of the resultant gear tooth force acting on the worm wheel.
    ii) Efficiency of the worm gear drive
    iii) temperature rise in the lubricating oil, if effective surface area is 3.0 m^2 with heat transfer coefficient 15 $w/m^2/°C$. **12**

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Estimate –

a) the module and dimensions of pinion and gear

b) the beam strength

c) the dynamic load using Buckingham's equation

d) the surface hardness for the gears and check the wear strength of the gear. **17**

OR

10. The following data is given for a pair of parallel helical gears.

i) Power transmitted = 20 kW

ii) Pinion speed = 720 rpm

iii) No. of teeth on pinion = 35

iv) No. of teeth on gear = 70

v) Normal pressure angle = 20°

vi) Helix angle = 23°

vii) Face width = 40 mm

viii) Velocity factor = $5.6 / (5.6 + V_p)$

ix) Ultimate tensile strength for steel pinion and gear = 600 N/mm^2

x) Service factor = 1.5

xi) Factor of safety = 2

xii) Deformation factor, C = 11400 for steel and 7900 for Cast Iron

xiii) Finished Grade 6, $e = 8.00 + 0.63\Phi$, where $\Phi = m + 0.25 (d)^{1/2}$

Here, m-module in mm and d = PCD of pinion / gear in mm.

Estimate –

a) the normal module and dimensions of pinion and gear

b) the beam strength

c) the dynamic load using Buckingham's equation

d) the surface hardness for the gears and check the wear strength of the gear. **17**

8. a) A multi-disk wet clutch is to be designed for transmitting a torque of 8.5 N-m. The space limitations to the outer diameter of the friction lining to 100 mm. If the moulded asbestos friction material and steel plates are $\mu = 0.06$ and $p_{max} = 240$ kPa.

   Determine :

   i) the inner diameter of the friction lining
   ii) the number of pressure plates and friction plates and ,
   iii) the axial force required to engage the clutch. **8**

   b) An automobile vehicle weighing 13.5 kN is moving on a level road at a speed of 95 k/hr. When the brakes are applied, it is subjected to a uniform deceleration of 6 m/s^2. There are brakes on all four wheels. The tyre diameter is 750 mm. The kinetic energy of rotating parts is 10% of the kinetic energy of the moving vehicle. The mass of each brake drum assembly is 10 kg and the specific heat capacity is 460 J/kg°C.

   Calculate :

   i) the braking time
   ii) the braking distance
   iii) the total energy absorbed by each brake
   iv) the torque capacity of each brake
   v) the temperature rise of brake drum assembly. **8**

9. A pair of spur gears with a 20° full depth involute teeth consists of 25 teeth pinion meshing with 60 teeth gear. An electric motor transmits 7.5 kW power at 1440 rpm connected to the pinion shaft. Both pinion and gear are made of plain carbon steel C-40 with an ultimate tensile strength Sut = 420 N/mm^2.

   Use the following data for the design of gears based on Lewis equation.

   i) Face width = 10 m
   ii) Velocity factor = $6 / (6 + V_p)$
   iii) Lewis form factor, $Y_p = 0.340$; $Y_g = 0.421$
   iv) Service factor = 1.75
   v) Factor of safety = 2
   vi) Deformation factor, C = 11400 for steel and 7900 for Cast Iron
   vii) Finished Grade 8, $e = 16.00 + 1.25\Phi$, where $\Phi = m + 0.25\ (d)^{1/2}$ Here, m-module in mm

6. a) What are the methods of reducing stress concentration ? Explain with neat sketch. **6**

   b) A transmission shaft made of cold drawn steel 45C8 (S_{ut} = 630 N/mm^2 and S_{yt} = 360 N/mm^2) is subjected to a fluctuating torque which varies from 600 N-m clockwise to 100 N-mm anticlockwise. The surface finish and size factor are 0.8 and 0.85 respectively. The reliability factor is 0.897. If the factor of safety is 2; determine the diameter of the shaft. Use the distortion energy theory of failure. **10**

SECTION – II

7. a) A cone clutch connects an electric motor running at 1440 rpm with a machine which is stationary. The machine is equivalent to a rotor of mass 250 kg and radius of gyration 300 mm. The machine has to be brought to the full speed of 1440 rpm from a stationary condition in 40 seconds. The semi cone angle is 12.5°. The mean radius of the friction surface is twice the face width. The coefficient of friction is 0.2, while the permissible normal intensity of pressure between the contacting surfaces is 0.1 N/mm^2. Assuming the uniform wear condition,

   Determine -

   i) the dimensions of the friction surfaces

   ii) the axial force required to engage the clutch; and

   iii) the amount of heat generated during each engagement of clutch. **8**

   b) A double block brake with an identical pivoted shoes is to be used for the braking torque capacity of 1 kN-m. The diameter of the brake drum is 400 mm and the angle of wrap for each shoe is 120°. The coefficient of friction is 0.3 and the permissible intensity of pressure is 0.8 N/mm^2. The pivot of each shoe is located in such a way that the moment of frictional force on the shoe about the pivot is zero. Calculate :

   i) the distance of pivot from the axis of brake drum; and

   ii) the width of friction lining parallel to the axis of drum. **8**

OR

4. a) Explain the construction of hydrodynamic bearings and journals with the help of sketches. **6**

   b) The following data is given for a 360° hydrodynamic bearing :

   Radial load = 30000 N

   Nominal Journal diameter = 75 mm

   Bearing width = 75 mm

   Radial clearance = 0.15 mm

   Operating speed = 3600 rpm

   Inlet Temperature = 40°C

   The temperature viscosity relationship is as follows.

Temp. (°C)	40	41	42	43	44	45	46	47	48	49	50
Viscosity (C_p)	52.5	50	47.5	45	43	41	39	37.5	36	34	33

   Assume that the specific gravity and the specific heat of the lubricant are 0.86 and 1.76 kJ/kg°C respectively, determine

   i) Outlet lubricant temperature

   ii) Minimum film thickness

   Use table 1 for journal bearing data. **10**

5. a) Explain modified Goodman's diagram for axial and bending fluctuating stresses. **6**

   b) A work cycle of a mechanical element is subjected to complete reversed bending stresses as follows,

   i) I 300 MPa for 30% of time

   ii) I 275 MPa for 25% of time

   iii) I 400 MPa for 10% of time

   iv) I 325 MPa for 25% of time

   v) No. load for remaining time

   The material has a ultimate tensile strength 1200 MPa. Take surface finish factor as 0.8, size factor 0.85, reliability factor 0.897. The operating temperature is 400°C and the temp. factor is 0.5. Assume the fatigue stress factor at the most stressed section as 0.7. Determine life of the component. **10**

OR

3. a) Derive an expression for determining the temperature increase in lubricant, when the side leakage is considered. **6**

   b) A hydrodynamic bearing has a diameter and length of 100 mm. The radial load on the bearing is 30 kN. The journal speed is 1500 rpm and the radial clearance is 100 microns. If the viscosity of the oil is 25 cP, determine

   i) Minimum oil film thickness

   ii) Probable coefficient of friction

   iii) Power lost in friction

   iv) Quantity of oil in circulation

   v) Side leakage

   vi) If the make up oil is supplied at 30°C, find the average oil temperature.

   Assume specific gravity of oil as 0.86 and the specific heat as 2.09 kJ/kg°C.

   Use following table; **10**

Table 1 : Performance Parameters for Journal Bearings

$\left(\frac{L}{D}\right)$	$\in$	$\frac{ho}{c}$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\frac{Q}{rcn_sL}$	$\frac{Qs}{Q}$	$\frac{P}{P_{max}}$
1	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	0

OR

The static and dynamic load capacities of ball bearing are 50 kN and 68 kN respectively. Calculate the expected life of the bearing in hours. Use following table for X and Y. **12**

Fa/Co	(Fa / Fr) ≤ e		(Fa / Fr) ≥ e		**e**
	X	**Y**	**X**	**Y**	
0.040	1	0	0.56	1.8	0.24
0.070	1	0	0.56	1.6	0.27
0.130	1	0	0.56	1.4	0.31
0.250	1	0	0.56	1.2	0.37
0.500	1	0	0.56	1.0	0.44

OR

2. a) What is preloading of rolling contact bearings ? State and explain with neat sketch (any one). **6**

b) A shaft with centrally mounted helical pinion is supported on deep groove ball bearings on both ends.

The centre distance between bearings is 100 mm.

The shafts transmits 5 kW power at 3000 rpm.

The pitch circle diameter of pinion is 80 mm.

The required reliability of the bearing is 95% with a life of 8000 hrs. Assume an helix angle of 25° and a normal pressure angle as 20°.

Assume;

Shock load factor = 1.25

Radial load factor = 0.56

Thrust load factor = 1.2

Find the dynamic load capacity of the bearing, when the bearings are selected from the manufacturing catalog. **12**

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T.E. (Mechanical) (Semester – II) Examination, 2011
MACHINE DESIGN – II (New)
(2008 Pattern)

Time : 4 Hours Max. Marks : 100

***Instructions**: 1) Answer **any three** questions from each Section.*

*2) Answer to the **two** Sections should be written in **separate books.***

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of programmable calculator is not **permitted**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive Stribeck's equation for the basic static capacity of bearing. State the assumptions made. **6**

b) A single row deep groove ball bearing is subjected to a 30 seconds work cycle that consists of the following two parts.

	Part - I	**Part - II**
duration (S)	10	20
radial load (kN)	45	15
axial load (kN)	12.5	6.25
speed (rpm)	720	1440

P.T.O.

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T.E. (Common to Mech. & Mech. Sandwitch) (Semester – II) Examination, 2011

MECHATRONICS

(2008 Pattern) (New)

Time: 3 Hours Max. Marks: 100

Instructions *: 1) Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *questions from Section* ***II****.*

2) Answer to the ***each*** *Section should be written in* ***separate*** *books.*

3) ***Draw*** *suitable* ***neat*** *diagrams,* ***wherever*** *necessary.*

4) Black figures to the ***right*** *indicate* ***full*** *marks.*

5) ***Use*** *of electronic pocket calculator is* ***allowed****.*

6) Assume suitable data, ***if required****.*

SECTION – I

1. a) Compare different types of temperature measurement sensors such as RTD, Thermocouple, and Thermister. **8**

b) Explain different dynamic characteristics of measurement system such as (i) Response time (ii) Rise time (iii) Settling time. **4**

c) What is meant by temperature compensation in strain gauges ? **4**

OR

2. a) A strain gauge and bridge circuit are used to measure the tension force in a steel bar. The steel bar has a cross-sectional area of 50 mm^2. The strain gauge has a nominal resistance of 120Ω and a GF of 2. The bridge is supplied with 10 V. When the bar is unloaded, the bridge is balanced so the output is 0.V. Then force is applied to the bar, and the bridge voltage goes to 0.0005 V. Find the force on the bar. (Youngs modulus of steel is 2.1×10^5 N/mm^2). **6**

   b) Write down the level measurement methods, explain basic principles of level measurement. **6**

   c) Explain terms precision and accuracy with appropriate example. **4**

3. a) What is meant by variable reluctance sensor ? And write down its applications. **6**

   b) Explain basic operation of rotary encoder ? And its applications in CNC machine. **5**

   c) A rotary potentiometer is used for angle measurement. Potentiometer is supplied with 10 V and is set at 82°. The range of this single-turn pot is 350°. Calculate the output voltage ? **5**

OR

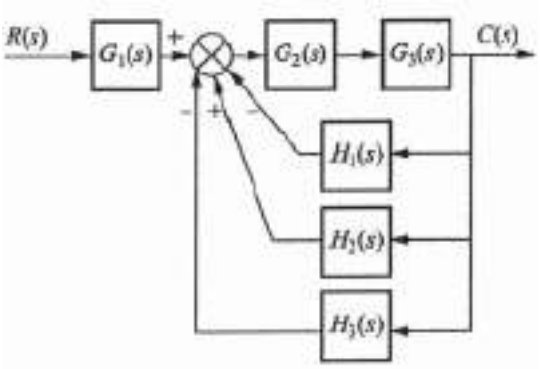
4. a) Explain basic principle and working of LVDT. **5**

   b) Describe applications of using a proximity sensor working on principle of optical sensing. **6**

   c) Explain capacitive and inductive principles used in position sensing. **5**

5. a) Write a short note on SCADA system and its applications in industrial environment. **4**

b) Carry out block diagram reduction of system shown in following figure. **8**



c) A circuit has a resistance R in series with a capacitance C. The differential equation relating the input V and output Vc, (i.e. the voltage across the capacitor, is) : **6**

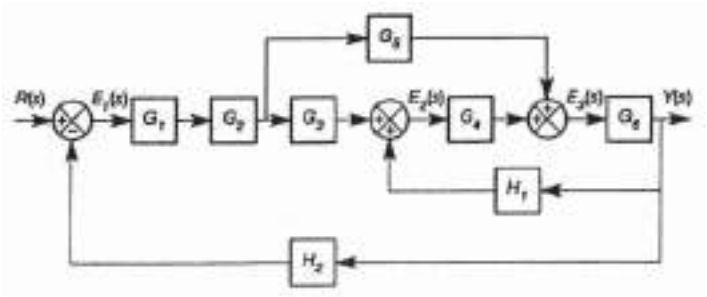
$$V = RC\frac{dVc}{dt} + Vc$$

Determine the output of the system when there is a 3 V impulse input.

OR

6. a) What is meant by Nyquist frequency and how it is used in sampling of analog signals. **4**

b) Use block diagram reduction to simplify the block diagram below into a single block relating Y(s) to R(s). **8**



c) In case of DAC (Digital to Analog Conversion) what is the purpose of Sample Hold Circuit and explain its working with suitable figure. **6**

SECTION – II

7. a) Explain terms (i) Process load, and (ii) Dead Time. **4**

b) Differentiate between feedback and feed forward control systems, illustrate with appropriate example. **6**

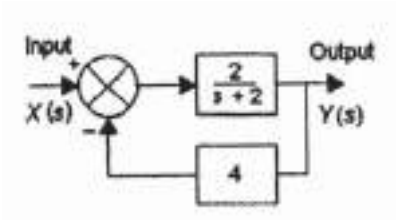
c) An open-loop system consists of three elements in series, the elements having transfer functions of 5, 1/s and 1/(s+1) with feedback element transfer function 5. What is the overall transfer function of the system ? **6**

OR

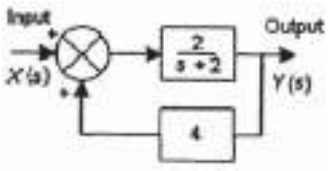
8. a) Give at least three examples of a two-point control system and explain how it works. **4**

b) Develop a block diagram representation for following control system. **6**

c) Determine the overall transfer function for a control system (Figure (a)) which has a negative feedback loop with a transfer function 4 and a forward path transfer function of 2/(s+2).



Determine the overall transfer function for a system (Figure (b)) which has a positive feedback loop with a transfer function 4 and a forward path transfer function of 2/(s+2). **6**



9. a) Assume that a motor driven arm was originally at 0° and then was directed to move to a new position at 30°. The gain of the system is KP = 2 N/deg. Describe how the controller responds to this situation (i.e. plot variation of time Vs position, time Vs control signal). **6**

b) Explain term stability in case of open loop and closed loop systems. **4**

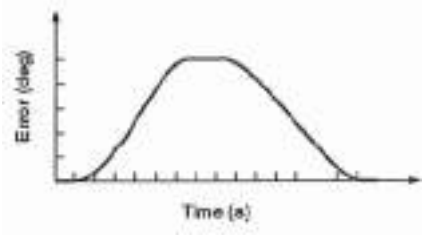
c) Write note on Proportional Integral and Derivative control Actions and its effect on error and response time. **6**

OR

10. a) Explain how the three elements of the PID control system work together to create a practical control system. **4**

b) Explain how derivative feedback makes a control system more responsive to rapid change and how it reduces overshoot. **6**

c) A plot of error versus time (for a control system) is shown in Figure. KP = 1 N/deg and KD = 2s. Find the maximum positive and negative values of derivative output. Make a sketch of the derivative output versus time. **6**



11. a) Explain the operation of electromechanical relays, and applications in industries. **6**

b) Design and write ladder logic for a simple traffic light controller for following sequence of operation as below,

Step 1 : Turn Green on for 35 seconds

Step 2 : Turn Yellow 1 on for 5 seconds.

Step 3 : Red 2 on for 40 seconds.

Step 4 : Sequence repeats thereafter. **12**

OR

12. a) A simple pick-and-place robot picks up parts from one conveyer belt and places them on another belt, as shown in Figure.

1) When a part moving along the lower conveyer belt activates Switch 1, a solenoidpowered gripper clamps on the part and carries it toward the upper conveyer belt ?

2) When the gripper reaches Switch 2, it releases the part and moves back (empty) to receive the next part ?

3) When the gripper reaches Switch 3, it halts and waits for the next part to start the cycle all over again ?

Draw the relay logic ladder diagram to control this operation. **12**

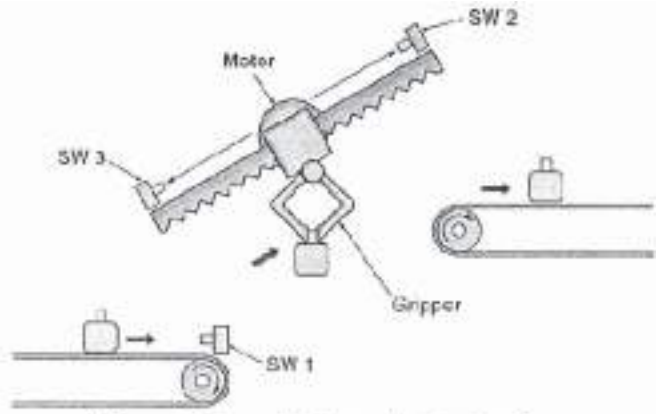


Figure Pick-and-place robot control

b) Write a short note on concept and purpose of a programmable Logic Controller (PLC). Explain the basic instructions used in a PLC program. **6**

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T.E. (Mechanical) (S/W) (Semester – I) Examination, 2011
Elective – I(A): PRODUCTION MANAGEMENT (New)
(2008 Pattern) (Self Study)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section II.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Describe the principals of scientific management in brief. **10**

   b) What is system ? Describe the system approach applied to an organisation. **6**

   OR

   a) Describe Taylors functional organisation with its advantages and limitations. **10**

   b) Distinguish between partnership and jointed stock company. **6**

2. a) Define plant layout. State principles of plant layout. **8**

   b) Explain "six lines of attack" to improve productivity. **8**

   OR

   a) Explain: Material handling in process layout
   Material handling in product layout. **8**

   b) Define Industrial engineering. What are functions of industrial engineering ? **8**

3. Write short notes on (**any three**): **18**
   i) Process chart and SIMO chart
   ii) Industrial engineering
   iii) Time study
   iv) Productivity index
   v) PMTS.

P.T.O.

SECTION – II

4. a) Define control chart and state the objectives of $\overline{X}$ and R charts. **8**

   b) What is process capability ? How will you determine the same ? **8**

   OR

   a) Explain quality of design and Quality of conformance. **8**

   b) Describe in brief TQM and Benchmarking. **8**

5. a) Discuss first four pillars of TPM. **8**

   b) Explain single and double sampling plan. **8**

   OR

   a) Define JIT. Explain JIT philosophy. **8**

   b) What is 5S principle ? Explain poka yoke. **8**

6. Write short notes on (**any three**): **18**

   i) Design of experiments

   ii) Concurrent engineering

   iii) Sampling plan

   iv) Standard of ISO 9000

   v) Six sigma.

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T.E. (Mechanical-S/W (Semester – I) Examination, 2011
Elective – I (B) BEHAVIOURAL SCIENCE (New) (Self Study)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the formation and working of partnership organisation and joint stock company, stating their merits and demerits. **10**

   b) Compare different forms of public sector undertakings. **6**

2. a) Explain with diagram line organisation and staff organisation. **10**

   b) Define the term motivation. Explain the following in brief : **6**

      1) Achievement motive

      2) Affiliation motive.

3. a) Explain the influence of following factors on enterprise : **8**

      1) Economic condition

      2) Political environment

      3) Technological environment.

   b) Explain the main characteristics of industrial licensing. **8**

P.T.O.

4. Write a short note on **(any three)** : **18**

   1) Herzberg two factor theory

   2) Maslow's Hierarchy

   3) Stimulus – Response connection in learning

   4) Personality Traits.

SECTION – II

5. a) Explain Theory X and Theory Y in detail. Give its relevance to people around you. **8**

   b) What is Conflict ? Which are different levels of Conflict ? List sources of conflict. **8**

6. a) Explain path - goal model of leadership. **8**

   b) Explain Leader / Manager role. **8**

7. a) What is grapevine ? Discuss its characteristics. **8**

   b) Explain process of upward communication practices. **8**

8. Write short note on **(any three)** : **18**

   i) Management of change

   ii) Model of Motivation

   iii) Leadership Behavior

   iv) Interview Techniques

   v) Transactional analysis.

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T.E. (Mechanical-Sandwich) (Semester – II) Examination, 2011
THEORY OF MACHINE AND MACHINE DESIGN – II
(2008 Pattern) (New)

Time : 4 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary.***

SECTION – I

1. a) Explain the following terms related to synthesis of mechanism.
   i) Function Generation
   ii) Body Guidance
   iii) Precision points and structural error
   iv) Dimensional synthesis. **8**

   b) Design a 4 bar mechanism to co-ordinate three positions of the input and output links, as follows :

   $\theta_1 = 20°$ $\phi_1 = 35°$

   $\theta_2 = 35°$ $\phi_2 = 35°$

   $\theta_3 = 50°$ $\phi_3 = 60°$. **10**

OR

2. A cam with a minimum radius of 25 mm is to be designed for a knife edge follower with the following data :

   – To raise the follower through 35 mm during 60° rotation of the cam

   – Dwell for next 40° of cam rotation

   – Descending of the follower during next 90° of the cam rotation.

   – Dwell during the rest of the cam rotation.

P.T.O.

Draw the profile of the cam, if the ascending and descending of the cam is with simple harmonic motion and the line of stroke of the follower is offset 10 mm from the axis of the cam shaft.

What is the maximum velocity and acceleration of the follower during the ascent and descent, if the cam rotates at 150 rpm ? **18**

3. a) Explain the term 'interference' related to gears. Discuss various methods to avoid interference. **6**

   b) Two involute gears in a mesh have a module of 8 mm and a pressure angle of 20°. The larger gear has 57, while the pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find the

      i) contact ratio

      ii) angle of action of pinion and gear wheel

      iii) ratio of sliding to rolling velocity at the

         a) beginning of contact

         b) pitch point

         c) end of contact. **10**

OR

4. a) Explain the force analysis in case of helical gear pair, with the help of neat sketch. **4**

   b) Explain, how the velocity ratio of epicyclic gear train is obtained by tabulor method. **4**

   c) Two 20° involute spur gears have a module of 10 mm. The addendum is 1 module. The larger gear has 50 teeth and the pinion has 13 teeth. Does interference occur ? It is occurs, to what value should the pressure angle be changed to eliminate interference ? **8**

5. a) Explain gyroscopic effect on 4-wheeled vehicle. **4**

   b) Derive the expression for the magnitude of gyroscopic couple. **4**

   c) The turbine rotor of a ship has a mass of 2.2 tons and rotates at 1800 rpm clockwise, when viewed from the aft. The radius of gyration of the rotor is 320 mm. Determine the gyroscopic couple and its effect, when the

      i) Ship turns right at a radius of 250 m with a speed of 25 km/hr.

      ii) Ship pitches with the bow rising at an angular velocity of 0.8 rad/sec. **8**

OR

6. a) With the help of neat sketch, explain the working of shoe brake. **5**

   b) With the help of neat sketch explain belt transmission dynamometer. **5**

   c) A bicycle and rider, travelling at 12 km/hr on a level road, have a mass of 105 kg. A brake is applied to the rear wheel, which is 800 mm in diam. The pressure on the brake is 80 N and the coefficient of friction is 0.06. Find the distance covered by the bicycle and number of turns of its wheel before coming to rest. **6**

SECTION – II

7. a) Derive the expression for formative number of teeth in helical gear. **6**

   b) A worm transmits 2.2 kW power at 1000 rpm. It drives a worm gear rotating at 20 rpm. The pitch diameter of right hand single start worm is 60 mm. The transverse pitch of the worm gear is 15.7 mm, while the normal pressure angle is 14.5°. The worm is above the worm gear and rotates in anticlockwise direction as viewed from the right side. Determine :

   i) Components of tooth force acting on worm and worm gear

   ii) The efficiency of worm gear pair

   iii) Power lost infriction

   iv) Comment on self locking of the drive.

   Use following relation for coefficient of friction

   $\mu = \dfrac{0.0765}{\sqrt{V_s + 0.4}}$ where V_s = sliding velocity u/s. **12**

OR

8. a) Explain different types of gear tooth failure with causes and remedies. **6**

   b) A 20° full-depth involute pair of spur gear consists of pinion and gear having 19 and 40 teeth respectively. A 10 hp single cylinder running at 1500 rpm is directly coupled with pinion shaft. The gear shaft operates a two stage reciprocating compressor. The gear pair is made of plain carbon steel 45C8 (S_{ut} = 600 N/mm^2). The module and face width are 3 mm and 50 mm respectively. The gear pair is manufactured by hobbing. Assuming the velocity factor accounts for the dynamic load.

   i) Calculate factor of safety based on beam strength

   ii) Specify surface hardness for gear tooth if factor of safety based on wear strength is 2

   Take service factor 1.5, $Y_p = 0.3142$. **12**

9. a) A ball bearing operates on a work cycle consisting of three parts : a radial load of 3000 N at 720 rpm for 30% of the cycle, a radial load of 7000 N at 1440 r.p.m. for 40% of the cycle and radial load of 5000 N at 900 r.p.m. for remaining cycle. The basic dynamic capacity of the bearing is 30700 N calculate :
   i) Rating life of bearing in hrs.
   ii) Average speed of rotation
   iii) Life of bearing with 95% reliability. **10**

   b) Write a short note on multiplate clutch. **6**

OR

10. a) An oil immersed multiplate clutch trasmits 20 kW power at 2400 r.p.m. The pressure plates are made of steel, while the friction plates are provided with asbestos lining for which coefficient of friction is 0.07. The permissible intensity of pressure is 0.20 N/mm^2. Determine number of steel and asbestos lining plates and axial force required to transmit the power with a) uniform wear condition b) uniform pressure condition.

    External diameter of friction lining is 150 mm and ratio of external to internal diameter is 1.25. **12**

    b) What is preloading of rolling contact bearings ? Explain method to achieve it. **4**

11. a) A transmission shaft carries a pulley midway between two bearings. The bending moment at the pulley varies from 200 N-m to 600 N-m and the torsional moment in shaft varies from 70 N-m to 200 N-m. The frequencies of variation of bending and torsional moments are equal to speed of shaft. The shaft is made of steel Fe E400 (S_{ut} = 540 N/mm^2 and s_{yt} = 400 N/mm^2). The corrected endurance limit of shaft is 200 N/mm^2. Determine diameter of shaft. Take factor of safety 2. **10**

    b) Explain following terms :
   i) Notch sensitivity
   ii) Endurance limit
   iii) Theoretical stress concentration factor. **6**

OR

12. a) Explain modified Goodman diagram for fluctuating axial and bending stresses. **6**

    b) A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to and P. The sapn of beam is 500 mm and its cross section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500 MPa, endurance limit of 330 MPa for reversed bending and factor of safety 1.3. Calculate maximum value of 'P'. Take size factor 0.85 and surface finish factor of 0.9. **10**

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T.E. (Mechanical S/W) (Semester – II) Examination, 2011
TRIBOLOGY (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, electronic pocket calculator is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) What are the different parameters which affect viscosity of oil ? Discuss in brief. **6**

   b) State physical and chemical properties of Lubricants. **4**

   c) An oil of viscosity of 50 cP and relative density of 0.9 is used for Lubrication. Convert the viscosity into centistokes, SUS and Pascal second units. **6**

OR

2. a) Explain different modes of Lubrication. **6**

   b) What is role of additives in lubrication ? What are different additives used in lubricating oils ? **4**

   c) What are the different parameters which affect viscosity of oil ? Discuss in brief. **6**

P.T.O.

Unit – II

3. a) Derive Archard's equation for volume of adhesive wear with assumptions made. State Laws of wear using above equation. **8**

   b) Write short note on : **6**

      i) Surface fatigue wear and ii)Fretting.

   c) Enumerate the factors affecting wear. **2**

OR

4. a) Derive an expression for coefficient of friction due to deformation using deformation theory. **6**

   b) Explain the following theories of friction : **6**

      a) Coulomb's classical theory

      b) Tomlinson's theory of molecular attraction.

   c) Explain stick-slip oscillations. **4**

Unit – III

5. a) Derive the Reynold's equation -

$$\frac{\partial}{\partial x}\left[h^3\frac{\partial p}{\partial x}\right]+\frac{\partial}{\partial y}\left[h^3\frac{\partial p}{\partial x}\right]=-6\mu U\frac{\partial h}{\partial x}$$

   with usual notations. State the assumptions made in the equation. **10**

   b) Explain Boyd-Raimondi's method for analysis of Hydrodynamic Journal Bearing. **8**

OR

6. a) Derive an expression for pressure 'p' around a short journal bearing of length L as -

$$p=\frac{3U\eta C\varepsilon\sin\theta}{RC^3(1+\varepsilon\cos\theta)^3}\left[\frac{L^2}{4}-y^2\right]$$ with usual notations. **10**

b) Following data is given for a 360° Journal bearing :

Journal diameter	=	50 mm
Bearing Length	=	50 mm
Radial load	=	3.2 kN
Journal speed	=	1490 rpm
Radial Clearance	=	0.05 mm
Oil viscosity	=	25 cP

Assuming that the total heat generated in the bearing is carried away by the total oil flow in the bearing, calculate -

i) minimum oil film thickness, ii) the coefficient of friction,
iii) flow requirement in litre/min and iv) power lost in friction. **8**

$\left(\frac{l}{d}\right)$	ε	$\frac{h_o}{c}$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\frac{Q}{rcn_s l}$	$\frac{Q_s}{Q}$	$\frac{P}{P_{max}}$
1	0	1.0	∞	(85)	∞	π	0	–
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152
	1.0	0	0	0	0	0	1.0	–

Table 1 : Dimensionless Performance Parameters for full journal bearings with side flow

SECTION – II

Unit – IV

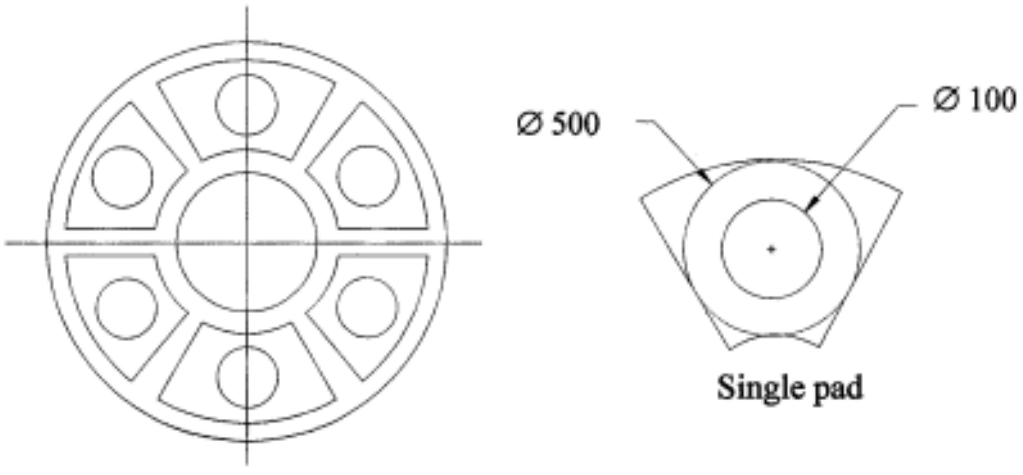
7. a) Derive relation for flow rate of lubricating oil and load carrying capacity for a circular step bearing with neat sketch. **8**

   b) Two reservoirs are connected by a slot 20 cm wide, 0.3 mm thick and 30 cm long. The reservoirs are filled with oil of 105 cP. The pressures in the two reservoirs are 10 bar and 3 bar respectively. Determine the quantity of oil flowing. Assume relative density of 0.8. **8**

OR

8. a) Discuss different types of energy losses in hydrostatic bearings and derive an equation for the same. **8**

   b) The hydrostatic step bearing consists of six pads as shown. Neglecting the flow over corners of each pad can be approximated as a circular area of outer and inner diameter of 500 mm and 200 mm resp. The total thrust load is 900 KN and the film thickness is 0.15 mm. The viscosity and density of the oil are 30 cP and 0.9 gm/cc resp. The specific heat of the lubricant is 2.09 KJ/kg°C. If the shaft is rotating at 720 rpm, calculate (i) supply pressure (ii) lubricant flow rate (iii) frictional power loss (iv) pumping power loss and (v) temperature rise. **8**



Unit – V

9. a) Derive equations for load carrying capacity and time of approach for a rectangular plate near a plane under hydrostatic squeeze film lubrication. **10**

   b) Two parallel plates 3 cm long and infinitely wide are separated by oil of viscosity 0.6 Ns/m^2 and are approaching each other. If a load of 30 KN per meter width is applied, what will be the film thickness after one second ? Initial film thickness is $25\mu m$. **6**

OR

10. a) Explain oil circulation systems in case of lubrication of plain bearings. How quality of the oil is maintained in the lubrication of such bearings ? **8**

    b) Explain the following in case of lubrication of gears : **8**

    (i) Crankcase explosions, (ii) Lubrication systems.

Unit – VI

11. a) Derive an expression for load carrying capacity of Rayleigh step bearing which has entry zone gap of h_1 over a length of B_1 and exit zone gap of h_0 over a length of B_0 and sliding with a velocity of U. $\left(\frac{h_1}{h_0} = 1.87 \text{ and } \frac{B_1}{B_0} = 2.588\right)$. **10**

    b) Discuss the mechanism of elasto-hydrodynamic lubrication and give its applications. **8**

OR

12. a) Write a short note on : **6**

    a) O-rings

    b) Sintered Metal bearings

    c) Bi and Tri metal bearings.

    b) Explain different types of gaskets in brief. **6**

    c) Explain Labyrinth seals and throttling bush seals in detail. **6**

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T.E. (Mech.) S/W (Semester – I) Examination, 2011
Elective – I (3) : BEHAVIOURAL SCIENCE
(2003 Course)

Time: 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Distinguish between partnership and joint stock company with their relative merits and demerits. **10**

   b) Explain in brief 'Industrial Law'. **6**

2. a) Explain the term motivation. How does effective managing take an advantage of and contribution of motivation ? Discuss. **8**

   b) Discuss various causes of Human behaviour. Explain how environment influences on human behaviour. **8**

3. a) Differentiate between project and matrix organisation. **8**

   b) Explain the following organisation structure **8**
      1) Functional organization
      2) Line organization

4. Write a short note on (**any three**) : **18**
   a) Licensing
   b) Trade union role
   c) Personality traits
   d) New Industrial Policy in India.

P.T.O.

SECTION – II

5. a) Compare formal and informal organizations. **8**

   b) What are sources of conflict ? How it is resolved ? **8**

6. a) What is a positive and negative leader ? What are other styles of leaders ? **8**

   b) Explain self leadership and super leadership. **8**

7. a) Explain characteristics of effective and ineffective feedback for employee performance. **8**

   b) What is downward communication ? What are ways to improve it ? **8**

8. Write short notes on **any three** : **18**

   i) Organizational behaviour

   ii) Management of change

   iii) Upward communication

   iv) Brainstorming.

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T.E. (Production) (Semester – I) Examination, 2011
KINEMATICS OF MANUFACTURING MACHINES (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer any **3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*

*6) Assume suitable data, if **necessary**.*

SECTION – I

1) a) Explain with neat sketch the kinematic analysis of gear hobbing machine. **10**

b) What do you understand by coupler curve ? How will you generate coupler curve using Fredunsteins equation ? **8**

OR

2. a) Determine the link length ratios using Freudenstein's equation to satisfy the following condition for a four bar mechanism :

$\theta = 60°,\ \phi = 90°,\ \omega_i = 3$ r/s, $\omega_o = 2$ r/s, $\alpha_i = -1$r/s^2, $\alpha_0 = 0$ r/s^2

where, θ and ϕ are angular positions of input and output links, ω_i and ω_o are the angular velocities of input and output links, α_i and α_o are the angular accelerations of input and output links. **10**

b) Explain with suitable example C-14 structure. **8**

P.T.O.

3. a) Two gears in mesh have module 8 mm, pressure angle 25°, number of teeth on pinion 20 and number of teeth on gear 50. Determine :

   i) Number of pairs of teeth in contact. **3**

   ii) The angles of action of gear and pinion. **3**

   iii) The ratio of sliding velocity to rolling velocity at pitch point and at the beginning and end of engagement. **4**

   b) Prove that, for involute profile : $\text{inv}\phi = \tan\phi - \phi$, where ϕ is involute pressure angle. **6**

OR

4. a) A four bevel planetary mitre gear block shown in Fig. 1 has been used for a gear hobbing machine, such that output rpm is 10. Determine the input rpm if the arm of the planetary wheel rotates at 25 rpm. **8**

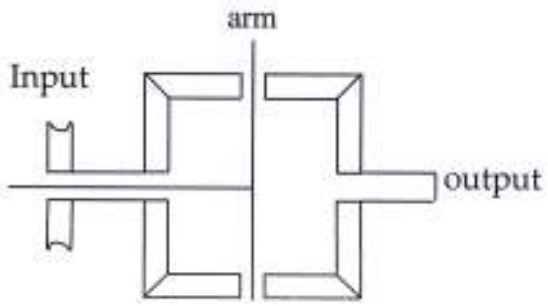

Figure 1. Planetary bevel block

   b) Explain with neat sketch the fundamental law of gearing. **8**

5. a) A punching press is to be driven by constant torque electric motor. A pressure is provided by a flywheel that rotates at a maximum speed of 225 rpm. Radius of gyration of flywheel rim is 0.5 m. Press punches 720 goals per hour. Each operation takes 2 seconds and requires 15 kN-m of energy. Find the power of the motor and the minimum mass of the flywheel if speed of the flywheel not to fall below 200 rpm. **12**

   b) Define the terms 'coefficient of fluctuation of speed' and 'coefficient of fluctuation of steadiness'. **4**

OR

6. a) The mean speed of a speed engine is 250 rpm at 75 kW. If the maximum and minimum speed not to vary by more than 1% and excess energy is $1/3^{rd}$ of the indicated work per stroke, what should be the mass of the flywheel if the radius of gyration is 0.6 m ? **10**

   b) Explain application of flywheel in various manufacturing machines. **6**

SECTION – II

7. a) Derive an expression of displacement, velocity and acceleration for follower moving with simple harmonic motion. **6**

   b) The following data relate to a cam operating an oscillating roller follower :

   * Minimum radius of cam = 30 mm.
   * Radius of roller = 10 mm.
   * Length of Follower arm = 45mm
   * Distance of fulcrum center from cam center = 55 mm
   * Angle of Ascent = 80°
   * Angle of Descent = 100°
   * Angle of dwell between Ascent and Descent = 50°
   * Angle of oscillation of follower = 30°

   Draw of profile of the cam if the follower moves outward with S.H.M. and returns with uniform acceleration and retardation. Also determine maximum velocity and maximum acceleration during accent when camshaft rotates at 400 *rpm* in clockwise direction. **10**

OR

8. a) Differentiate between trace point and pitch point of a radial cam. **4**

   b) Draw a cam to raise a valve with S.H.M. through 50 mm in 1/3 of revolution , keep it fully raised through 1/12 revolution and to lower its harmonic motion in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and minimum radius of the cam is 25 mm. The diameter of the camshaft is 25 mm. The axis of the valve rod passes through the axis of the camshaft. If the camshaft rotates clockwise and at uniform speed of 100 rpm find the maximum velocity and acceleration of a valve during raising and lowering. **12**

9. a) What are in-line engine ? How are they balance ? Is it possible to balance them completely ? **6**

   b) The three cylinder of an air compressor have their axes 120 to one another and their connecting rods are coupled to a common crank. The stroke is 100 mm and length of each connecting rod is 150 mm. The mass of the reciprocating parts per cylinder is 2 kg. Find the maximum primary and secondary forces acting on the frame of the compressor when running at 3000 rpm. **10**

OR

10. a) Write a note on “Partial Primary Balancing”. **4**

    b) A shaft has three eccentrics, each 75 mm diameter and 25 mm thick, machined in one piece of shaft. The central planes of the eccentric are 60 mm apart. The distances of the centers from the axis of rotation are 12mm, 18 mm, and 12 mm and their angular position are 120 apart. The density of metal is 7000 kg/m^3. Find the amount of out of balance force and couple at 600 rpm. The shaft is balanced by adding two masses at a radius 75 mm and at distances 100 mm from the central plane of the middle eccentric. Find the masses and their angular positions. **12**

11. a) What are the causes and effect of vibration ? **4**

b) Derive the expression for logarithmic decrement and hence find its value for a system that vibrates with frequency of 1MHz in undamped condition and 0.9 Hz when damped. **8**

c) Write a note on 'critical speed of shaft'. **6**

OR

12. a) Define following terms : **6**
   i) Free Vibration
   ii) Forced Vibration
   iii) Damped Vibration
   iv) Longitudinal Vibration
   v) Transverse Vibration
   vi) Damping ratio

b) A shaft of mass 1200 kg is acted upon by an external force of 2450 N at 500 rpm to reduce the effect of vibration, isolators of rubber having a static deflection of 2 mm under machine weight and an estimated damping factor of 0.2 is used. Determine :
   i) Amplitude of vibration of machine.
   ii) Force transmitted to the foundation.
   iii) Phase angle between transmitted force and exciting force.
   iv) Speed at which the maximum amplitude of vibration would occur.

12

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T.E. (Production) (Semester – I) Examination, 2011
MATERIAL FORMING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

UNIT – I

1. a) Sketch and explain stress-stain diagrams for the material exhibiting : **8**
   i) Elastic Behaviour
   ii) Plastic Behaviour
   iii) Rigid Behaviour
   iv) Elastic-Plastic Behaviour.

   b) Explain and draw Mohr's circle for various two and three dimensional stress conditions. **8**

OR

2. a) Compare Tresca and Von mises criterion. **4**

   b) What is formability ? Explain the significance of material forming limit diagrams. **4**

   c) Explain camplastometer with neat sketch. **8**

P.T.O.

UNIT – II

3. a) What is parting line ? What are the different factors to be considered while selecting the parting line ? **6**

   b) Explain the concept of forgeability and briefly discuss any one forgeability test. **6**

   c) Explain forging defects and remedies. **6**

OR

4. Write short note :

   i) Orbital forging **6**

   ii) P/M forging **4**

   iii) Isothermal forging **4**

   iv) Parting line selection. **4**

UNIT – III

5. a) Derive an equation for the drawing stress (σ_d) in tube drawing operation using fixed tapered plug. **16**

OR

6. a) Show that the maximum permissible reduction in strip drawing using tapered dies is 60%. Assume coefficient of friction, $\mu = 0.05$ and semi die angle $\alpha = 15°$. **8**

   b) Explain construction and working of slip stepped cone wire drawing machine and multistage wire drawing machine. Also state its advantages and limitations. **8**

SECTION – II

UNIT – IV

7. a) Explain the methods used to reduce the separating force in rolling. **4**

   b) Explain AGC. Discuss the methods of AGC. **8**

   c) Explain roll camber. **4**

OR

8. a) Explain Sendzimer and Planetary mill with neat sketch. **6**

   b) A wide strip is rolled to final thickness of 6.35 mm with a reduction 30%. The roll radius is 500 mm and Coefficient of friction is 0.2. Determine the location of neutral plane. **10**

UNIT – V

9. a) Explain types of flow patterns with neat sketches in extrusion. State various extrusion defects. **8**

   b) Calculate the work done in extruding an aluminium billet 780 mm diameter 1.5 m long to square bars 30 mm side. Flow stress of aluminium 60 N/mm^2. Coefficient of friction, $\mu = 0.38$. Also find the power utilized if process is completed in 10 min. **8**

OR

10. a) Explain the variation of extrusion pressure with ram travel in direct, indirect and hydrostatic extrusion process with suitable graph. **6**

    b) An aluminum alloy is hot extruding at 400° C through square dies without lubrication from 125 mm diameter to 40 mm diameter. The extrusion speed is 45 mm/s. The flow stress of material at above temperature is 250 MPa. The length of fillet is 450 mm. Determine the extrusion load by taking coefficient of friction, $\mu = 0.1$ and semi-die angle, die $\alpha = 45°$. **10**

UNIT – VI

11. a) Explain the following systems of explosive forming : **8**

    i) Contact system (confined)

    ii) Stand-off system (unconfined),

    Enlist different explosives used.

    b) Explain the following methods of stretch forming with neat sketch. **10**

    i) Stretch draw forming ii) Stretch wrapping.

OR

12. a) Define spinning. State the applications of metal spinning. Explain vertical power spinning machine with neat sketch. **8**

    b) Explain the following methods of stretch forming with neat sketch. **10**

    i) Compression forming ii) Radial draw forming.

    State the advantages of stretch forming.

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T.E. Production Engineering (Semester – I) Examination, 2011
CUTTING TOOL ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Attempt **one** question of **each** unit from Section-**I** and Section-**II**.*
*2) Answer to the questions should be written on **separate** books.*
*3) Draw neat diagram **wherever** necessary.*
*4) Assume suitable data if **required**.*

SECTION – I

Unit – I

1. a) In an orthogonal cutting, the cutting velocity is 30 m/min and chip velocity is 15 m/min. If the rake angle of a tool a 10 degree, cutting force is 500 N and feed force 200 N, cut chip thickness is 0.50 mm, Feed = 0.2 mm/rev calculate -

   i) Chip thickness ratio ii) Shear plane angle

   iii) Shear force iv) Coefficient of friction

   v) Shear velocity. **10**

   b) Prove that according to Ernst Merchant theory the relation between rake angle (α), shear angle (Φ) and friction angle (β) is given by $2\Phi + \beta - \alpha = \frac{\pi}{2}$. **5**

   c) Explain the procedure for force measurement in drilling operation. **5**

OR

2. a) Define chip reduction coefficient. Prove that the strain in chip is minimum when the value k = 1. Also prove that shear strain = $\frac{K^2 - 2K\sin\alpha + 1}{K\sin\alpha}$

   α = Rake angle. **8**

b) Describe with neat sketch orthogonal cutting and oblique cutting. Why orthogonal cutting conditions are used in experimental work on cutting ? **6**

c) Explain a mechanism of metal cutting with the help of neat diagram and comment on the observation made during the machining operation. **6**

Unit – II

3. a) State some of the important characteristics of following tool materials **8**

   i) High speed steel ii) Carbide

   iii) Ceramic iv) Stellite.

b) Draw the tool geometry along with a one tooth and label the important part of Reamer. **7**

OR

4. a) Explain with suitable sketches tool represented by ORS system. **8**

b) What is the use of chip breakers ? Sketch various types of chip breakers and explain how a chip breakers breaks up a chip. **7**

Unit – III

5. a) Identical components are produced at different spindle speeds and feed between consecutive tool change in a single pass turning operation indicated in the observation table. **7**

Spindle speed rpm	Feed mm/rev	Number of components produced
250	0.100	311
250	0.125	249
300	0.125	144

What will be the number of components produced at a spindle speed of 250 rpm at feed of 0.2 mm/rev. Use equation $V T^n f^{n1} = C_1$ where v = cutting speed (rpm), T = tool life (min) n, n_1,C_1 = constant.

b) State and justify the desirable properties of cutting fluids. What are the functions of additives ? **8**

OR

6. a) Explain the effect of the following on tool life **8**

   i) machining variables ii) metal being machined

   iii) tool material iv) tool geometry.

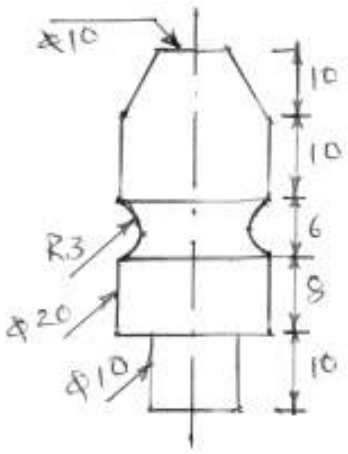
   b) In a turning operation it was observed that the tool life was 120 minutes when the cutting speed was 30 m/min. As the speed was increased to 40 m/min, the tool life was dropped to 55 minutes. If the time required to change the tool was 2 minutes. And if the cost of regrinding the tool was 12 times the cost of turning/minute, calculate (1) the most economical cutting speed, (2) tool life for maximum production. **7**

SECTION – II

Unit – IV

7. a) Design a circular form tool for following job **7**

   α =Rake angle = 12°, γ = Relief angle = 10°, Chip disposal thickness = 5 mm



   b) Discuss the broach design aspects. What are the main geometric elements of broach teeth to be considered while designing the broach ? **8**

OR

8. a) Explain design consideration for a plain milling cutter tool. **8**

   b) Discuss how will you design the principal elements of a reamer tool ? **7**

Unit – V

9. a) Explain the principle of motion economy. **4**

   b) Write a short note on : **8**

      i) standardisation of jig and fixture, ii) universal jig.

   c) Explain why the clamps on milling fixture must be extremely rigid ? **3**

OR

10. a) What is an indexing jig ? Describe various indexing devices commonly used with suitable sketch. **8**

    b) Explain with suitable sketch the use of Diamond pin locator, how the dimension of Diamond pin is calculated. **7**

Unit – VI

11. Design a jig for drilling Φ 10 mm holes for a component shown in fig.no.1. **20**

OR

12. Design a milling fixture to mill at face A & B for a component shown in fig. no. 1. Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping and bushing. **20**

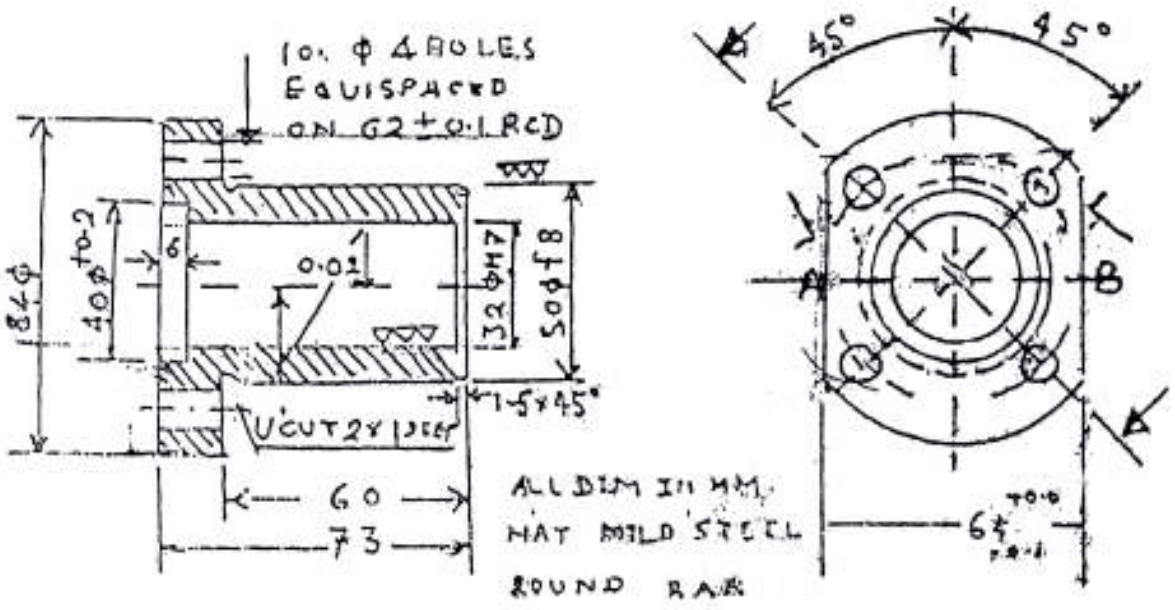


Fig. No. 1

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T.E. Production (Semester – II) Examination, 2011
TOOL DESIGN (New)
(2008 Pattern)

Time : 4 Hours Max. Marks: 100

N.B. *: i) From Section **I** solve, Q. **1** or Q.**2**, Q.**3** or Q. **4**, Q.**5** or Q.**6**, and from Section **II** solve Q. **7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12**.*

*ii) **Neat** diagrams must be drawn **wherever** necessary.*

*iii) Figures to the **right** indicate **full** marks.*

*iv) **Use** of electronic pocket calculator is **allowed**.*

*v) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Draw neat sketch and label it to show the basic terminology of press tool for the component shown in fig. 1. Also state the different types of die set and which one is shown in your sketch. **8**

   b) What is C.P. ? Find it for the blank shown in fig.1. **8**

OR

2. Design a blanking die to produce a component as shown in fig.1.

   i) Draw strip layout and find out material utilization. **5**

   Given : Sheet size = 2500 mm×1259 mm×1.22 mm thick

   Shear strength of material = 195 MPa

ii) Find out cutting force if full shear is given. **5**

iii) Design and draw die. **3**

iv) Design and draw punch plate. **3**

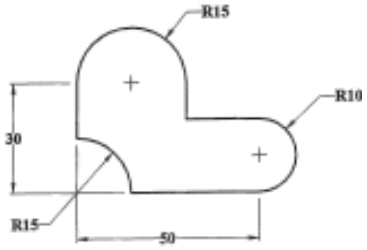


Fig: 1

3. a) What are the drawing process parameters ? Explain in short. **5**

b) What is spring back ? And what are the methods of its prevention ? **5**

c) Calculate the develop length for bend component in fig.2. **6**

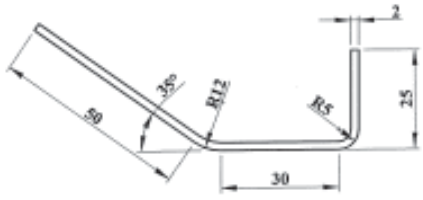


Fig: 2

OR

4. Design a drawing die for the shell shown in fig. 3. **16**

   Given : blank thickness = 1.2 mm

   UTS = 260 N/mm^2.

   Determine :

   1) Blank size

   2) Number of draws

   3) Cup size, die and punch design for each draw.

   4) Blank holding pressure and drawing force for each draw.

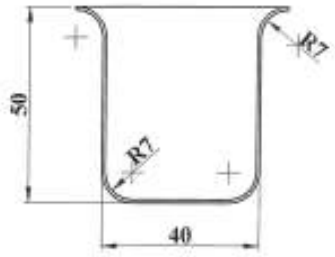


Fig: 3

5. Design a progressive die for the component shown in Figure 4

   Given : Stock thickness = 1.2 mm, Shear strength of material = 195 MPa.

   i) Draw strip layout that explain the operation to be performed on the strip to get component as shown in fig. 4. **2**

ii) Find out cutting force and press tonnage. **3**

iii) Design and draw the die. **3**

iv) Design dowel and allen socket head screw. **4**

Given : Safe tensile stress of screw material = 80 N/mm^2

Safe shear stress of dowel material = 50 N/mm^2

v) Draw assembly drawing of press tool. **6**

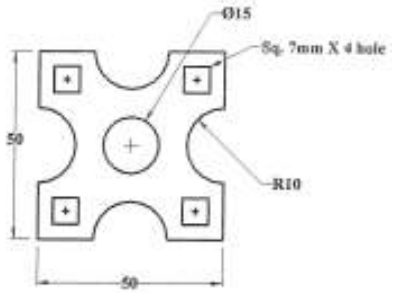


Fig: 4
Material: Al, 1.2mm thick

OR

6. a) What is pilot ? What are the types of pilots ? How it is selected for the component in fig. 4 ? And how it will be fitted in press tool explain with neat sketch. **8**

b) Differentiate with neat sketches Hot and Cold chamber die casting. **10**

SECTION – II

7. Design closed die for forging a component shown in fig.5

i) State the operation required. **1**

ii) Design edging impression. **5**

iii) Design finishing impression. **5**

iv) Find out raw material size. **5**

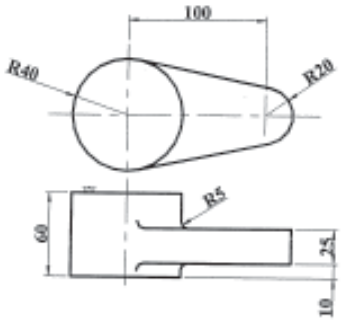


Fig:-5

OR

8. Apply rules of upsetting and design upset forging die for component shown in fig.6. **16**

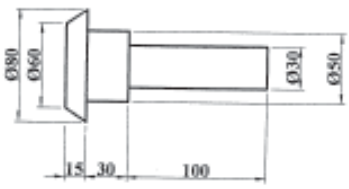


Fig:-6

9. a) Explain with neat sketch **16**

   i) Blow moulding

   ii) Compression molding

   iii) Injection moulding.

OR

10. a) Explain cavity and core insert with neat sketch and also explain its method of fitting to bolster. **10**

    b) Explain basic terminology in injection moulding. **6**

11. Design a single-impression injection mould for the component shown in fig.7 by considering following points **18**

    i) General construction

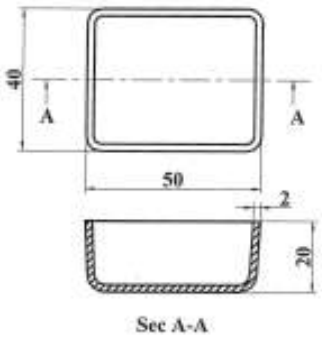
    ii) Ejection system

    iii) Feed system

    What rectangular edge gate and 50 mm long runner dimensions are required ?

    Given : PVC constant (n) = 0.9; PVC density = 1.39 gm/cm^3

    iv) Cooling system.



Sec A-A

Fig: 7

OR

12. a) Explain any one ejection plate returns system. **5**

b) What type of shape is suitable for runner and why ? And explain tab gate with neat sketch. **5**

c) For the component shown in fig. 8 a single impression injection mould is required. Find out the amount of cooling water to be circulated and cooling channel size.

Given :

Density : 1.14 g/cm^3, Material constant : 0.7, Incoming water temp : 20°C, Outgoing water temp: 30°C, constant to allow heat transfer efficiency: 0.65, Rate of heat extracted : 2500 kJ/h., Specific heat capacity of water : 4200J/kg/K, Shrinkage : 0.78%. **8**

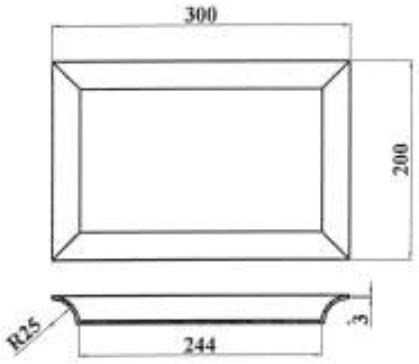


Fig. 8: Injection moulding job

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T.E. (Production and Industrial Engg.) (Semester – II) Examination, 2011
INDUSTRIAL ENGINEERING AND QUALITY ASSURANCE
(2008 Pattern) (New)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **any three** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain briefly various tools and techniques of Industrial Engineering. **10**

   b) Define Total Productivity, Factor Producutivity. Explain various ways to increase the productivity of material and machine. **6**

OR

2. a) Define Industrial Engineering. Explain the contribution of F.W. Taylor and Gilbreth in the development of Industrial Engineering. **6**

   b) Define basic work content. Explain the various factors which increases the basic work content. **10**

P.T.O.

3. a) Define Method study. Explain the objectives and steps to carry out method study. **8**

   b) Explain and construct a two handed process chart for the operator working on photo copy machine with suitable format. **10**

OR

4. a) Explain the following factors to be considered while selecting a job for the purpose of method improvement : **8**
   i) Economic Consideration
   ii) Technical Consideration
   iii) Human Consideration.

   b) Explain the principles of motion economy related to **10**
   i) Use of human body
   ii) Arrangement of workplace
   iii) Design of tools and equipment.

5. a) Explain MTM in detail. **8**

   b) The following elemental data is recorded in minutes for calculation of the standard time of the job. **8**

Element number	**Number of cycles**						
	Cycle 1	**Cycle 2**	**Cycle 3**	**Cycle 4**	**Cycle 5**	**Cycle 6**	**Cycle 7**
1	1.1	1	0.9	1.2	1.1	1.3	1.1
2	2	2.1	2.1	2.2	2.1	1.9	2
3	0.5	0.5	0.6	0.4	0.5	0.5	0.6
4	3	3.4	3.5	3.3	3	3.2	3.3
5	2.2	2.4	2.3	2.1	1.9	2.3	2
6	5	4.8	4.8	4.9	4.7	4.9	4.9
7	2.9	2.6	2.6	2.7	2.5	2.6	2.7

Calculate the basic time and the standard time for the job considering the relaxation allowance as 12% and the contingency allowance as 3%.

OR

6. a) Explain the procedure to carry out work sampling study and to calculate standard time for the job. **8**

b) Explain briefly various rating system used in time study procedure. **8**

SECTION – II

7. a) Explain in detail different quality costs. **8**

b) The table given below shows the number of defectives found in inspection of 12 lots of 100 items each. Determine the control limits for p and np charts and state whether the process is in control or not ? Plot the charts. **10**

Lot no.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
No. of defectives	5	4	2	3	6	0	7	9	3	0	5	6
Fraction defectives	0.05	0.04	0.02	0.03	0.06	0.00	0.07	0.09	0.03	0.00	0.05	0.06

OR

8. a) What are the trends in control charts ? **8**

b) What is AOQ explain in detail ?

Calculate sample size and AOQ for single sampling plan using following data :

i) Probability of acceptance of 0.4% defectives in a lot is 60

ii) Lot size = 10000

iii) Acceptance no. = 1

iv) np = 1.7

v) Defectives found in the sample are not to be replaced. **10**

9. a) What are the different tools and techniques of problem solving in quality circle ? **8**

   b) Explain in detail Juran's approach to quality control. **8**

OR

10. a) Explain Deming's forteen points to quality control with PDCA cycle. **8**

    b) What is QFD ? Explain House of quality. **8**

11. a) Explain the what are the requirements of ISO 9001 Quality Management standard ? **8**

    b) Explain the steps in implementing ISO 9000 quality standard system. **8**

OR

12. a) Discuss in detail Malcolm Balbridge national quality award. **8**

    b) What is ISO14000 ? What are the benefits of environmental management system ? **8**

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T.E. (Production) (Semester – II) Examination, 2011
NUMERICAL TECHNIQUES AND DATABASE
(Common to Production Sandwich)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **any one** quetions from **each** Unit.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) **Use** of electronic pocket calculator is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) Explain the significant differences between file processing system and DBMS. **6**

   b) Explain various types of data models used in DBMS. **6**

   c) Explain various components of DBMS with a neat sketch. **6**

OR

2. a) Explain the organization of a DBMS with neat diagram. **7**

   b) What are various functions of database administrator ? **5**

   c) Define normalization ? Explain the role of normalization in DBMS ? **6**

P.T.O.

Unit – II

3. a) What is a data constraint ? Explain primary key and foreign key constraint with an example. Also write various features of primary and foreign key. **8**

   b) Create a table student_master with following columns by assuming suitable data type and size_Roll_no (primary key), name, surname, branch, date_of_admission, address, city, state, pincode. **4**

   c) Give an expression in SQL for each of the following queries from student_master table. **4**

      i) Find the roll no, names, surname and branch of students who stay in the city named 'Pune' or Mumbai'.

      ii) Find the roll_no, name, surname of students whose surname starts with 'Pa'

OR

4. a) Explain the following : **8**

      i) Datatypes used in SQL

      ii) Entity relationship model.

   b) Create table salesman_master with following columns by assuming suitable data type and size– salesman No(primary key), name, address, city, state, salary(not null), sales_target. **4**

c) Give an expression in SQL for each of the following queries from salesman_master. **4**

i) List the details of those whose salary is in between 10000 to 15000 Rupees

ii) Add the columns 'telephone_no' and 'mobile_no' to salesman_master table.

Unit – III

5. a) Explain the following : **8**

i) Electronic data interchange

ii) Inter-organizational information systems.

b) Define e-commerce. Explain organizational, societal, consumer benefits of e-commerce. **8**

OR

6. a) Define expert systems. Describe briefly its major components. **8**

b) List major types of e-commerce applications. Explain business to consumers applications of e-commerce. **8**

SECTION – II

Unit – IV

7. a) Define an algorithm, flow chart and programming language. **6**

b) If $R = 10X^3Y^2Z^2$ and errors in X, Y, Z are 0.03, 0.01, 0.02 respectively at X = 3, Y = 1 and Z = 2. Calculate the absolute error and percentage error in evaluating R. **4**

c) Solve the following system of equations by Gauss Siedel method correct to three decimal places. **8**

$8X - 3Y + 2Z = 20$

$4X + 11Y - Z = 33$

$6X + 3Y + 12Z = 35$

OR

8. a) What is the output generated by following program **4**

```
#include<stdio.h>
 int main()
{
 int arr[5], i=0, z;
 while  (i<5)
      arr[i] = ++i;
 for(i=0;i<5; i++)
       printf("%d", arr[i]);
   printf("\n");
return 0;
}
```

b) Explain absolute error and relative error, round off with an example. **6**

c) Find the root of $x^4 – x^3 – 2x^2 – 6x – 4 = 0$ in the interval x=2 and x=3, correct upto two decimal places by bisection method. **8**

Unit – V

9. a) Draw a flowchart and write Psedo C-program for Lagrange's interpolation method. **8**

b) It is known that the curve $y = ax^b$ fits in the given data below. Find the best values of a and b. **8**

X:	1	2	3	4	5	6
Y:	1200	900	600	200	110	50

OR

10. a) By using method of moments, obtain a parabola which fits best to the following data : **8**

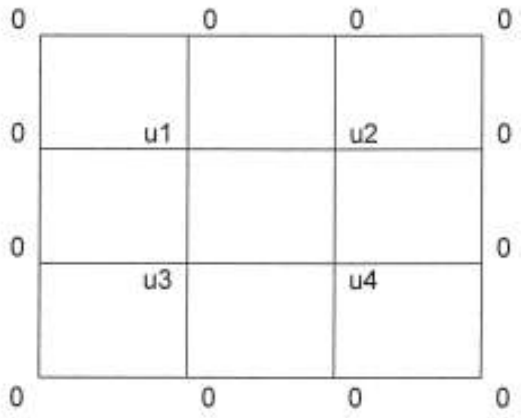
X:	1	2	3	4
Y:	0.30	0.64	1.32	5.40

b) Draw a flowchart and write Pseudo C-program to fit a line Y=AX+B using least square method. **8**

Unit – VI

11. a) Using Euler method solve for y at x= 0.1 from $\frac{dy}{dx} = x + y + xy$, y(0) = 1 taking step size h = 0.025. **6**

b) Evaluate the functions u(x,y) satisfying $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 2x^2y^2$, at the inside grid points of mesh length of h = 1, given the boundary conditions as follows. **6**

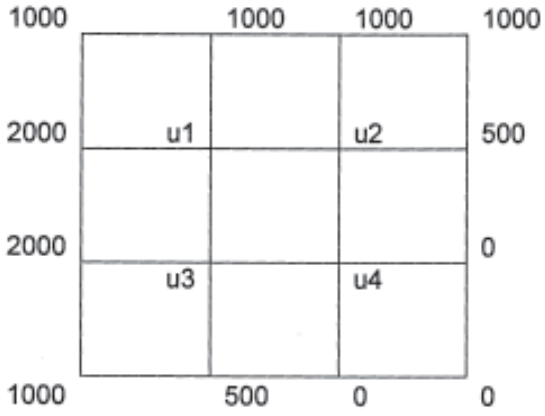


c) Define optimization. State any four applications of optimization. **4**

OR

12. a) Using Runga Kutta method of fourth order, compute y at x = 0.4 given $\frac{dy}{dx} = x^2 + y^2$, y = 0 at x = 0. Take step h = 0.2. **6**

b) Evaluate the functions u(x, y) satisfying $\frac{\partial^2 u}{\partial X^2} + \frac{\partial^2 u}{\partial Y^2} = 0$, at the inside grid points given the boundary conditions as follows. Use the iterative method and carry out 5 iterations. **6**



c) Explain the following in relation to an optimization problem. **4**

i) Design constraints

ii) Objective function.

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T.E. (Prod. S/W) (Semester – II) Examination, 2011
KINEMATICS DESIGN OF MACHINES (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions :
1) *Solve Que. No. **1** or Que. No. **2**, Que. No. **3** or Que. No. 4 Que. No. **5** or Que. No. **6** from Section – **I** and Que. No. **7** or Que. No. **8**, Que. No. **9** or Que. No. **10**, Que. No. **11** or Que. No. **12** from Section – **II.***
2) *Answers to the **two** Sections should be written in **separate** books.*
3) ***Neat** diagrams must be drawn **wherever** necessary.*
4) *Black figures to the **right** indicate **full** marks.*
5) *Assume suitable data, **if necessary.***
6) ***Use** of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is **allowed.***

SECTION – I

Unit No. 1

1. a) Explain various Kinematics principles used in the operation of gear hobbing machine used to generate helical gear. **10**

   b) Explain the following terms related to Kinematic Synthesis.
   i) Function Generation ii) Dimensional Synthesis
   iii) Path Generation. **6**

OR

2. a) Explain the following Kinematic chain representation with figure :
   i) E - 21 ii) C - 13 iii) K - 25 iv) K - 23 **8**

   b) In a slider crank mechanism, the crank AB = 100 mm and the connecting rod BC = 400 mm. The line of the stroke of the slider is offset by a perpendicular distance of 25 mm. If the crank rotates at an angular velocity of 20 rad/s and angular acceleration of 12 rad/s^2 when the crank is inclined at an angle of 30°, determine the following :
   i) The linear velocity and acceleration of the slider and
   ii) The angular velocity and angular acceleration of the connecting rod. **8**

P.T.O.

Unit No. 2

3. a) What is stress concentration ? What are the various causes of stress concentration ? Discuss the various methods to reduce effect of stress concentration. **8**

b) A cantilever beam of circular cross section is fixed at one end and subjected to completely reverse force of 20 kN at the free end. The force is perpendicular to the axis of the beam. The distance between the free end and fixed end is 150 mm. The beam is made of steel (S_{ut} = 540 N / mm^2) and tensile yield strength of 320 N / mm^2. The construction of cantilever is such that there is no stress concentration. Determine the life of beam.

Use following data :

Diameter of beam	=	45 mm
Size Factor	=	0.85
Surface Finish Factor	=	0.8
Reliability Factor	=	0.868
Temperature Factor	=	1.010

10

OR

4. a) Explain the Modified Goodman Diagram for fluctuating axial/bending stresses. Why modified Goodman diagram is widely accepted ? **6**

b) A cantilever beam made up of cold drawn steel (S_{ut} = 700 N / mm^2 and S_{yt} = 550 N / mm^2) as shown in figure is subjected to a load which varies from – F to 4 F. The finish factor and size factor are 0.89 and 0.85 respectively. The theoretical stress concentration factor and notch sensitivity at the fillet are 1.42 and 0.9 respectively. If the factor of safety is 2.0, determine the maximum value of 'F' which the cantilever beam can withstand for infinite life. **12**

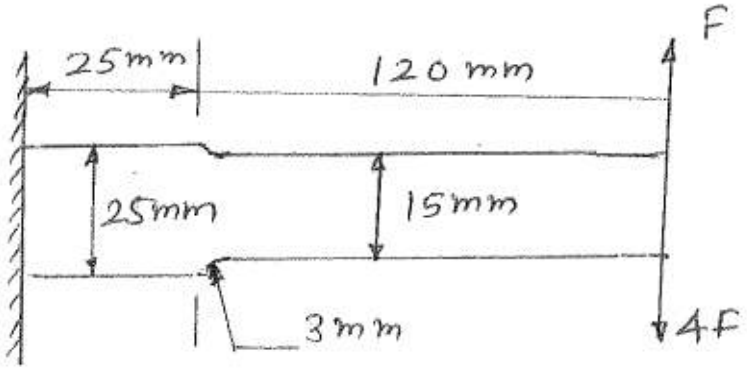

Fig. 4 (b)

Unit No. 3

5. a) It is required to design a pair of spur gears with 20° full depth involute teeth consisting of a 20 teeth pinion meshing with 50 teeth gear. The pinion shaft is connected to a 7.5 kW, 1440 rpm electric motor. The starting torque of the motor can be taken as 150 % of the rated torque. The material for the pinion is plain carbon steel Fe410 (S_{ut} = 410 N / mm^2), while gear is made up of grey cast iron FG 200 (S_{ut} = 200 N / mm^2). The factor of safety is 1.5 The gears are machined to meet the specification of grade 7. Design the gear pair against bending failure.

Calculate :

i) Module
ii) Beam Strength
iii) Dynamic load by Spott's Equation.

Use following data :

Face Width = 10 m

Load distribution factor = 1.4

Dynamic Factor $Kv = \frac{6}{6+V}$

For Grade 7, $e = 11.0 + 0.9\left(m + 0.25\sqrt{d}\right)$

Lewis Factor, $Y = 0.484 - \frac{2.87}{Z}$

$$Fd = \frac{e.n_p.Z_p.b.r_p.r_g}{3259\sqrt{r_p^2 + 0.92\, r_g^2}} \times \cos\ \phi$$

Notations have usual meaning. **16**

OR

6. a) i) State purpose of providing lubrication in Gear Box.

ii) State different types of lubricant used.

iii) State modes of lubrication. **6**

b) The following data is given for a pair of helical gears made of steel :

Normal Module	=	5 mm
Face Width	=	50 mm
Number of pinion and Gear teeth	=	30 and 60
Centre distance	=	245 mm
Normal pressure angle	=	20°
Pinion Speed	=	1000 rpm
Permissible bending stress for pinion and gear material	=	150 N / mm^2
Surface hardness	=	300 BHN
Factor of safety and Service Factor	=	2.0 and 1.5

Grade of machining 8,

Determine :

i) Helix angle

ii) Beam Strength

iii) Wear Strength

iv) Dynamic Load by Spott's Equation

v) Power transmitting capacity

Use following data :

$e = 16.0 + 1.25\left[m_n + 0.25\sqrt{d}\right]$

Lewis Factor, $Y_p' = 0.3851$. **10**

SECTION – II

Unit No. 4

7. a) Differentiate between the static capacity and dynamic capacity of a ball bearing. What is their significance in the selection of the bearings ? **6**

   b) Differentiate between the Rolling and Sliding contact bearings with respect to following : **5**

      i) Magnitude of load
      ii) Nature of load
      iii) Speed
      iv) Life
      v) Frictional Loss.

   c) Explain the hydrodynamic bearings with neat sketch. **5**

OR

8. a) A single row deep groove ball bearing is subjected to the following work cycle.

Element No.	Fraction of Cycle	Radial Load 'Fr' kN	Thrust Load 'Fa' kN	Radial Factor 'X'	Thrust Factor 'Y'	Race Rotating	Service Factor	Speed in Rpm.
1	1/10	1.5	0.25	1.0	0	inner	1.2	400
2	1/5	1.0	0.75	0.56	2.0	outer	1.8	600
3	3/5	5.0	1.0	0.56	2.0	inner	1.5	700
4	Remaining	1.0	-	1.0	0	outer	2.0	800

If the desired rating life of the bearing is 12,000 hrs. select the bearing from the following. What is the average speed of bearing ?

Bearing No.	6011	6211	6311	6411
Dynamic Capacity 'C' kN	28.1	43.6	71.5	99.5

16

Unit No. 5

9. a) A multi cylinder engine is to run at a constant load at a speed of 600 rpm. On drawing the crank effort diagram to a scale of 1 mm = 250 Nm and 1 mm = 3°, the areas in sq. mm above and below the mean torque line are as follows :

   + 160, – 172, + 168, – 191, + 197, – 162 sq. mm

   The speed is to be kept within $\pm$ 1 % of the mean speed of the engine. Calculate the necessary moment of inertia of the flywheel.

   Determine suitable dimensions for cast iron flywheel with a rim whose breadth is twice its radial thickness. The density of cast iron is 7250 kg / m^3, and its working stress in tension is 6 MPa. Assume that the rim contributes 92 % of the flywheel effect. **12**

   b) Define the following term :

      i) Coefficient of fluctuation of speed. **2**

      ii) Coefficient of fluctuation of energy. **2**

OR

10. A single cylinder double acting steam engine develops 100 kW at a mean speed of 75 rpm. The coefficient of fluctuation of energy is 0.1 and fluctuation of speed is $\pm$ 2 % of mean speed. If the mean diameter of the flywheel is 2 meters and the hub and spoke provides 5 % of the rotational inertia of the wheel.

    Find : i) Mass of the flywheel.

    ii) Cross sectional area of the rim.

    Assume density of flywheel material as 7200 Kg / m^3. **16**

Unit No. 6

11. a) The tensile strengths of a population of 700 connecting rods are normally distributed with a mean of 450 N / mm^2 and a standard deviation of 50 N / mm^2. Determine :

i) The number of connecting rods having strength less than 395 N / mm^2 and

ii) The number of connecting rods having strength between 395 N / mm^2 and 595 N / mm^2.

Area under the normal distribution curve are given below :

Z	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
Area	0.3413	0.3849	0.4192	0.4452	0.4641	0.4772	0.4861	0.4918

Z	2.6	2.8	3.0
Area	0.4953	0.4974	0.4987

Assume linear interpolation for intermediate values. **12**

b) Explain the following terms used in statistical analysis of the engineering problems :

i) Mean ii) Variance

iii) Standard deviation iv) Standard variable. **6**

OR

12. a) Explain the difference between 'design tolerance' and 'natural tolerance'. How the designer would select the tolerance for the minimum rejection of the components ? **6**

b) Explain the following terms with suitable examples :

i) Functional requirement parameter.

ii) Unspecified and unlimited parameter.

iii) Material parameter.

iv) Limited parameter. **6**

c) What is adequate design and optimum design ? Explain with suitable examples. **6**

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T.E. (Production S/W) (Semester – II) Examination, 2011
MATERIAL FORMING AND MOULD DESIGN (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, if **necessary**.*
*6) **All** questions are c**ompulsory**.*

SECTION – I

1. a) Define true stress and true strain. **2**

   b) Calculate the ratio of true strain to engineering strain for the values of engineering strains of 0.001, 0.01, 0.02, 0.05, 0.1, 0.2 and 0.5.
   Also show for what values of engineering strain, true strains and engineering strains are equal. **10**

   c) Show that true strains are additive in nature. **4**

OR

1. a) Compare Tresca and Von Mises criterion. **4**

   b) The state of stress at a point is given by $\sigma_x = 120$ N/mm^2, $\sigma_y = 120$ N/mm^2, $I_{xy} = 35$ N/mm^2, what is yield stress according to tresca and Von Mises criterion. **8**

   c) Draw Mohr's circle for various three dimensional stress conditions. **4**

2. a) Explain forgeability and describe any one forgeability test in detail. **8**

   b) Explain following forging operations with neat sketch (**any two**) : **8**
   i) Drawing Down
   ii) Fullering
   iii) Edging
   iv) Powder Metallurgy.

OR

2. a) Explain in detail, effect of grain flow lines in forging. **8**

   b) Calculate work done in extruding an aluminium billet of 800 mm dia 1.5 m long to 8 square bars of 30 mm side. Flow stress of aluminium 60 N/mm^2, $\mu = 0.38$. If the process to be completed in 8 min, calculate power utilization. **8**

3. a) Show that the drawing stress in a wire drawing process is given by : **10**

$$\frac{\sigma_d}{\sigma_o} = \left(\frac{1+B}{B}\right)\left[\left(1-(1-RA)^B\right]\right.$$

   where σ_d = Drawing stress

   σ_o = Yield stress before Drawing

   R_A = Reduction in area.

   b) Calculate drawing load for 40% reduction in area of 50 mm×10 mm annealed mild strip using straight tapered die having semi-die angle 26.5°, coefficient offriction is 0.1, yield stress of material is 300 N/mm^2. **8**

OR

3. a) Explain wire drawing die with neat sketch. Also explain various zones of wire drawing die. **8**

   b) Explain how lubrication is carried out in wire drawing. **2**

   c) Write short notes on (**any two**) : **8**

   i) Explosive forming

   ii) Magnetic pulse forming

   iii) Electro hydraulic forming.

SECTION – II

4. a) For rolling process, show that : **8**

$$(\Delta h)^2_{max} \approx \mu 2 R$$

   where

   h = Draft in rolling

   μ = coefficient of friction

   R = Roll Diameter.

b) Determine maximum possible reduction for cold-rolling a 300 mm thick slab when coefficient of friction is 0.08 and roll diameter is 600 mm. What is the maximum reduction on same mill when $\mu = 0.5$ for hot rolling process ? **4**

c) Explain four high roll mill with neat sketch. **4**

OR

4. a) A wide strip is rolled to final thickness of 6.35 mm with a reduction of 30%. The roll radius is 500 mm and coefficient of friction is 0.2. Determine the location of neutral plane. **6**

b) A 0.1% Carbon Steel strip is 50 mm wide and 5 mm thick was rolled in one pass to 3.5 mm at 1060°C. When the homogeneous yield stress was 1.05 kN/ mm^2. The roll diameter was 340 mm. Find magnitude of rolling load, taking into account roll flattening, if rolls were made up of CI. Assume Young's modulus $E = 1.005$ MN/mm^2.

Poissons Ratio = r = 0.35. **10**

5. a) With the help of Chvorinov's equation, show that spherical casting has the maximum solidification time as compared to cubic casting and cylindrical casting. **12**

b) Explain following for casting process (**any one)** : **4**

i) Progressive and Directional solidification

ii) Elements of Gating system.

OR

5. Explain following for Die Casting Design (**any eight)** : **16**

i) Minimum wall thickness

ii) Undercuts and Ribs

iii) Comer radii and fillets

iv) Draft

v) Cored holes

vi) Combination die`

vii) Figure showing a typical Die-casting die

viii) Preheating of dies

ix) Die-lubrication and coatings

x) Design of cooling system.

6. a) Explain open die forging and closed die forging with explanatory sketch. **6**

   b) For design of simple die for forging (**any four)** : **12**

      i) Types of allowances and their consideration

      ii) Heat-transfer considerations

      iii) Inter-cooling system

      iv) Cam operated ejectors

      v) Determination of cavity shapes.

OR

6. Write short notes on following (**any three**) : **18**

   i) Type of ejectors in mould design

   ii) Injection molding of thermosetting plastic

   iii) Sketch showing mould construction

   iv) Cooling systems and heat transfer considerations for mould design.

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T.E. (Production Sandwich) (Semester – II) Examination, 2011
PRODUCTION AND INDUSTRIAL MANAGEMENT – II
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

SECTION – I

Unit – I

1. a) Explain Law of Demand. **6**
   b) Explain the functions of Material Management. **8**
   c) What are the different forms of Money ? **4**

OR

2. a) Write short note on Enterprise Resource Planning (ERP). **8**
   b) What are the objectives of Material Management ? **6**
   c) Explain Law of Diminishing Marginal Utility. **4**

Unit – II

3. a) Discuss the general considerations in selecting machining methods. **8**
   b) What is the role of product engineering department ? **8**

OR

4. a) Explain the phases of process planning. **8**
   b) What are the functions of process engineering ? **8**

Unit – III

5. a) Explain in brief basic manufacturing processes. **10**
   b) Define following :
      1) Allowance 2) Tolerance 3) Limits. **6**

OR

6. a) What is the Purpose and utilization of Tolerance chart ? **8**
   b) Explain Dimensional analysis. **6**
   c) Define Datum. **2**

P.T.O.

SECTION – II

Unit – IV

7. a) Discuss different type of control charts. **8**

   b) Discuss advantages of Statistical Quality Control. **8**

OR

8. a) Explain single and double sampling plan. **8**

   b) The values of sample means and the range for ten sample size of 5 given below. Draw mean and range chart.
   (Given : A2 = 0.58, D3 = 0, D4 = 2.11) **8**

Sample No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Means	43	49	37	44	45	37	51	46	43	47
Range	5	6	5	7	7	4	8	6	4	6

Unit – V

9. a) Discuss in detail 14 Deming Principles. **12**

   b) What is 5'S ? **4**

OR

10. a) Explain House of quality. **8**

    b) Explain Six Sigma. **8**

Unit – VI

11. a) What does the term "ISO" stand for ? And what is ISO 9000 ? **8**

    b) Explain Taguchi Method. **8**

    c) What is "continual improvement" ? **2**

OR

12. a) State advantage and disadvantages of ISO 9000. **8**

    b) Explain Failure Mode Effects Analysis (FMEA). **8**

    c) Define : Fault Tree Analysis (FTA). **2**

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T.E. Mechanical S/W. (Semester – II) Examination, 2011
THEORY OF MACHINES AND MACHINES DESIGN – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any 3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain function generation, path generation and body guidance. **6**

   b) A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below :

      i) To move outwards through 40 mm during 100° rotation of the cam

      ii) To dwell for next 80°

      iii) To return to its starting position during next 90°

      iv) To dwell for the rest period of a revolution i.e. 90°.

   Draw the profile of the Cam, when the line of stroke of the follower is offset by 15 mm towards right.

   The displacement of the follower is to take place with uniform acceleration and retardation. Determine the maximum velocity and the acceleration of the follower when the cam shaft rotates at 900 r.p.m. **12**

OR

P.T.O.

2. a) Explain the following terms as applied to cam.

   i) Pressure angle

   ii) Base circle

   iii) Pitch circle

   iv) Lift. **8**

   b) A four bar mechanism is to be designed by using three precision points, to generate the function, $y = x^{1.3}$ for the range $2 \leq x \leq 5$.
   Assuming 40° starting position and 120° finishing position for the input link and 90° starting position and 180° finishing position of the output link, find the values of x, y, θ and ϕ corresponding to three precession points. **10**

3. a) Explain holding torque in epicyclic gear trains. **4**

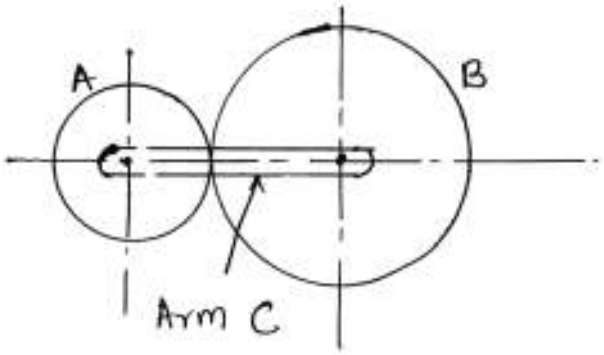
   b) A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and the contact ratio. **8**

   c) With a neat sketch explain 'Law of Gearing'. **4**

OR

4. a) Explain the phenomena of interference and undercutting. Also state the different methods to avoid it. **6**

b) In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B. **10**



5. a) Explain self locking and self energizing of brakes. **4**

b) A multi disc clutch has three discs on the driving shaft and two on the driven shaft. The outside diameter of the contact surfaces is 240 mm and the inside diameter 120 mm. Assuming uniform wear and coefficient of friction as 0.3, find the maximum axial intensity of pressure between the discs for transmitting 25 kW at 1575 r.p.m. **8**

c) Explain epicyclic train dynamometer. **4**

OR

6. a) Derive an expression for the torque transmitted by single plate clutch assuming

i) uniform pressure and

ii) uniform wear. **8**

b) A bicycle and rider of mass 100 kg are travelling at the rate of 16 km/hr on a level road. A brake is applied to the rear wheel which is 0.9 m in diameter and this is the only resistance acting. How far will the bicycle travel and how many turns will it make before it comes to rest ? The pressure applied on the brake is 100 N and $\mu = 0.05$. **8**

SECTION – II

7. a) A pair of spur gears with 20° full depth involute teeth consists of a 19 teeth pinion meshing with a 40° teeth gear. The pinion is mounted on a crankshaft of 7.5 kW single cylinder diesel engine running at 1500 RPM. The driven shaft is connected to a two stage compressor. The pinion as well as the gear are made of steel 40C8 (S_{ut} = 600 N/mm^2). The module and face width of the gears are 4 and 40 mm respectively.

   i) Using the velocity factor to account for the dynamic load, determine the factor of safety

   ii) If the factor of safety is 2 for pitting failure, recommend surface hardness of the gears

   iii) If the gears are machined to meet the specification of grade 8, determine the factor of safety for bending using Spott's equation.

   Data :

   i) Velocity factor :

      a) For v < 10 m/s, C_v = 3/ (3+v)

      b) For v < 20 m/s, C_v = 6/ (6+v).

   ii) Lewis form factor :

   Y = 0.175 – (0.841/T) for 20° involute system. **12**

   b) Derive an equation for the deflection of helical springs. **4**

OR

8. a) In the design of an elevator, 8 springs are arranged in parallel to absorb shock of impact, in case of failure. The elevator weighs 10 kN. Assuming a free fall of 1.5 m from rest, find the maximum stress in each spring is made of 25 mm diameter rod and has a spring index as 8. The number of active turns are 20 and the modulus of rigidity of the spring material is 83 GPa. **8**

   b) Derive an equation for beam strength of helical gears. **6**

   c) Explain Surging of springs. **2**

9. a) A multi-cylinder engine is to run at a speed of 600 RPM. On drawing the turning moment diagram to the scale of 1 mm = 250 N-mm and 1 mm = 3°, the areas above and below the mean torque line in mm^2 are : + 160, – 172, + 168, – 191, + 197, – 162

The speed is to be kept within ± 1% of the mean speed of the engine. Calculate the necessary moment of inertia of the flywheel. Determine the suitable dimensions of a rectangular flywheel rim if the breadth is twice its thickness. The density of the cast iron is 7250 kg/m^3 and its hoop stress is 6 MPa. Assume that the rim contributes 92% of the flywheel effect. **10**

b) Explain the construction and working of Centrifugal clutch with neat diagram. **6**

OR

10. a) Determine the main dimensions if a cone clutch and the axial thrust required from following data :

Power to be transmitted = 45 kW

Speed = 1440 RPM

Cone angle = 25°

Coefficient of friction = 0.2

Allowable intensity of pressure = 500 kN/mm^2

Width of Clutch face should not exceed $1/6^{th}$ minimum diameter of cone . **8**

b) Explain the following terms :

i) Maximum Fluctuation of speed

ii) Maximum Fluctuation of Energy

iii) Coefficient of Maximum Fluctuation of speed

iv) Coefficient of Maximum Fluctuation of Energy. **8**

11. a) A 30 seconds work cycle consists of the following two parts :

	Part I	**Part II**
Duration (seconds)	10	20
Radial Load (kN)	45	15
Axial Load (kN)	12.5	6.25
Speed (RPM)	720	1440

For this application, the static and dynamic load capacities of a single row deep groove ball bearings are 50 and 68 respectively. Calculate the life of the bearings in hours. **8**

b) Derive Reynold's equation in two dimensional form for Hydrodynamic journal bearings. **10**

OR

12. a) Write short note on following :

i) Dynamic load carrying capacity of rolling contact bearings.

ii) Lubrication of rolling contact bearings. **6**

b) The following data relates to a 360° hydrodynamic bearings :

Radial load	=	3.2 kN
Journal diameter	=	75 mm
Bearing length	=	75 mm
Journal speed	=	1490 RPM
Radial Clearance	=	50 microns
Viscosity of the lubricant	=	30 cP
Density of the lubricant	=	860 kg/m^3
Specific heat of the lubricant	=	1.76 kJ/kg°C

Assuming that the total heat generated in the bearing is carried away by the total oil flow in the bearing, calculate :

i) Minimum oil film thickness

ii) The coefficient of friction

iii) The power lost in friction

iv) The total flow rate of lubricant in LPM

v) The side leakage

vi) The temperature rise. **12**

Table 1 : Dimensionless Parameters for full Journal Bearing

L/d	**h_0/C**	**ε**	**S**	**(r/C).f**	**$Q/(rCn_sL)$**	**(Q_s/Q)**
1.0	0.6	0.4	0.264	5.79	3.99	0.497
	0.8	0.2	0.631	12.8	3.59	0.280
	0.9	0.1	1.33	26.4	3.37	0.150

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T.E. (Electrical) (Semester – I) Examination, 2011
ENGINEERING ECONOMICS AND MANAGEMENT(New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) Black figures to the **right** indicate **full** marks.*
*3) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*4) Answer **any one** question from **each** Unit.*

SECTION – I

Unit – I

1. a) Distinguish between proprietory firm and partnership firm. **8**
   b) Explain BOT and BOLT types of ownerships **8**

OR

2. a) Explain the concept of Elasticity of demand and Elasticity of supply with suitable examples. **8**
   b) Explain law of variable proportion in detail. **8**

Unit – II

3. a) Define Management. Explain contributions of F.W. Taylor in the field of Management. **8**
   b) Define and explain the concept of "organisation" in detail. **8**

OR

4. a) Explain the concept of Just-In-Time. **8**
   b) Explain ABC Analysis in detail. **8**

P.T.O.

Unit – III

5. a) What is online marketing ? Explain its importance in today's competitive era with suitable examples. **9**

   b) What is Marketing Research ? Explain process of Marketing Research. **9**

OR

6. a) Define and explain Financial management in detail. **9**

   b) Write a brief note on Mergers and Acquisitions with suitable examples. **9**

SECTION – II

Unit – IV

7. a) Explain various theories of group formation. **8**

   b) Define Conflict. Explain various measures to resolve conflict. **8**

OR

8. a) Explain various qualities of a Good leader. **8**

   b) Differentiate between Herzberg theory of motivation and 'X' and 'Y' theory of motivation. **8**

Unit – V

9. a) What is Performance Management ? How it can be used for Human Resources Development ? **8**

   b) Differentiate between on the Job and off the Job Training. **8**

OR

10. a) Briefly explain the concept of Labour Welfare. **8**

    b) Explain the importance of stress management. **8**

Unit – VI

11. Define Disaster Management ? Explain various phases of Disaster Management in detail. **18**

OR

12. Prepare a Disaster Management Plan for Earthquake and Tsunami. **18**

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T.E. (Electrical) (Semester – I) Examination, 2011
ELECTRICAL MACHINES – II
(2008 Pattern) (New)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) **Use** of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define voltage regulation for an alternator at full load. Is voltage regulation necessary ? **6**

b) A 15 KVA, 440V, 50Hz, 3-phase star connected synchronous generator has the DCC as given below.

I_f (A)	1.6	3.5	5	9	12	16
Voc (line, volts)	160	320	440	555	610	640

With full load zero power factor, the excitation required is 16A to produce 550V of terminal voltage. At short circuit 5A excitation is required to have full load current. Determine the voltage regulation for full load 0.8 p.f. lagging. **10**

OR

2. a) For a 5 MW, 11kV generator, out of the armature and the field winding which one should be rotary and which one stationary ? **6**

   b) What method should be used to determine armature leakage voltage drop and armature reaction mmf ? **6**

   c) Define short circuit ratio. Is it related to X_d. **4**

3. a) Draw vector diagram using Blondel's two reaction theory for a salient pole synchronous generator and find voltage regulation. **10**

   b) Explain characteristics of synchronous motor at constant excitation and variable load. **6**

OR

4. a) Two identical 3-phase alternators work in parallel and supply a total load of 1500 kW at a p.f. of 0.867 lagging. Each machine supplies half the total power. The synchronous reactance of each is 50Ω per phase and resistance is 4Ω per phase. The field excitation of first machine is so adjusted that its armature current is 50A lagging. Determine the armature current of second alternator and the generated voltage of first machine. **8**

   b) Derive expression for the synchronizing power per mechanical degree deviation of the rotor of a three phase generator working in parallel with infinite bus-bars and supplying lagging current. **8**

5. a) Why V/f method of speed control is preferred in the industry ? Is it necessary to keep the V/f ratio constant. Show the torque Vs slip characteristics for different frequencies. **12**

   b) As per IS : 325 write down name of the tests under

   a) Routine test and b) Type test. **6**

OR

6. a) What tests are required to be performed on a synchronous induction motor to determine the centre and radius of its circle diagram when working as synchronous motor with a constant d.c. excitation ? **10**

   b) Write in detail the operation of 3-phase induction motor as an induction generator. **4**

   c) Compare 3 phase synchronous motor with 3-phase synchronous induction motor. **4**

SECTION – II

7. a) Draw and explain vector diagram for compensated ac series motor. **8**

   b) The following data refer to a 240V, 2-pole uncompensated series motor when run on a 50 Hz 1-phase supply.

   Applied voltage = 240V, Input current = 1.5A, Input power = 198.75 W, field winding resistance = 8.8 Ω, armature resistance = 4.2 Ω, speed = 4800 rpm, the number of turns on field winding is 300 and the number of armature conductor is 1200. Leakage reactance drop is 20% of total reactive drop in the motor. Determine (i) induced voltage in armature (ii) field flux per pole (iii) armature flux per pole. **8**

OR

8. a) Compare uncompensated ac series motor with compensated single phase series motor. **8**

   b) Write procedure for plotting circle diagram for series motor. **8**

9. a) Write in detail the construction and operation of variable reluctance stepper motor. **8**

   b) What are causes of harmonic production in 3- phase induction motor ? Explain crawling phenomenon in induction motor. **8**

OR

10. a) Explain the construction and working principle of brushless d.c.motor. **8**

    b) List the methods to reduce harmonic effect in induction motor. Explain any one method in detail. **8**

11. a) Explain the cross-field theory applied to single phase induction motor. **8**

    b) The following data pertains to a 230V, 50 Hz capacitor-start single phase induction motor at standstill.

    Main winding alone = 100V, 2A, 40W

    Starting winding alone = 80V, 1A, 50W.

    Determine the value of capacitance for determining the maximum starting torque. **10**

OR

12. a) A 230 V, 50 Hz, 4-pole, class A, 1-ph I.M. has the following parameters at an operating temperature of 63°C. $r_{1m} = 2.51\,\Omega$, $r_2' = 7.81\Omega$, $x_m = 150.88\,\Omega$, $x_{1m} = 4.62\,\Omega$, $x_2' = 4.62\Omega$.

    Determine the main winding current and power factor when the motor is running at a ship if 0.05 at the specified temperature of 63°C. **10**

    b) Explain in detail, the tests to be conducted on single phase induction motor to determine the equivalent circuit parameters. Plot the equivalent circuit for the motor showing the parameters determined. **8**

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T.E. Electrical (Semester – I) Examination, 2011
POWER ELECTRONICS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the significance of dv/dt, di/dt, i^2t rating of SCR. **6**

   b) Draw gate drive circuit for GTO. Discuss switching characteristics and give comparison between SCR and GTO. **10**

OR

2. a) Draw gate characteristics of SCR. Explain how value of gate voltage and gate current can be selected. **8**

   b) Explain and compare R and RC firing circuit for SCR. **8**

3. a) Explain three phase semi converter feeding RL load with freewheeling diode. Draw output voltage and current waveforms for $\alpha = 45°$ and $\alpha = 90°$. What is requirement of circuit for continuous conduction. **10**

   b) Explain single phase dual converter. Draw waveforms for output voltage at $\alpha = 30°$ and $\alpha = 120°$. Comment on mode of operation of 1ϕ dual converter at 30° and 120°. **8**

P.T.O.

OR

4. a) Explain single phase two pulse mid point converter. Draw necessary waveforms for $\alpha = 45°$. **6**

   b) Explain single phase two pulse bridge converter feeding RL load with free wheeling diode. Draw output voltage waveforms at $\alpha = 60°$. **6**

   c) Explain 3ϕ dual converter. Also state the difference between circulating and non-circulating mode of operation. **6**

5. a) For circuit shown sketch the waveforms for two cycles of supply voltage, supply current, load voltage and load current for a firing angle of about 45° for the two thyristors.

   In case diode D, gets open circuited, draw load current waveforms. **8**

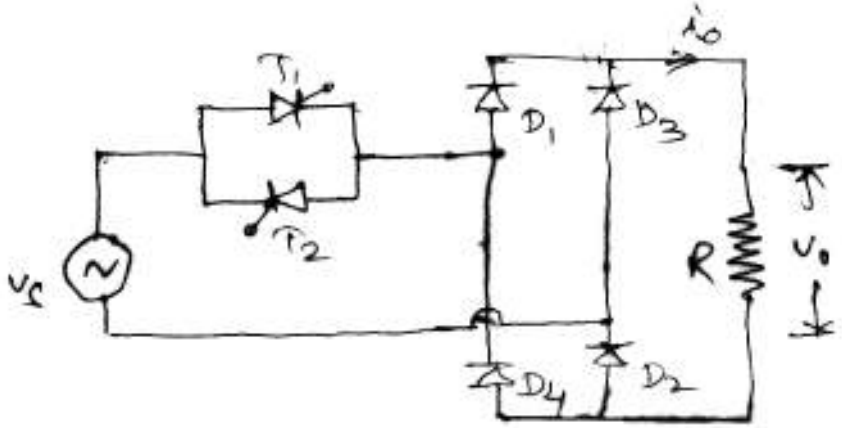

Fig. Que. 5a)

   b) Describe the working of a two stage sequence control of voltage controllers for R load. What is the advantage of this controller over 1ϕ full wave voltage controller. **8**

OR

6. a) Explain four mode of operation of TRIAC and also describe the triggering circuit using DIAC. **8**

   b) Discuss various technique adopted for protection of TRIAC and DIAC. **8**

SECTION – II

7. a) Draw output and transfer characteristics of MOSFET and explain the terms : **8**

   i) Pinch off voltage

   ii) Threshold voltage

   iii) Transconductance.

   b) What are the gate drive requirements of MOSFET and IGBT ? **8**

OR

8. a) Explain switching characteristic of IGBT and compare MOSFET and IGBT. **8**

   b) Explain turn on and turn off process in MCT. State its Merits. **8**

9. a) Explain working of type A chopper feeding RL load with help of neat circuit diagram. Draw the output voltage and current waveforms. Derive expression for average output voltage. **8**

   b) What is “Duty Cycle Control” of a chopper ? How PWM and FM control is used ? Compare. **8**

OR

10. a) Explain working of class E chopper feeding a motor load with help of circuit diagram. **8**

    b) A chopper is feeding inductive load with R = 4 Ω and L = 6 mH from 200 V source at 50% duty operating at frequency of 1 KHz. Find :

    i) Minimum and maximum load current

    ii) Maxi. peak to peak ripple in load current

    iii) Average load current. **8**

11. a) Explain working of single phase transistorised bridge inverter to supply variable voltage variable frequency output. How frequency can be controlled ? Draw output voltage and current waveforms for inductive load. **9**

    b) What are the techniques used for control of harmonics in output voltage of 3 phase inverter ? Explain. **9**

OR

12. a) Explain working of 3 phase transistorised bridge inverter feeding a 3 phase resistive star connected load with 120° mode of conduction. Draw relevant waveforms for control signals and output voltages (line voltage). **10**

    b) Explain sinusoidal PWM technique used in inverter circuits. What is the significance of modulation indices and pulse number for control of output voltage ? **8**

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T.E. (Electrical) (Semester – II) Examination, 2011
UTILIZATION OF ELECTRICAL ENERGY (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II.***
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*7) Assume **suitable** data, if **necessary.***

SECTION – I

1. a) Describe resistance heating methods and its temperature control. **8**

   b) Describe the construction and working of Ajax Wyatt induction furnace. **8**

   OR

2. a) Explain in brief the following welding methods : **8**
      i) Electric Arc Welding
      ii) Resistance Welding.

   b) A 15 kW, 220 V, single phase, resistance oven employs Nickel-Chrome wire for its heating elements. If the wire temperature is not to exceed 1000° C and the temperature of the charge is to be 600° C, calculate the diameter and length of wire. Assume radiating effiency to be 0.6 and emmissivity as 0.9. For Nickel-Chrome, resistivity is 1.016×10^{-6} ohm-meter. **8**

3. a) Explain the factors on which quality of electro-deposition depends. **8**

   b) Write short note on : **8**
      i) Electroplating

   OR

4. a) Give the brief description of vapour compression refrigeration cycle. **8**

   b) Explain the electrical circuit used in refrigerator. **8**

5. a) Explain with a neat sketch the construction, working of a sodium vapour lamp. **8**

   b) A drawing hall of 40 m × 25 m × 6 m is to be illuminated with metal filament gas filled lamps to an average illumination of 90 lm / m^2, on a working plane 1 meter above the floor. Estimate suitable number, size and mounting height of lamps. Sketch spacing layout. Assume coefficient of utilization of 0.5, depreciation factor of 1.2 and space to height ratio of 1.2. **10**

Sr. No.	Size of lamps (Watts)	Luminous efficiency (lm / w)
1	200	16
2	300	18
3	500	20

OR

6. a) Describe with neat sketches, types of electrical light fittings used for illumination. **6**

   b) State and explain laws of illumination. **6**

   c) Discuss various factors which have to be considered while designing any lighting scheme. **6**

SECTION – II

7. a) Compare - Steam engine drive and Electric drive. **8**

   b) Describe D.C. system, single phase low frequency A.C. system for electric traction. **8**

OR

8. a) Draw a block diagram of electric locomotive and describe function of each part. **8**

   b) Describe 3 phase low frequency A.C. systems, composite systems for traction. **8**

9. a) State and explain the factors affecting the coefficient of adhesion. **8**

   b) An electric train weighing 250 Tonne has 8 motors geared to driving wheel. Each wheel has diameter of 90 cm. Determine the torque developed by each motor to accelerate the train to a speed of 40 kmph in 28 seconds up a gradient of 1 in 200. The tractive resistance is 48 Nm / Tonne. The effect of rotational inertia is 10 % of the train weight. The gear ratio is 4 : 1 and gearing efficiency is 80 %. **8**

OR

10. a) What is speed time curve in electric traction. Draw trapezoidal speed time curve and describe different sections in it. **8**

    b) A speed time curve of a train consists of uniform acceleration of 6 kmphps for 21 sec, free running for 10 min. and uniform retardation of 6 kmphps for stopping the train. The stop time is 5 min. Calculate distance between the two stations, Average speed, Schedule speed. **8**

11. a) Explain the suitability of D.C. series motor for traction. **6**

    b) What is meant by route relay interlock ? How it is achieved ? **6**

    c) Two Dc series motors operate on 600 volt supply are started by series-parallel transition method. Each motor takes a current of 400 Amp during starting time of 20 sec and has a total resistance of 0.1 ohm. Calculate :

       i) Energy lost in starting resistance
       ii) Energy lost in two motors
       iii) Motor output
       iv) Total energy input from line
       v) Efficiency of starting. **6**

OR

12. a) Derive the expression for energy lost and efficiency for series parallel control of two DC series motor. **6**

    b) Explain the difficulties involved in braking of D.C. series motor. **6**

    c) Write a short note on anti-collision system used for trains. **6**

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T.E. (Mechanical S/W) (Semester – II) Examination, 2011
MECHATRONICS
(2003 Course)

Time : 3 Hours Total Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the measurement system with a neat sketch of block diagram. **5**
   b) Distinguish between the following :
      i) Repeatability and Reproducibility
      ii) Resolution and threshold. **6**
   c) Compare the characteristics of any two pressure measuring devices. **5**

OR

2. a) Discuss the advantages and limitations of hot wire anemometer. **5**
   b) Explain the following terms :
      i) Precision
      ii) Hysteresis. **6**
   c) Explain with a neat sketch the principle and working of Mcleod gange. **5**

3. a) Differentiate between incremental optical encoder and absolute optical encoder. **8**
   b) Derive the expression for Gauge Factor used in strain gauge. **4**
   c) Explain capacitance type level measurement transducer. **4**

OR

P.T.O.

4. a) Explain various types of strain gauge circuits used for measurement of strain. **8**

   b) Explain with a neat sketch the working principle of load cells and its various types. **8**

5. a) Explain the significance of mathematical models with suitable example. **9**

   b) Distinguish between feed back control system and feed forward control system with suitable example. **9**

OR

6. a) Explain fluid system building blocks. **5**

   b) Differentiate between open loop control system and closed loop control system with suitable example. **8**

   c) Write a short note on transfer function. **5**

SECTION – II

7. a) Compare dynamic responses of first order and second order systems to different inputs. **8**

   b) Explain proportional + Derivative control action. **8**

OR

8. a) Explain any two proximity switches. **6**

   b) Explain P + I + D control action. **5**

   c) Write a short note on Bode plots. **5**

9. a) State typical op-amp specifications. **5**

   b) Compare A/D converter and D/A converter. **6**

   c) Explain master slave flip flop. **5**

OR

10. a) Write a short note on :
    i) IC 555 timer
    ii) Schmitt trigger
    iii) JK flip flop. **12**

    b) Explain integrator and differentiator op.amp. **4**

11. a) Differentiate between PLC and Relays. **6**

    b) Explain the various criteria's for selection of PLC's. **6**

    c) Write a short note on Ladder diagram. **6**

OR

12. a) Explain the basic elements of PLC. **5**

    b) Write a short note on micro controller. **4**

    c) Write a ladder diagram for the following logic functions : **9**
    i) AND
    ii) OR
    iii) NOR

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T.E. (Electrical) (Semester – II) Examination, 2011
CONTROL SYSTEM – I (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

SECTION – I

1. a) Discuss feedback characteristics of control system in respect of
   i) sensitivity ii) disturbance signal
   iii) system gain and iv) system stability **8**

   b) Derive the transfer function of the electrical network as shown in Fig. 1b. Sketch the pole zero map if given L = 1 h, R_1 = 10 Ω, R_2 = 20Ω and C = 1 F. **8**

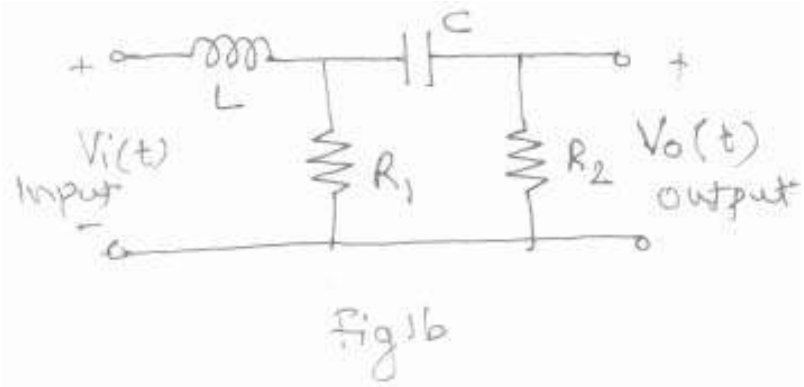

Fig 1b

OR

2. a) Find the transfer function $\frac{X_2(s)}{F(s)}$ of the mechanical system shown in fig 2.a. Also, using force voltage analogy draw equivalent electrical circuit. **8**

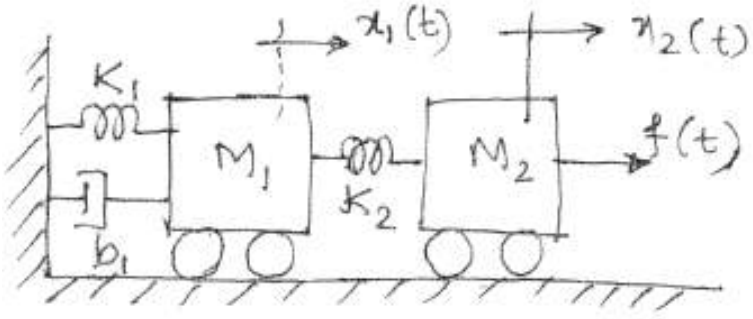

fig 2.a

P.T.O.

b) Find $\left(\frac{C}{R}\right)$ of the signal flow graph shown in fig. 2b using Mason's gain formula. **8**

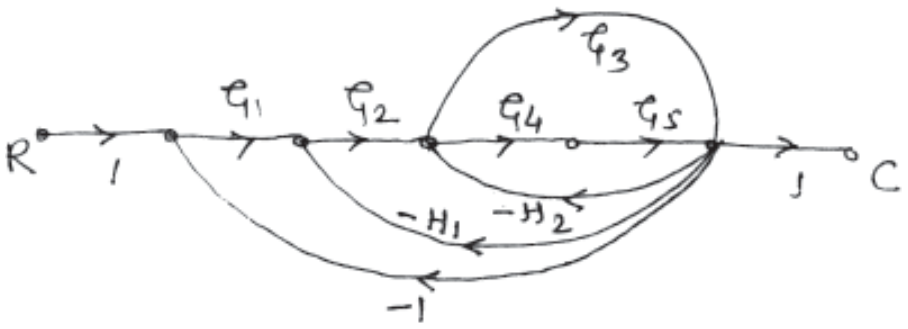

Fig 2b

3. a) What are standard test signals used in time domain analysis. Derive steady state errors and static error, coefficients for type '0', type '1' and type '2' systems. **8**

b) For a system with $G(s)H(s) = \frac{5}{S+5}$, calculate the generalised error coefficients and steady state error. The input to the system is r(t) = 6 + 5t. **8**

OR

4. a) For a second order and underdamped system, sketch the time response and explain all the specification of the time domain. **8**

b) For a system having $\frac{C(s)}{R(s)} = \frac{20}{S^2 + 7s + 25}$, find its time response specifications, namely i) Delay time ii) Rise time iii) peak time iv) peak overshoot and v) settling time. **8**

5. a) Briefly explain the terms : **4**

i) BIBO stability ii) Marginal stability
iii) Asymptotic stability iv) Conditional stability

b) State and explain Routh-Hurwitz stability condition. **6**

c) The characteristic equations of two systems are given as
i) $s^4 + 6s^3 + 21s^2 + 36s + 20 = 0$ ii) $s^5 + 6s^4 + 3s^3 + 2s^2 + s + 1 = 0$

Find whether the systems are stable or not using Routh Hurwitz Criteria. **8**

OR

6. a) Explain Magnitude condition and angle condition theories. How these are useful in Root-locus technique used for stability analysis. **6**

b) Sketch the root locus for the system having $G(s)H(s) = \frac{K}{s(s+1+j)(s+1-j)}$ with k > 0 from the root locus sketch, determine **12**

i) Stability ii) Marginal value of K

iii) Gain margin if design value of K is 2.5.

SECTION – II

7. a) State and explain (i) Gain cross-over frequency (ii) Phase crossover frequency (iii) Gain Margin and (iv) Phase margin. Also discuss how stability analysis is made from above calculations in frequency response plots. **6**

b) Open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{100(1+0.1s)}{s(1+0.2s)(1+0.5s)}$$

Sketch the bode plot and determine: i) W_{gc} ii) W_{pc} iii) GM iv) P.M. Comment on system stability. **12**

OR

8. a) State and explain Nyquist stability criterion. **4**

b) Sketch the polar plot for a given open loop transfer function $G(s)H(s) = \frac{10}{s(s+1)(s+3)}$.

Find Gain margin and determine stability of the system. **6**

c) The open loop transfer function of a unity feedback system is

$$G(s)H(s) = \frac{100}{s(s+5)(s+2)}$$

Sketch Nyquist plot. Using Nyquist stability criterion determine stability. **8**

9. a) Explain the following terms related to state space representation of control system **4**

i) State variable ii) State equations

iii) State space and iv) State vector

b) State the advantages of state space representation over transfer function representation. **4**

c) Determine state space model of the network shown in fig 9 c. **8**

Choose state variables as i) current through 'L' and ii) voltage across C.

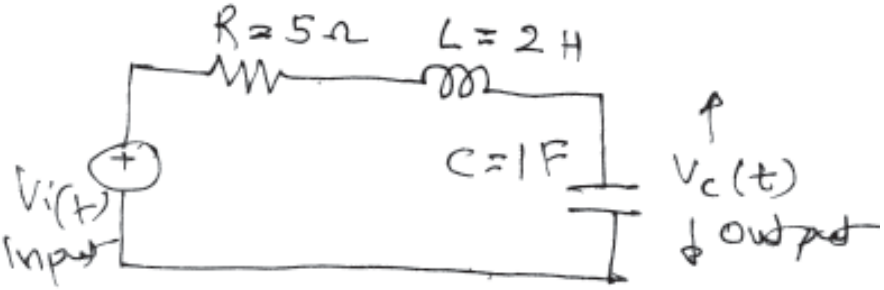

Fig 9c

OR

10. a) Given the transfer function $\frac{y(s)}{v(s)} = \frac{2}{s^3 + 2s^2 + 4s + 8}$ obtain the state space representation. Draw state diagrams. **8**

b) The state equations of a LTIV system are given by $[\dot{X}] = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} [x] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ and Y = [1 0] [x]

Determine transfer function of the system. **8**

11. a) Explain with functional block diagram, the transfer function , characteristics and applications of i) PD controller ii) PI controller. **8**

b) Write short note on characteristics, design and applications of 'Lead compensation network. **8**

OR

12. With necessary sketches and equations discuss the following control system components

a) DC servomotor **4**

b) Synchros **6**

c) Potentiometers (as error detectors) **6**

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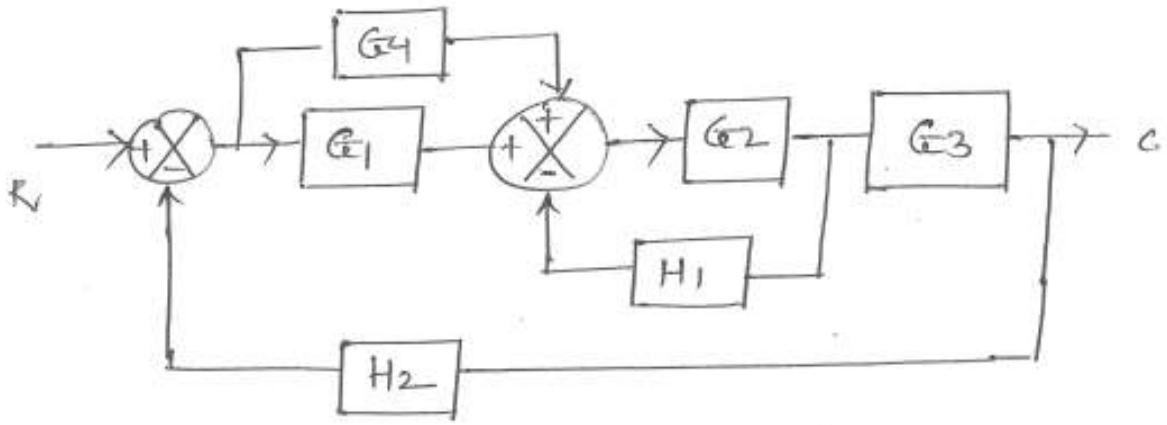
T.E. (Electronics) (Semester – I) Examination, 2011
FEEDBACK CONTROL SYSTEMS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers of the **two** Sections should be written in **separate** answer book.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** carry **full** marks.*
*4) Use of algorithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam table are **allowed**.*
*5) Assume suitable data **wherever** felt necessary.*

SECTION – I

1. a) Draw the SFG for the given block diagram and from that obtain the transfer function $\frac{C(s)}{R(s)}$ using Manson's gain Formula. **8**

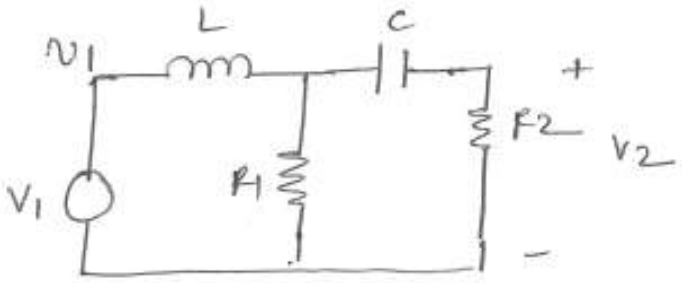


b) List and explain the advantages and disadvantages of open and closed loop control system. Give one example of each. **8**

OR

P.T.O.

1. a) Write a block diagram to describe the electrical circuit given in fig. and determine the T.F. using signal flow graph. **8**



b) Represent the armature controlled DC motor with a block diagram and derive its transfer function. **8**

2. a) An unity feedback system has a loop T.F

$$G(s) = \frac{10\,(s+1)}{s\,(s+2)\,(s+5)}.$$ **10**

Determine :

1) Stability gain
2) Ramp, step parabolic error coefficient
3) Steady state error when r (t) = 3 + 10t.

b) Find the range of K for stability for a unity feedback system. Also find k_{max} and w_{max} when $G(s) = \frac{k(1+s)^2}{s^3}$. **6**

OR

2. a) A second order system is given by

$$\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}.$$ **8**

Find its Rise Time, Peak time, Peak overshoot, Settling time if subjected to unit step input. Also calculate the expressions for its output response.

b) Sketch the root locus at the following open loop function and comment on the stability :

$$G(s).H(s) = \frac{K}{s^2 + 2s + 2}.$$ **8**

3. a) State and explain “Mapping therom”. **6**

   b) Determine the value of gain K for a unity feedback system having

$$G(s) = \frac{K}{s(s+1)(0.1s+1)}.$$ **12**

   so that gain margin is 15 dB. Use bode plot technique.

OR

3. a) For a certain control system

$$G(s)H(s) = \frac{K}{s(s+2)(s+10)}$$

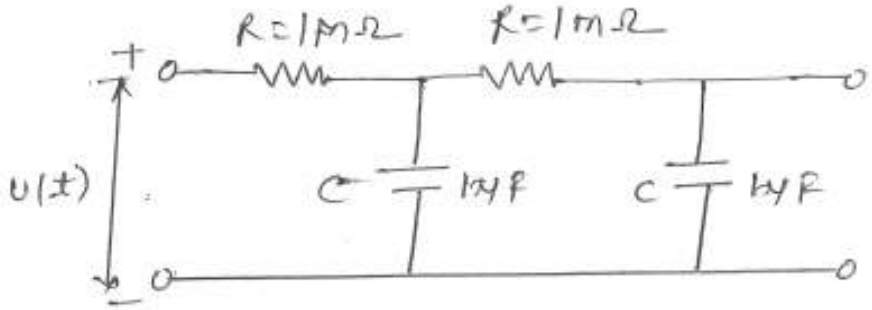
   Sketch the Nyquist plot and hence calculate the ranges of values of K for stability. **10**

   b) State the merits and demerits of the Routh’s methods. **4**

   c) Write a short note on frequency domain specifications. **4**

SECTION – II

4. a) Obtain the state model for the given Electrical network shown in Fig. Choose $v_1(t)$ and $v_2(t)$ as state variables. **8**



   b) Obtain the state transition matrix for the system expressed as **8**

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} -1 & 1 & 0 \\ 0 & -1 & 1 \\ 0 & 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

OR

4. a) Find out transfer function of state model given by

$$\dot{X} = A\overline{X} + Bu$$

$$Y = C\overline{X} + Du$$

where

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -3 \end{bmatrix} B = \begin{bmatrix} 3 \\ -6 \\ 3 \end{bmatrix} C = [1\ 1\ 1]\ 0 = [0].$$ **8**

b) Evaluate the controllability and observability of the following state models.

a) $A = \begin{bmatrix} -2, & 1 \\ 1 & -2 \end{bmatrix} B = \begin{bmatrix} 1 \\ 0 \end{bmatrix} C = [1, -1]$

b) $A = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix} B = \begin{bmatrix} 1 & 0 \\ 1 & 2 \\ 2 & 1 \end{bmatrix} C = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 5 \end{bmatrix}.$ **8**

5. a) Draw and explain the Ladder diagram for the system having the following specifications :
   1) Tank level control system in which a bottle is filled by the outlet valve. **12**
   2) The bottles are coming for filling one after other periodically.
   3) Assume 1 min for initialization.

   b) Justify the statement PLC is a sequence controller. **4**

OR

5. a) A small Electric Furnace has two heating elements when switched on, First element starts and after 2 minutes 2nd starts. A temp. sensor is used to shunt down the furnace if over heating occurs. Draw the ladder diagram. **6**

   b) Define the following : **6**
   1) Proportional Band
   2) Integral gain
   3) Derivative gain.

   c) Sketch the response of a PID controller for
   1) Unit step input
   2) Unit ramp input. **4**

6. a) Explain various fuzzy operations. **6**
   b) Expain the practical process control using fuzzy logic controller. **6**
   c) Write short note on artificial neuron. **6**

OR

a) Explain various types of neural networks used in control system. **6**
b) What are the advantages of fuzzy controller over PIN controller ? **6**
c) Explain the Architecture of fuzzy controller. **6**

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T.E. Electronics (Semester – I) Examination, 2011
DATA COMMUNICATION (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections must be written in **separate** sheets.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data; **if necessary.***

SECTION – I

1. a) Explain following processes with neat diagram : **8**
   i) Stationary Random Process
   ii) Non-Stationary Random Process
   iii) Wide Sense Stationary Process
   iv) Ergodic Process

   b) Explain following terms : **8**
   i) Mean Value
   ii) Power Spectral Density (PSD)
   iii) Correlation Functions
   iv) Variance of Random variable

OR

2. a) Show that if a wide sense stationary process X(t) is passed through a LTI filter with impulse response h(t) then its output has constant mean square value. **8**

   b) Explain various probability distribution functions. **8**

P.T.O.

3. a) Explain the properties of various line formats ? Compare RZ, NRZ formats on the basis of above properties along with their merits and demerits. **8**

   b) Define Scrambling and Descrambling with their importance in digital communication. **8**

OR

4. a) Explain with neat diagram Inter Symbol Interference (ISI) and Eye Diagram. **8**

   b) What is a synchronizer ? Explain any one type of bit synchronizer. **8**

5. a) Determine the encoded message for the following 8-bit data codes using the following CRC generating polynomial $P(x) = x^4 + x^3 + x^0$: **10**

      i) 11001100 ii) 01011111

   b) Explain ARQ system in detail. **8**

OR

6. a) Find out the generator matrix for a systematic (7, 4) cyclic code if $G(p) = p^3 + p + 1$. Also find the parity check matrix. **8**

   b) What are convolutional codes ? How they are different from block codes. **4**

   c) Calculate throughput efficiencies of all the three ARQ systems if $T_w = 10$ μsec, $p = 0.99$ and $T_1 = 40$ μsec. The retransmission time in the go back N system is same as idle time in stop and wait system. BCH (1023, 973). code is used. **6**

SECTION – II

7. a) Explain entropy with its mathematical analysis. **6**

   b) An analog signal is band limited to BHz and sampled at Nyquist rate. The samples are quantized into 4 levels. Each level represents one message. Thus there are 4 messages. The probabilities of occurrence of these messages are $p_1 = p_4 = 1/8$ and $p_2 = p_3 = 3/8$. Find out information rate of source. **6**

   c) Channel capacity is given by :

$$C = B \log_2\left[1 + \frac{S}{N}\right]$$

In the above equation when the signal power is fixed and white Guassian noise is present, the channel capacity approaches the upper limit with increase in bandwidth 'B'. Prove that this upper limit is given as :

$$C_\infty = \lim_{B \to \infty} C = 1.44 \frac{S}{N_o}.$$ **6**

OR

8. a) Explain various channels along with their models. **10**

   b) State and explain all the three Shannon's theorems of information theory. **8**

9. a) Explain with the help of neat block diagram QPSK transmitter and receiver. Also give the mathematical analysis. **8**

   b) Compare the error probabilities for ASK and BFSK. **8**

OR

10. a) Explain with the help of neat block diagram 16 bit QAM transmitter and receiver. Also give the mathematical analysis. **8**

    b) Binary data transmitted at a rate of 25 Mbps over a channel whose bandwidth is 10 MHz. Find energy per bit at the receiver input for a coherent BPSK and DPSK to achieve error probability $P_c \leq 10^{-4}$. Assume $N_o/2 = 10^{-10}$ W/Hz. **8**

11. a) A FHSS system has following parameters : **8**

    i) No. of bits/symbol = 4

    ii) No. of symbols/hop = 4

    Calculate processing gain of the system.

    If the above system is changed to SHSS with following parameters :

    i) No. of bits/symbol = 4

    ii) No. of symbols/hop = 7

    Calculate processing gain of the SHSS.

    b) Explain the working of DSSS transmitter and receiver. **8**

OR

12. a) A PN sequence is generated using a feedback shift register of length m = 4, the chip rate is 107 chips/sec. Find the following parameters :

    i) PN sequence length

    ii) Chip duration of the PN sequence

    iii) PN sequence period. **8**

    b) Compare various multiplexing and multiple access techniques with relevant diagrams. **8**

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T.E. Electronics (Semester – I) Examination, 2011
MICROCONTROLLERS
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer any **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
6) Assume suitable data, if necessary.

SECTION – I

1. a) Distinguish microprocessor and Microcontroller. **8**

   b) Discuss briefly features of Microcontroller resources, resources in advanced microcontroller and next generation microcontroller. **8**

OR

2. a) Draw block diagram of Microcontroller Architecture and explain. **8**

   b) Discuss the Havard and Von-Neuman architecture. **8**

3. a) Explain the memory mapping of 8051. **8**

   b) Explain the timer/counter control logic with neat diagram. Explain the timer modes also. **8**

OR

P.T.O.

4. a) Explain the Special Function Registers (SFRs). Also elaborate stack and its functioning. **8**

   b) Explain handshaking signals for RS-232. Explain serial communication in micro controller. **8**

5. a) Explain the different addressing modes with an example for 8051. **8**

   b) Write an assembly language program to check status of bit 0 and bit 5, make these 'logically 1' and save it in Ro. **10**

OR

6. a) Explain the following instructions in detail : **10**
   i) JNB
   ii) JNC
   iii) ORL
   iv) ANL
   v) CPL

   b) Compare the emulator and simulator. **8**

SECTION – II

7. a) Explain the bus standard
   i) RS – 232
   ii) RS – 485. **8**

   b) Interface the Digital-to-Analog converter. Draw the interfacing diagram with 8051 and write an assembly language program for conversion. **8**

OR

8. a) Interface the keyboard to 8051 and write the routine for keyboard debouncing. **10**

   b) Write an assembly language program to generate square wave. **6**

9. a) Explain the features of PIC 18F XXXX series also discuss the features of RISC architectures in PIC. **10**

   b) Explain the Watch Dog Timer (WDT) in microcontroller. **6**

OR

10. a) Discuss in detail Maskable and Non-maskable interrupt for PIC. **8**

    b) Discuss in brief microcontroller based system design. **8**

11. Design a system to generate clockwise rotation pattern by animation on LED. Key Ks toggles the direction pattern from clockwise to anti clockwise or vice versa using the µc-89C2051. Draw the interface diagram, flow-chart and write the assembly language program. **18**

OR

12. Design a Robotic system which on experiencing an obstacle reverses its direction of motion. On learning about the obstacle, it is indicated by red LED and starts oscillating between start point-obstacle point automatically even if obstacle is not physically present. **18**

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T.E. (Electronics) (Semester – I) Examination, 2011
POWER ELECTRONICS (New)(2008 Pattern)

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **All** questions carry **equal** marks.*

SECTION — I

1. a) What are phase controlled converter ? Explain with circuit diagram and waveforms, working of 3 phase full controlled converter using RL load. Comment power factor. Deduce the equation for DC load voltage. **10**

b) An armature circuit of (RLE load) of separately excited DC motor is fed from 3 phase full controlled converter. The i/p ac line is V line = 148 V, Ra = 0.06Ω La= 0.85 mH Ia (rated) = 150 A, Va (rated) = 200V find V_0 and α

when

i) E = 160V

ii) E = 160 V at 200/- rated Tq.

iii) E = –109V at 200/- rated Tq. **8**

OR

2. a) What is the necessity of dual converters ? Explain with circuit diagram and waveforms, working of 1 phase dual converter with highly inductive load. Deduce the equation for Icr. **10**

b) 1 phase dual converter is operated from a 120 V, 60Hz supply and load resistance is R = 10Ω. The circulating inductance is Lc = 40 mH. Delay angles are $\alpha_1 = 60^\circ$ and $\alpha_2 = 120^\circ$. Calculate the peak circulating current and peak count of converter L. **8**

P.T.O.

3. a) What are choppers ? Explain with circuit diagram and waveforms working of 2 quadrant chopper (set up). **10**

   b) What is SMPS ? Explain. **6**

OR

4. a) What is reversible drive ? Explain with diagram and waveforms working of 4 quadrant chopper. **10**

   b) Explain choppers are preferred over phase controlled converters in power control application. **6**

5. a) What are Resonant converters ? Explain with circuit diagram and waveforms working of ZVS. **10**

   b) Compare Linear, Switched mode and Resonant converters. **6**

OR

6. a) What is AC to AC converter ? Explain with diagram and waveform working of 1ϕ cycloconverter. State its merits and demerits. Justify why it is not popular. **10**

   b) Explain with circuit diagram working of ZCS. **6**

SECTION – II

7. a) What are DC to AC converters ? Explain with circuit diagram and waveforms working of 3ϕ voltage source Inverter with 180° conduction mode with purely resistive load. **12**

   b) Why transistorised inverters are prefered over thyristerised inverter ? Justify. **4**

OR

8. a) What is invertor ? Explain with circuit diagram and waveforms working of 3ϕ VSI with 120° conduction mode with R-load (star connected). **10**

   b) What are harmonics ? Explain at least one type of Harmonic reduction technique. **6**

9. a) Explain with diagram following cooling systems. **8**
   i) forced cooling ii) Liquid cooling.

   b) What are protection circuits ? Explain. **4**

   c) What is MOV ? Explain. **4**

OR

10. a) What is electronic ballast ? Explain with its circuit diagram and characteristics. **10**

   b) What is HVDC ? Explain. **6**

11. a) What are different types of P.f improvement technique ? Explain with circuit diagram and waveform any one type. **10**

   b) What is the difference between free wheeling and feedback diode ? Explain. **4**

   c) What is the basic cause for poor p.f. in converters ? Explain. **4**

OR

12. a) What are different types of power line disturbances ? Suggest its preventive remedies. **8**

   b) Write short notes on **any two** : **10**
   i) H.F. heating
   ii) Avalanche diodes.
   iii) DC -CT/PT
   iv) Friac based power controllers.

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T.E. (Electronics) (Semester – II) Examination, 2011
SENSORS AND INTERFACES (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) **Assume** suitable data, **if necessary**.*

SECTION – I

1. a) Explain the following characteristics of measurement system.
   i) Accuracy
   ii) Resolution
   iii) Repeatability
   iv) Sensitivity. **4**

   b) Explain selection criterion for choosing a transducer for a particular measurement application. **4**

   c) Explain any two level measurement techniques. **8**

OR

2. a) What is a proximity switch ? Explain any two types of proximity switches. **8**

   b) Explain with neat diagram working of a combination type pH electrode. **8**

3. a) Design a signal conditioning circuit for a temperature measurement system using PT 100 RTD, Wheatstone's bridge and three OP-AMP instrumentation amplifier. The circuit should give 0 to 5V output for a temperature range of 0 to 100°C. **8**

   b) Explain with neat diagram working of a loop powered 4-20 mA transmitter. **8**

OR

P.T.O.

4. a) Explain with neat diagram I/P converter and also explain its input output characteristics. **8**

   b) State important features of a SMART transmitter and explain its working with a block diagram. **8**

5. a) Enlist the features of PIC micro controller. Draw and explain interface of matrix keyboard with PIC 16 F 84. **10**

   b) State the different types of ADC and state their specifications. **8**

OR

6. a) Enlist the features of 8051 series microcontrollers. Draw and explain interfacing of following devices with 89C51 microcontroller.

   i) ADC ii) Electromechanical relay. **10**

   b) Enlist different types of DAC and give performance parameters for selection of DAC. **8**

SECTION – II

7. a) Explain role of HART communication protocol in process control networks along with its modes of operation. **8**

   b) Write a short note on IEEE 488 bus. **8**

OR

8. Write short notes on :

   i) Foundation field bus

   ii) I^2C bus. **16**

9. a) Draw control valve characteristics. Explain the following terms related to control valve characteristics.

   i) Quick opening

   ii) Equal percentage

   iii) Linear. **8**

   b) Explain principle of operation of stepper motor. State important selection criterion of stepper motor. **8**

OR

10. a) Draw and explain the symbols of following pneumatic valves.
    i) 2 × 2 valve
    ii) 3 × 2 valve
    iii) 4 × 2 valve
    iv) Pressure limiting valve. **8**

    b) Design a lift system to move the load up and down using pneumatic actuators. **8**

11. a) Sketch common notations for PLC ladder diagram.
    i) Double pole push button
    ii) Motor
    iii) Temperature limit switch
    iv) Level limit switch
    v) Pressure limit switch
    vi) Relay contact normally closed. **6**

    b) Explain the term scan time of a PLC. Develop a PLC ladder diagram for a pneumatic cylinder sequencing.
    i) Cylinder A extends (A+)
    ii) Cylinder B extends (B+)
    iii) Cylinder A retracts (A–)
    iv) Cylinder B retracts (B–) **12**

OR

12. a) Give important specifications and selection criterion of a PLC. **8**

    b) With suitable assumptions draw the block diagram of a bottle filling plant and develop a PLC ladder diagram for the automatic operation of bottle filling plant. **10**

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T.E. (Electronics) (Semester – II) Examination, 2011
MICROCOMPUTER BASED SYSTEM (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Attempt Q. **1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** from Section **I**.*
*2) Attempt Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12** from Section **II**.*
*3) Answers to the Sections should be written in **separate** books.*
*4) **Neat** diagrams should be drawn **wherever** necessary.*
*5) Figures to the **right** indicate **full** marks.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain the architecture of 8086 with suitable block diagram. **8**

   b) Explain the functions of following pins : **8**

   I) TEST II) BHE
   III) LOCK IV) MN\MX

OR

2. a) With suitable examples explain the following addressing modes of 8086. **8**

   I) Indexed II) Relative
   III) Based indexed IV) Relative based indexed

   b) Explain the concept of segmentation and address translation process in 8086. **8**

3. a) Explain the following instructions : **8**

   I) LAHF II) XLAT
   III) IMUL IV) XCHG

   b) Write an ALP for reversing the given string. Use DOS INT 21H for accepting a string. **8**

OR

4. a) List and explain string manipulating instructions. **8**

   b) Write an ALP for addition of two 32-bit numbers. **8**

5. a) Explain the structure of 80386 descriptor. **8**

   b) Describe the paging operation in 80386 using page directory and page table. **10**

OR

6. a) Explain multitasking concept in 80386 with the help of TSS and TR. **8**

   b) Explain the following : **10**

   I) CPL II) RPL III) DPL

   Describe the rules for accessing data and code at different privilege level.

SECTION – II

7. a) Describe with block diagram typical Pentium motherboard. **8**

   b) Give the specifications of PCI Bus and compare it with EISA Bus. **8**

OR

8. a) With suitable block diagram explain the USB interface of PC. **8**

   b) Draw printer interface diagram using parallel port, explain functions of each pin. **8**

9. a) Explain with suitable diagram dataflow model of ARM7. **8**

   b) Write an ALP for ARM7 for finding out factorial of a given number. **6**

   c) State various operation modes of ARM7. **4**

OR

10. a) Explain Register model of ARM7. **8**

    b) Describe IRQ and FIQ modes with various shaded registers. **4**

    c) Write an ALP for ARM7 to transfer 32 bytes of data from memory location 40000000H to 42000000H using load and store instructions. **6**

11. Design an electronic weighing bridge system using 8086/8088 processor.

    I) Design signal conditioning circuit.

    II) Show complete interfacing diagram.

    III) Draw flowchart of operation. **16**

OR

12. Design 16 channel data Acquisition system using 8086/8088/Arm7 **16**

    I) Sensors temperature-PT100

    II) Display 4 digit LED/LCD

    III) Control action-ON/OFF

    IV) Load to be switched -1 KW

    V) Limits Programmable using 4×4 keypad.

    Draw complete interfacing diagram and flow chart. Explain important design steps required.

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T.E. (Electronics) (Semester – II) Examination, 2011
INDUSTRIAL MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Define Management. Describe various functions of management. Explain the role of managers in a changing business environment. **10**

   b) State and explain F.W. Taylor's theory of scientific management. **8**

OR

2. a) State and explain definition and characteristics of MIS. Describe how MIS is helpful in decision making and problem solving in a complex business environment. **12**

   b) Briefly explain the relationship of MIS with logistics and supply chain management. **6**

3. What is convergence Technology ? Explain the impact of CT as a potential source of information beyond Total Quality Management (TQM) and Business Process Re-engineering (BPR) to develop a sustainable value chain. **16**

OR

4. a) List out the 10 technology shift from analog to digital economy. How they develop competition in the market ? **8**

   b) State and explain the basic concepts of Networking. Describe Network topologies with their advantages and disadvantages. **8**

P.T.O.

5. a) Write short notes of the following .
   i) Impact of convergence Technology on consumer Electronics, Telecom and IT. **10**
   ii) CT and business process Re-engineering.

   b) "Convergence Technology is an internet worked open system view of business as potential source of information". Explain with examples. **6**

OR

6. a) State and explain the major business failures due to non-application of CT driven business models. (Cite examples) **10**

   b) Describe the advantages and disadvantages of satellite communication. **6**

SECTION – II

7. Distinguish between 'Traditional' and 'Open system' view of business IS. Construct the block diagram and explain how open system view a multi-stage decision making process. **16**

OR

8. Define business IS. Explain the system view of uncertainty in Traditional Business. Explain how business IS shifts task based business model to process based business model. **16**

9. State and explain the concept of system dynamic model in I * I technology development. List out the various steps in system dynamic model. **18**

OR

10. a) Explain the concept of STELLA and its application to address real world business problems. **9**

    b) What is freedback Loop ? Explain positive Feedback Loop and negative Feedback Loop. **9**

11. a) Define the concept of Information Integrity (I * I). Explain various attributes of I * I. **8**

    b) Explain the concept of UUI paradigm. (Usefulness - Usability Integrity) **8**

OR

12. a) Write a short note on the cost benefit analysis of Information Integrity (I * I). **8**

    b) Illustrate a real world problem using system dynamics methodology. **8**

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T.E. (Electronics) (Semester – II) Examination, 2011
DISCRETE TIME SIGNAL PROCESSING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Attempt **three** questions from **each** Section.*
*ii) Answers to the **two** Sections must be written in **separate** answer books.*
*iii) **Neat** diagrams must be drawn if **necessary.***
*iv) Figures to right indicate **full** marks.*
*v) Assume **suitable** additional data if **necessary.***
*vi) In Section **I** : Attempt Q. **1** or **2**, Q. **3** or **4**, Q. **5** or **6.***
*vii) In Section **II** : Attempt Q. **7** or **8**, Q. **9** or **10**, Q. **11** or **12.***

SECTION – I

1. a) With the help of frequency spectrum, explain how the Discrete Time Signal is obtained from continuous Time Analog Signal. **5**

   b) What are the advantages of Discrete Time Signal processing over analog signal processing ? **5**

   c) A sampler with sampling interval of T = 1 MSCC samples continuous sinusoids of following frequencies :
   i) 1.6 kHz ii) 1.4 kHz iii) 3.522 kHz.
   Find the aliased frequencies of the resulting signals. **8**

OR

2. a) Compare IIR and F.I.R. systems. **5**

   b) Discrete time systems $h_1(n) = \left\{\frac{1}{2}, \frac{1}{4}, \frac{1}{2}\right\}$ and $h_2(n) = \delta(n-2)$ are connected in cascade.
   Determine the response of the overall system to the input
   $x(n) = \delta(n+2) + 3\,\delta(n-1) - 4\,\delta(n-3)$. **7**

   c) Explain Direct I and Direct II structures for realization of LTI systems. **6**

P.T.O.

3. a) For the sequence

$$x[n] = \sum_{k=-\infty}^{\infty} \delta[n - 4k].$$ **5**

i) Sketch x [n].

ii) Find the Fourier coefficients C_k of x [n].

b) Given two finite duration sequences $x_1[n] = \{1, -1, -2, 3, -1\}$ and $x_2[n] = \{1, 2, 3\}$. Find the circular convolution using graphical method. **6**

c) Find the Fourier transform of $x[n] = -a^n u[-n-1]$ where 'a' is real. **5**

OR

4. a) Explain, how the 'Zero Padding' helps to get better idea of frequency spectrum in the DFT computation. **4**

b) Compute 8 - point DFT of the sequence x [n] = {2, 2, 2, 2, 1, 1, 1, 1} by radix – 2, decimation in frequency domain. **6**

c) Explain following properties of DFT : **6**

i) Linearity ii) Time shifting

iii) Frequency shifting iv) Circular convolution.

5. a) What are the limitations of Fourier Transform in the analysis of Discrete Time System ? How these are overcome using Z - Transform ? **5**

b) Find the Z - transform of following sequences :

i) $x[n] = n.a^n\ u[n]$

ii) $x[n] = n.a^{n-1}\ u[n]$. **6**

c) Find inverse Z - transform of

$$x[z] = \frac{z}{2z^2 - 3z + 1}\ |z| > 1.$$ **5**

OR

6. a) Solve the following difference equation using Z - transform.

Given $y[0]=1,\ y[1]=2$

Input $f[k]=u[k]$

$y[k+2]+3\,y[k+1]+2\,y[k]=f[k+1]+3\,f[k]$. **5**

b) Find the inverse Z - transform of the $X[z]=\dfrac{z^2}{(z-1)(z-0.2)}$. **5**

c) Explain the following properties of Z - transform :

i) Linearity ii) Right shift (Delay)

iii) Left shift (Advance) iv) Initial and final value. **6**

SECTION – II

7. a) A discrete time linear, causal system is given by the difference equation : **8**

$$y[n]-\frac{3}{4}y[n-1]+\frac{1}{8}y[n-2]=x[n]+\frac{1}{3}x[n-1]$$

Where x [n] is input and y [n] is output.

Find following realizations for above system :

i) Direct I and II form

ii) Parallel form.

b) Obtain the transformation formula for bilinear transformation method of IIR filter design. **8**

OR

8. a) Explain time domain equivalence criterion of digital filter design. **7**

b) Convert the following filter into a digital filter $H(s)=\dfrac{s+0.2}{(s+0.2)^2+9}$. Use impulse invariance method, assume T = 1 sec. **9**

9. a) With the help of suitable examples explain the need of sampling rate conversion. **6**

   b) Explain the process of Decimation and Interpolation. **6**

   c) With help of neat diagram explain coefficient digital to analog conversion in compact hi - fi systems. **6**

OR

10. a) Design a two stage decimeter for the following specifications :

   Passband : $0 < F < 50$ Hz,

   Transition band : $50 < F < 75$ Hz,

   Input sampling rate : 10 KHz

   Ripple : $\delta_1 = 10^{-1}$, $\delta_2 = 10^{-3}$. **12**

   b) Explain poly phase filter structure for implementation of interpolators. **6**

11. a) Explain the following in connection with DSP processor :
   i) Pipelining ii) MAC. **4**

   b) With the help of examples explain special instructions used in DSP processor. **6**

   c) Draw and explain generic hardware architecture for DSP processor. **6**

OR

12. a) Draw and explain simplified Har Vard architecture. **4**

   b) Explain **any three** of the following :
   i) Architecture of TMS 320 C28 XX
   ii) Application of DSP processor for speed control of D.C. Motor.
   iii) Proportional control using DSP processor.
   iv) Converter, triggering circuit implementation using DSP. **12**

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T.E. (E &TC) (Semester – I) Examination, 2011
CONTROL SYSTEMS
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer **three** questions from **each** Section.*
*ii) Answers to the **two** Sections should be written in **separate** answer sheets.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain design process of antenna azimuth position control system. **8**

   b) Reduce the following block diagram shown in fig. 1 into single equivalent block by block reduction techniques. **8**

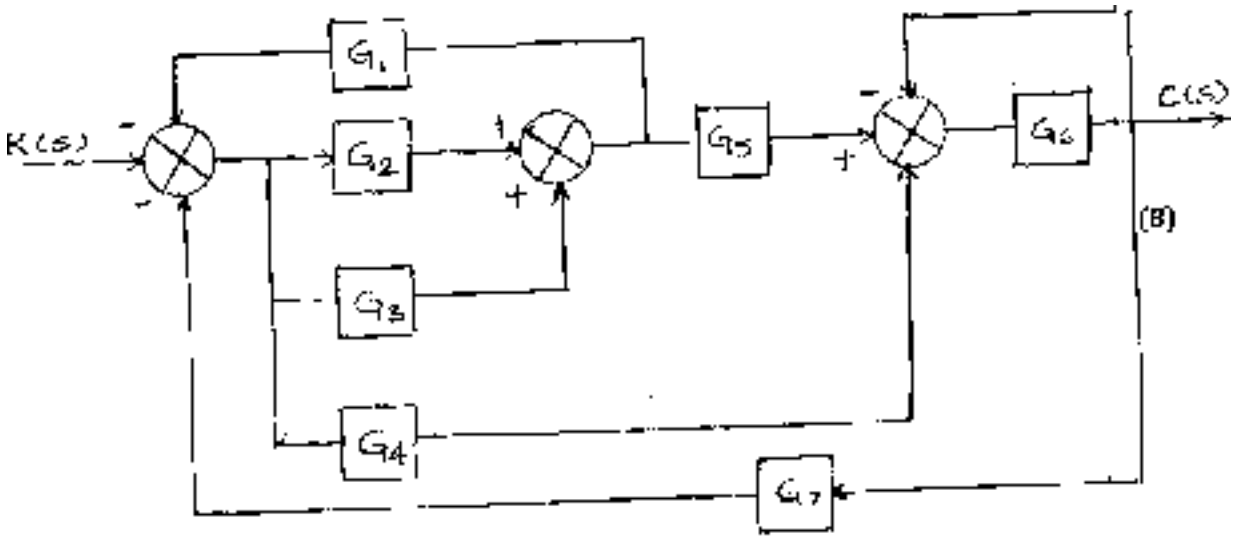

Fig. 1

OR

2. a) What is feedback and feed forward control systems explain with real time examples. **8**

   b) Using Mason's gain formula find gain of the following system shown in fig. 2 **8**

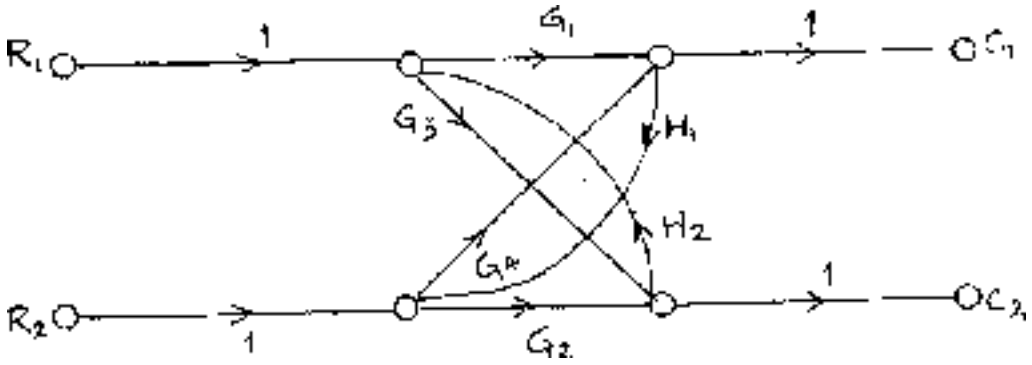

Fig. 2

3.a) A control system with a type O process and a P1 controller is shown in fig. 3 **8**

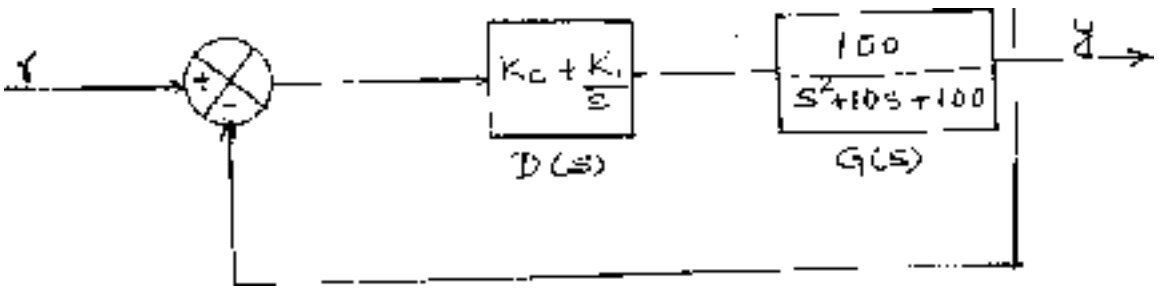

Fig. 3

i) Find the value of K_1 so that the velocity errors is constant, K_v is 10.

ii) With the value of K_1 found in part (i) determine the value of K_c so that the real part of the conjugate pair of complex roots of characteristic equation is – 1.

b) A feedback control systems has an open loop transfer function : **8**

$$G(s)H(s) = \frac{K}{s(s+3)(s^2+2s+2)}$$

Find the root locus as K is varied from 0 to ∞.

OR

4. a) Draw the sketch of an under-damped second order system response with unit input excitation. Show the various specifications clearly on it and define them. **8**

b) Using Routh-Hurwitz criterion, find the stability of the system whose characteristic equation is **8**

$s^6 + s^5 + 3s^4 + 3s^3 + 2s^2 + s + 1 = 0$

5. a) Sketch the Nyquist plot for a system with the open loop transfer function : **10**

$$G(s)H(s) = \frac{K(1+0.5s)(s+1)}{(1+10s)(s-1)}$$

Determine the range of values of K for which the system is stable.

b) Explain the correlation between time and frequency response specifications. **8**

OR

6. a) Explain the procedure of Lead-Lag compensators using Bode plot. **8**

b) Find the gain margin and phase margin for a unity feedback system having:

$$G(s) = \frac{10}{s(1+0.1s)(1+0.05s)}$$

Determine also the open loop gains when :

i) Gain margin is 20 dB.

ii) Phase margin is 24°. **10**

SECTION – II

7. a) Define the following terms : **4**

i) State

ii) State Variable

iii) State Vector

iv) State space.

b) Explain the state model for Multiple Input Multiple Output (MIMO) control systems with the help of a block diagram. **6**

c) What is controllability and observability. **6**

OR

8. a) For a system represented by the state equation :

$\dot{x}(t) = Ax(t)$

Find the following :

i) Response of : $x(t) = \begin{vmatrix} e^{-2t} \\ -2e^{-2t} \end{vmatrix}$

when $x(0) = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

ii) Response of : $x(t) = \begin{vmatrix} e^{-t} \\ -e^{-t} \end{vmatrix}$

when $x(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ **8**

b) Obtain the state space representation of the system shown in fig. 4. **8**

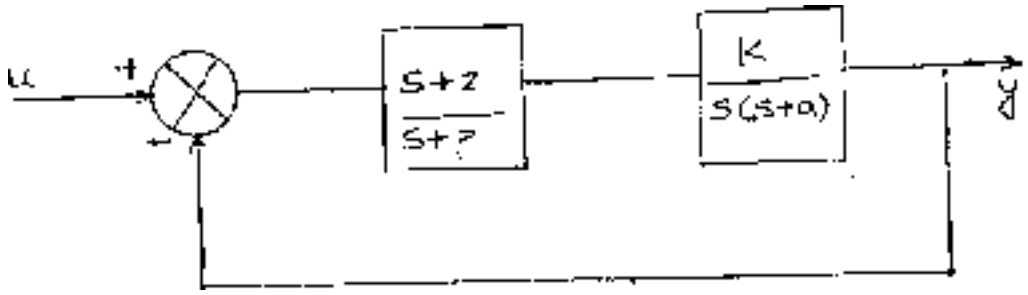

Fig. 4

9. a) Draw the ladder diagram for Bottle Filling plant and explain it. **8**

b) Draw and explain the architecture of PLC. **8**

OR

10. a) Sketch and comment on the output of P, PI, PD and PID controller for a ramp input. **8**

b) Write a note on PID controller. **8**

11. a) Write short notes on : **10**

i) Distributed Control System

ii) Adaptive Control.

b) Explain : **8**

i) Gain Scheduling

ii) Feedback linearization control.

OR

12. a) Explain Predictive Control and Optimal control. **8**

b) Write short notes on: **10**

i) Aircraft/Missile Guidance and control.

ii) SCADA system.

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T.E. (E & TC) (Semester – I) Examination, 2011
DIGITAL COMMUNICATION (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any three** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, mollier charts, electronic Pocket calculator and steam tables is **allowed**.*

*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Explain formatting and transmission of different baseband signals with the help of block diagram of digital communication system. **6**

   b) Why oversampling is needed ? Draw and explain effect of undersampling in time domain and in frequency domain. **6**

   c) A signal m (t) = cos $200\pi t$ + 2 cos $320\pi t$ is ideally sampled at fs = 300 Hz. If the sampled signal is passed through an ideal LPF with a cut off frequency of 250 Hz, what frequency components will appear at the output ? **4**

OR

2. a) In a 8 bit PCM scheme, the voice signal is sampled at a rate of 8 kHz. The maximum signal amplitude is 1V, voice signal bandwidth is 3.5 kHz. The quantisation noise signal amplitude is uniformly distributed as shown in fig. 1. Calculate the signal to noise ratio of the system. **8**

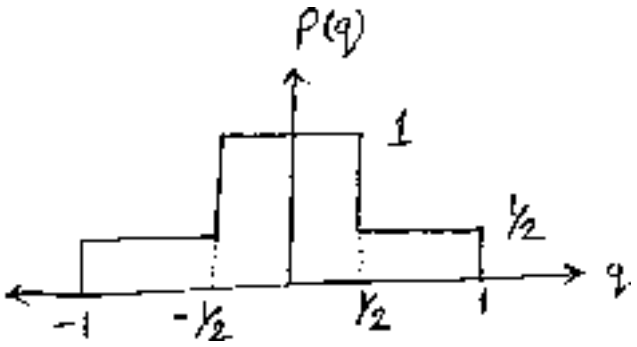
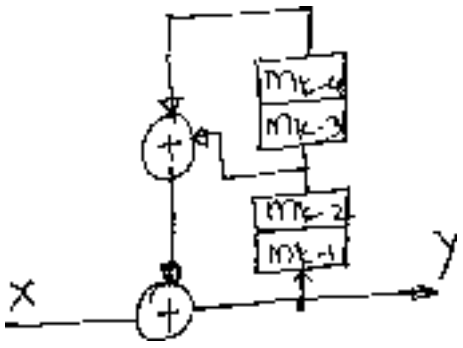


fig. 1

b) Explain LPC encoder and decoder in detail with help of block diagram. **8**

3. a) Describe Early-Late Synchronizer for polar NRZ signalling with help of neat diagram. **6**

b) A scrambler is shown in fig design the corresponding unscrambler if a sequence is 1010110 applied to the scrambler input determine the output. **6**

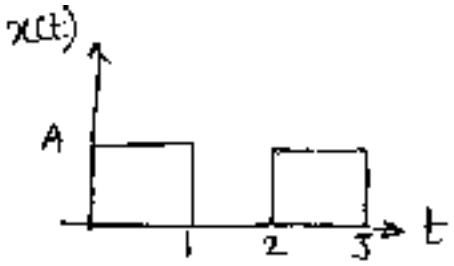


c) Derive an equation of PSD for ON-OFF signalling. **6**

OR

4. a) Explain T1 carrier system and hence compare AT-T and CCIT hierarchy of multiplexing. **7**

   b) Find the impulse response and output of matched filter for the given signal. **7**



   c) Explain eye diagram. **4**

5. a) Explain classification of Random processes with Mathematical expressions. **6**

   b) A WSS random process X (t) is applied to the input of a LTI system with impulse response h (t) = a exp (–at) u (t). Find the mean value of the output Y (t) of the system if E [X (t)] = 6 and a = 2. **6**

   c) Two random processes z(t) and y (t) are given by

   $z(t) = A \cos(\omega t + \theta)$

   $y(t) = A \sin(\omega t + \theta)$

   where A and ω are constants and θ is a uniform random variable over $(0, 2\pi)$.

   Find the cross correlation of z (t) and y (t). **4**

OR

6. a) Show that the output of LTI system is WSS if the input applied to it is WSS. **6**

   b) If the process X (t) = A cos $(2\pi fct + \phi)$, where ϕ is a random variable uniformly distributed in the range $(0, 2\pi)$ is passed through a filter with H (f) = $j2\pi f$. Find the output PSD. **6**

   c) The random variable X has a uniform distribution over a $0 \leq x \leq 2$ find mean and mean square value for the random process V (t) = $6e^{Xt}$. **4**

SECTION – II

7. a) Draw the block diagram and with the help of mathematical expression explain in detail the QPSK transmitter and receiver. Diagram the geometric representation and draw its power spectral density, along with its expression thereby comment on its Euclidean distance and bandwidth. **10**

   b) If the digital message input data rate is 10 kbps and average energy per bit is 0.02 unit find bandwidth and Euclidian distance for the following schemes.

      1) BPSK

      2) 16-MPSK

      3) MSK

      4) 16-QAM. **6**

OR

8. a) With a neat diagram, explain how a coherent binary FSK wave can be generated and detected. **6**

   b) Diagram the geometric representation of

      a) Orthogonal and non-orthogonal BFSK.

      b) M-ary FSK.

      State the Euclidean distance of above mentioned systems by explaining the importance of Euclidean distance. **6**

   c) What is DPSK and DEPSK ? **4**

9. a) Show that the probability of error of QPSK is same as that of BPSK for 1 bit duration. **8**

   b) A QPSK signal is received at the input of a coherent optimal receiver with amplitude 10 mV and frequency 2 MHz. The signal is corrupted with white noise of PSD 10^{-11} W/Hz. If data rate is 10^4 bits/sec find the probability of error, also find the probability of error for BPSK system if the local oscillator has a phase shift of $\pi/6$ rad with the input signal. Ref. Table 1. **8**

OR

10. a) Derive the equations of probability of error for BPSK and BFSK. **8**

b) A system transmits binary data at the rate of 2.5×10^6 bits per second. During the course of transmission, white Gaussian noise of zero mean and power spectral density 10^{-20} W/Hz is added to the signal. In the absence of noise, the amplitude of the received sinusoidal wave for digit 1 or 0 is 1 mV. Determine the average probability of symbol error for the following system configuration

i) Coherent binary FSK

ii) Noncoherent binary FSK

iii) 16 MPSK.

(Ref. Table 1). **8**

11. a) State classification of spread spectrum and explain FHSS in detail. **7**

b) Derive an equation of C/N ratio of satellite link design. **7**

c) A pseudo-noise sequence is generated using a feedback shift register of length m = 4. The chip rate is 10^7 chips per second. Find the following parameters.

a) PN sequence length.

b) Chip duration of the PN sequence.

c) PN sequence period. **4**

OR

12. a) The information bit duration is DS-BPSK spread spectrum communication system is 10 MS while the chipping rate is 1 MHz. Assuming an average error probability is 10^{-6} for proper detection of message signal, calculate the Jamming margin. (Ref. Table 1) **6**

b) Explain DSSS in detail and state the applications of the same. **6**

c) Define following terms :

1) Cell.

2) Cell splitting.

3) Frequency reuse. **6**

* * *

Table 1

Z	Q (Z)
2.5	0.0062100
2.8	0.0025600
3.0	0.0013500
3.2	0.0006900
3.4	0.0003400
3.6	0.0001690
3.68	0.0001660
3.8	0.0000700
4.0	0.0000300
4.3	0.0000100
4.7	0.0000010
5.2	0.0000001

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T.E. (E & TC) (Semester – I) Examination, 2011
NETWORK SYNTHESIS AND FILTER DESIGN (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any 3*** *questions from* ***each*** *Section.*

2) Answer Q. ***1*** *or Q.* ***2****. Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6*** *questions from Section* ***I*** *and Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12*** *questions from Section* ***II****.*

3) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

4) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

5) Black figures to the ***right*** *indicate* ***full*** *marks.*

6) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) A series RLC circuit has a scale factor '5' for its driving point admittance. Pole zero diagram as shown in figure '1'. Find the values of R, L and C. **8**

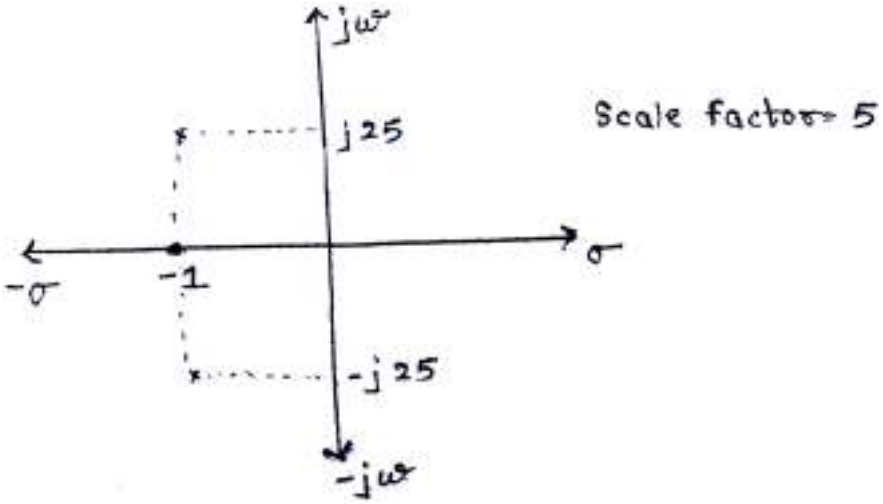

Figure 1. Q. 1(a)

P.T.O.

b) Test whether **6**

$$F(s) = \frac{s^2 + 6s + 5}{s^2 + 9s + 14}$$ is a positive real function.

c) State the properties of all types of network functions. **4**

OR

2. a) When is the network said to be **8**

i) Causal ii) Stable

State and explain the conditions for stability and causality of a network function.

b) For the network shown in figure 2 find the driving point function z(s). Plot the poles and zeros of z(s) on S plane. **6**

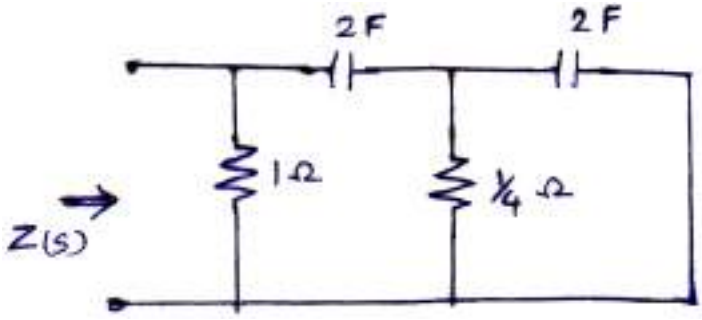

Figure 2 Q. 2(b)

c) Find out the voltage transfer function of the network shown in figure 3. **4**

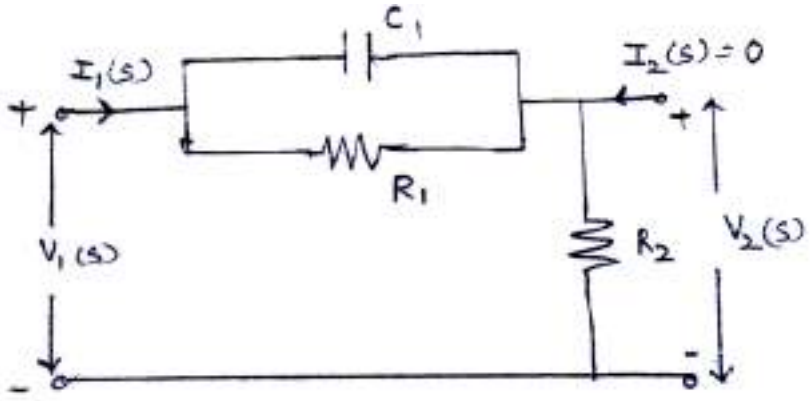

Figure 3 Q. 2(c)

3. a) Synthesize the following function by cauer first and cauer second form **10**

$$z(s) = \frac{(s+2)\,(s+5)}{(s+1)\,(s+3)}$$

b) Indicate with reasons, which of the following functions are either RC, LC, RL or RLC impedance functions. **6**

i) $z(s) = \dfrac{2(s^2+1)\,(s^2+9)}{s(s^2+4)}$

ii) $z(s) = \dfrac{(s+4)\,(s+8)}{(s+2)\,(s+6)}$

OR

4. a) Synthesize the following impedance function in Foster I and Foster II form **10**

$$z(s) = \frac{2(s+1)\,(s+3)}{(s+2)\,(s+6)}$$

b) State the properties of RLC driving point functions and explain its synthesis procedure. **6**

5. a) Explain the concept and significance of zeros of transmission in network synthesis. Define minimum phase and non minimum function. **6**

b) Synthesize given voltage ratio as a constant resistance bridged T network. **6**

$$\frac{V_2}{V_1} = \frac{s^2+1}{s^2+2s+1}$$

c) Realize the voltage ratio transfer function $\frac{V_2}{V_g}$ as a lattice network with both ends terminated in R. **4**

$$\frac{V_2}{V_g} = \frac{1}{2}\left[\frac{s-1}{s+1}\right]$$

OR

6. a) Explain the general procedure of synthesis of a transfer function. Obtain the transfer function of two port terminated network in terms of 'y' parameters. **6**

b) Synthesize the open circuit voltage ratio transfer function using RC ladder network. **6**

$$\frac{V_2}{V_1} = \frac{k}{(s+2)(s+4)}$$

c) Identify the zeros of transmission for the network shown in figure 4. **4**

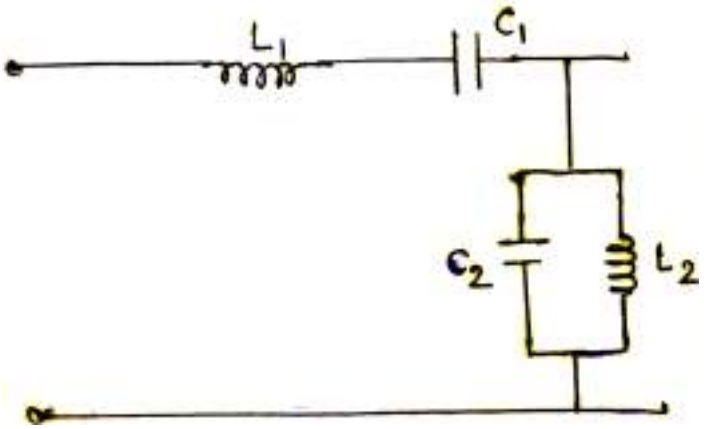

Figure 4 Q. 6(c)

SECTION – II

7. a) Realize a third order Butterworth filter whose transfer admittance function is given by **8**

$$z_{21}(s) = \frac{1}{s^3 + 2s^2 + 2s + 1}$$

b) Explain the need and concept of magnitude and frequency scaling as used in filter designing. **8**

OR

8. a) Justify the necessity of approximation technique in filter design. Compare and list the important characteristics of Butterworth and Chebyshev approximations. **8**

b) Find the Chebyshev polynomials for n = 2, n = 3 and n = 4. Design an equiripple filter with the following specifications. **8**

i) Maximum pass band ripple is 1 dB

ii) Cut off frequency $\omega_c < 1.2$.

iii) Stop band attenuation is 40 dB for $\omega \geq 4$ rad/s.

9. a) Explain the different biquad feedback topologies used in active filter designing and list the important observations. **8**

b) Synthesize the following high pass filter function using RC to CR transformation. **8**

$$T_{HP}(s) = k \cdot \frac{s^2}{s^2 + s + 16}$$

OR

10. a) What is cascade approach in active filter synthesis ? Explain in brief and list the advantages of the approach. **8**

    b) Synthesize a second order low pass filter to have a pole frequency of 2 KHz and a pole 'Q' of 10. Use Sallen key circuit based on positive feedback topology. **8**

11. a) For the parallel LC network shown in Figure 5, find the transfer function $\frac{V_o}{I_{in}}$ and compute the sensitivities of k, ω_p, Q_p, w.r.t. to the passive elements R, L and C. **10**

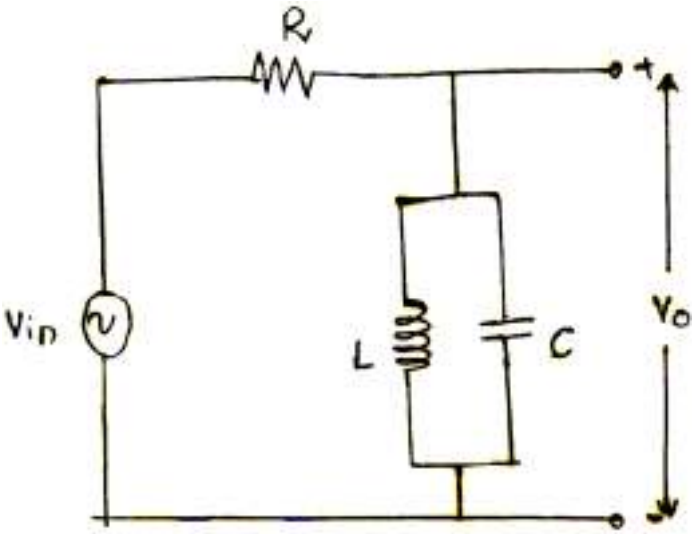

Figure 5 Q. 11(a)

    b) Explain the concept of gain sensitivity. Also explain the various factors effecting the gain sensitivity. **8**

OR

12. a) Explain the need of frequency compensation in OPAMP. Briefly explain any two frequency compensation techniques. **10**

b) Explain the effect of offset voltage on active filter performance. The input to the inverter shown in figure 6 is a sine wave of an amplitude 5 volts. If the slew rate of the opamp is 1V/sec, find the frequency at which the slew rate limiting occurs. **8**

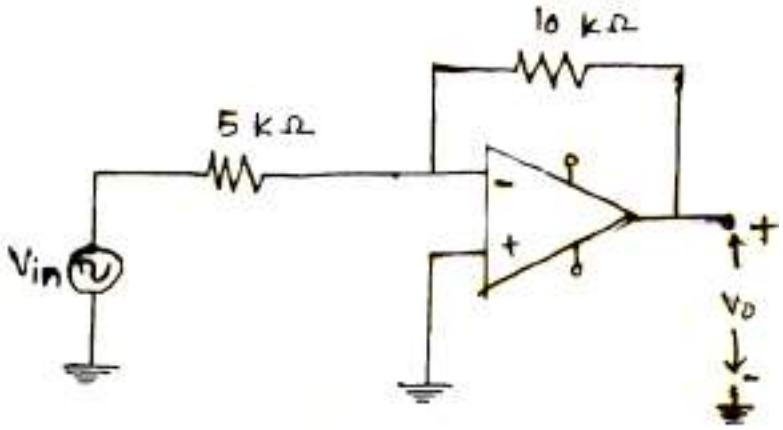

Figure 6 Q. 12(b)

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T.E. (E & TC) (Semester – I) Examination, 2011
MICROCONTROLLERS AND APPLICATIONS (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

Instructions** : 1) Answer Q. **1** or Q **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12.

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronics pocket calculator and steam tables is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Compare microprocessor and microcontroller in brief. **8**

   b) Compare CISC and RISC processor architectures. **8**

OR

2. a) Draw and explain the architecture of a microcontroller in detail. **8**

   b) Explain idle mode and watch dog timer facilities in a microcontroller. **8**

3. a) Explain internal RAM structure of 8051. **8**

   b) What are the different modes of timers ? Describe the SFR for timer mode selection. **8**

OR

4. a) Write a program to transmit letter ‘A’ to serial COM port using 8051 at 9600 baud rate. Assume XTAL = 11.0592 MHz. **8**

   b) Explain the structure of port 1 in 8051. **8**

P.T.O.

5. a) State and explain various addressing modes in 8051 with an example each. **8**

   b) Explain the following instructions : **10**

   i) SWAP ii) DJNZ

   iii) PUSH iv) RET

   v) MOVC

OR

6. a) Write an assembly language program to add 5 numbers stored in internal RAM starting from address 40 H onwards. Store the result in location 60 H(LSB) and 61 H (MSB). **8**

   b) Explain the following development tools :

   i) Simulator ii) Logic analyzer. **10**

SECTION – II

7. a) Explain the operation of SPI bus. **8**

   b) Draw a neat interfacing diagram to interface 8 bit DAC to 8051 and write an assembly language program to generate a triangular wave. **8**

OR

8. a) Interface stepper motor to 8051. Draw the interfacing diagram showing driver circuit. Write assembly program to rotate motor in clockwise direction continuously. **8**

   b) Write an assembly language program to interface an LED to pin Pl.0 and flash it after every l ms. Assume XTAL = 11.0592 MHz. **8**

9. a) Explain architecture of PIC 18FXX with a suitable block diagram. **8**

   b) Write a program in C for PIC to toggle all the bits of port C continuously with a 200 ms delay. **8**

OR

10. a) Explain memory organization of PIC microcontroller. **8**

    b) Draw and explain pipelining in PIC microcontroller. State its advantages. Also state the features of PIC microcontroller. **8**

11. Design a system to calculate and display the weight using load cell using 89C51/PIC microcontroller along with suitable signal conditioning circuit. Display the weight on LCD interfaced to the microcontroller. Draw the complete block diagram and flow chart. Also write the algorithm and program for the system. **18**

OR

12. Design a system for ROBOT movement in clockwise direction using 89C51/PIC microcontroller along with suitable motors. Draw the system block diagram and flow chart. Also write algorithm and program for the system. **18**

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T.E. (E & TC) (Semester – I) Examination, 2011
DIGITAL SIGNAL PROCESSING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
4) Your answers will be valued as a whole.
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*
*7) **All** questions are **compulsory**.*

SECTION – I

1. a) State sampling theorem. A signal $x(t) = \sin c(5\pi t) + \sin c^2(10\pi t)$ is sampled at a rate of a) 2.5 Hz b) 5 Hz. For each of these two cases, explain if you can recover the signal x(t) from the sampled signal. **8**

b) For an LTID system described by the difference equation

$y(n + 2) – 0.6\, y(n + 1) – 0.16\, y(n) = 5\, x(n + 2)$

i) Find the zero I/P response if the initial conditions are $y[-1] = 0$ and $y[-2] = 6.25$ and if the I/P $x(n) = 4^{(-n)}\, 4(n)$.

ii) Find the zero state response if the input $x(n) = 6^{(-n)}\, 4(n)$. **10**

OR

2. a) Find the impulse response of the system described by **6**

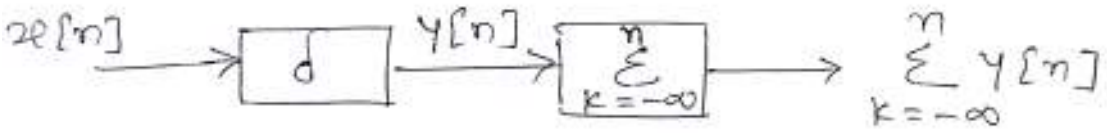
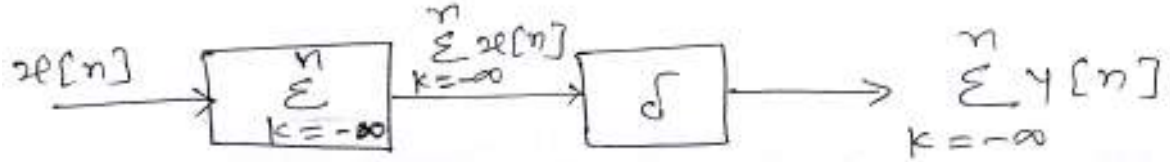


Fig. (a)



b) Obtain the direct form-I and direct form-II structures for the following systems :

i) $y(n) = 0.5\ y\ (n-1) - 0.25\ y\ (n-2) + x(n) + 0.4\ x\ (n-1)$

ii) $y(n) = -0.1\ y\ (n-1) + 0.2\ y\ (n-2) + 3x\ (n) + 3.6\ x(n-1) + 0.6\ x\ (n-2)$

iii) $y(n) = -0.1\ y\ (n-1) + 0.72\ y\ (n-2) + 0.7\ x\ (n) - 0.252\ x\ (n-2)$ **12**

3. a) Find 4-point DFT of a discrete time sequence $x(n) = 1 \quad \text{for } 0 \le n \le 2$

$= 0 \quad \text{otherwise}$

plot $|x(k)|$ and $< x(k)$ **6**

b) Determine and sketch the energy density spectrum of the signal $x(n) = (0.5)^n\ u(n)$. **6**

c) Consider the finite length sequence x(n) in fig. c. The five point DFT of x(n) is denoted by X(k). Plot the sequence whose DFT is $y(k) = e^{\frac{-4\pi k}{5}} . X(k)$. **4**

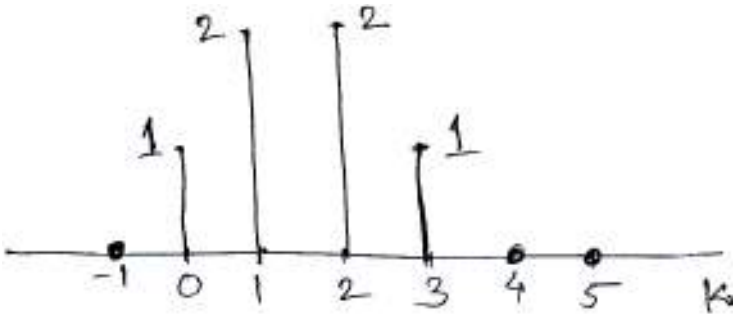


Fig. (c)

OR

4. a) Find the circular convolution of the following sequences. **6**

$x(n) = \{1, 2, 3, 4\}$

$h(n) = \{1, 1, 2, 2\}$

b) Compute IDFT of the sequence

$X(k) = \{7, -0.707 - j0.707, -j, 0.707 - j0.707, 1, 0.707 + j0.707, j, -0.707 + j0.707\}$

using DITFFT algorithm. **10**

5. a) Find the z-transform of the following discrete time signals and find ROC for each.

i) $x(n) = (-1/5)^n \; u(n) + 5\,(1/2)^{-n} \; u(-n-1)$

ii) $x(n) = (n + 0.5)\,(1/5)^n \, u(n)$

iii) $x(n) = n^2 \, a^n \, u(n)$ **6**

b) Find the system function and the impulse response of the system described by the difference equation $y(n) = x(n) + 2x(n-1) - 4x(n-2) + x(n-3)$ and determine, if the system is stable. **10**

OR

6. a) Given the z-transform pair $(0.5)^n \, x(n) \overset{z}{\longleftrightarrow} \dfrac{1}{1-0.5z^{-1}}$ with ROC $|z| > 0.5$ use transform properties to determine inverse ZT of the signal

i) $y(z) = \log (1 - 0.5\, z^{-1})$

ii) $y(z) = x(2z)$ **6**

b) Determine the impulse response of the system described by difference equation $y(n) = y(n-1) - 0.5\, y(n-2) + x(n) + x(n-1)$ plot the pole-zero pattern and discuss on stability. **10**

SECTION – II

7. a) Using frequency sampling method, design a bandpass filter with the following specifications.

Sampling freq. = 8000 Hz

Cut-off frequencies $fc_1 = 1000$ Hz

$fc_2 = 3000$ Hz

Determine the filter coefficients for N = 7. **8**

b) How the poles and zeros in FIR filter is located ? Explain briefly. What is the condition for the impulse response of FIR filter to satisfy for constant group and phase delay and for only constant group delay ? **6**

c) Distinguish between FIR and IIR filters. **4**

OR

8. a) Design a digital butterworth filter that satisfies the following constraint using bilinear transformation. Assume T = 1 sec.

$$0.9 \le \left|H(e^{j\omega})\right| \le 1 \qquad 0 \le \omega \le \frac{\pi}{2}$$

$$\left|H(e^{j\omega})\right| \le 0.2 \quad 3\frac{\pi}{4} \le \omega \le \pi$$

8

b) Design a third order Butterworth digital filter using impulse invariance method. Assume sampling period T = 1 sec. **6**

c) What is warping effect ? What is its effect on magnitude and phase response ? **4**

9. a) Prove that the spectrum of a downsampled signal is a sum of M uniformly shifted and stretched versions of spectrum of I/P signal by a factor 1/M. **8**

b) What is the need of antialiasing filter prior to downsampling and anti-imaging filter after upsampling a signal ? **8**

OR

10. a) What is the principle of interpolation ? Derive the expression for interpolated signal at the output. **8**

b) Explain in detail :

i) DAC in compact hi-fi system

ii) Acquisition of high quality data applications of multirate sampling. **8**

11. a) Write short note on : **8**

i) Pipelining

ii) VLIW architecture

b) Compare between microprocessor and DSPs. What are the various elements that the central processing unit of TMS 320 C 67 XX consists of ? **8**

OR

12. a) Draw computer architecture for signal processing and explain function of each block. **10**

b) List and explain the instructions required to perform convolution sum using TMS 320 C 67 XX. **6**

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T.E. (E & TC) (Semester – II) Examination, 2011
SYSTEM PROGRAMMING AND OPERATING SYSTEMS
(New) (2008 Pattern)

Time : 3 Hours Total Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data, **if** necessary.*
*5) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6**, Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.*

SECTION – I

1. a) Describe the language processor in detail with various language processing activities. **8**

   b) What is a assembler ? Explain two pass assembler along with the schematic diagram. **8**

   OR

2. a) Mention different data structures used for language processing. Explain any one data structure in detail. **8**

   b) What is parsing ? Explain LEX and YACC in brief. **8**

3. a) Explain the advance macro facilities :
      i) Alteration of flow of control during expansion.
      ii) Expansion time variables.
      iii) Attributes of parameters. **10**

   b) Explain parameter passing mechanisms : **8**
      i) call by value
      ii) call by result
      iii) call by references
      iv) call by name.

   OR

P.T.O.

4. a) Explain phases of compiler with example. **10**

   b) Define macro. Explain with suitable example lexical expansion of macro. **8**

5. a) Explain the software tools for program development. **10**

   b) What are loaders ? List the different type of loader schemes. Explain compile and Go-loadder scheme. **6**

OR

6. a) Explain the Editor structure with different text editors. **10**

   b) Explain with diagram program execution. Discuss the terminologies.
      i) Translated origin
      ii) Link origin
      iii) Load origin. **6**

SECTION – II

7. a) What is an operating system ? Explain the basic functions of O.S. **8**

   b) Find out the safe sequence for the execution of three processes for following example.

   Maximum resources $R_1 = 4$, $R_2 = 4$.

   Allocation matrix

	R_1	R_2
P_1	1	0
P_2	1	1
P_3	1	2

   Maximum requirement

	R_1	R_2
P_1	1	1
P_2	2	3
P_3	2	2

   Calculate the need matrix. **10**

OR

8. a) Define process. Explain various states of process with process state diagram for five state process model. **8**

   b) Consider the following processes where arrival and burst time is as shown below :

Process	Burst time	Arrival time
P_1	3	0
P_2	6	2
P_3	4	4
P_4	5	6
P_5	2	8

   calculate :

   1) Average waiting time
   2) Average turn around time

   If the processes are scheduled

   i) FCFS

   ii) Shortest job first (assuming all processes arrive at 0 arrival time for SJF). **10**

9. a) Explain the virtual memory system with suitable diagram. **8**

   b) Consider the following page reference string.
   1, 2, 3, 4, 2, 1, 5, 6, 1, 2, 3, 7, 6, 3, 2, 1, 3, 6.

   The number of page frames = 3. Calculate the page faults for :

   i) First in first out

   ii) Least recently used. **8**

OR

10. a) Compare paging and segmentation. **8**

    b) Explain design issues for paging system. **8**

11. a) Explain different file operations. **8**

    b) Explain Input/Output software layers. **8**

OR

12. a) Draw and briefly explain the file structure. **8**

    b) Explain memory mapped I/O and direct memory access. **8**

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T.E. (Electronics and Telecomm. Engg.) (Semester – II) Examination, 2011
INDUSTRIAL MANAGEMENT (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any three** questions from **each** Section.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*

SECTION – I

1. a) What are different functions of Management ? Explain in detail how planning is applied with reference to forecasts, objectives, policies, programmes, procedures, schedules and budgets. **8**

   b) Define "quality" of a product and explain the importance of quality of a product in a typical buyer's market. **6**

   c) "Traditionally, information seen as function of "source" only. For example, information in a book. Such information is often termed as "data". In communication theory, information refers to transmission of message (Transferred information) and is viewed as function of "source" and "medium of communication". At higher (holistic) level, information is function of "source", "process" (medium inclusive), and "recipient".

   Answer the following : **4**

   What do you understand by 'information is for *use* and is function of *user'* ? Explain in your own words, preferably by giving an example.

P.T.O.

2. a) Though it is sometimes applied to all types of information systems used in businesses, the term "management information systems" or MIS, actually describes specific systems that provide managers with reports and , in some cases, on-line access to the organization's current performance and historical records. MIS primarily serve the functions of planning, controlling and decision making at the management level.

   Answer the following :

   Explain how MIS can help to increase the productivity of workers in an organization. **8**

   b) Explain the role of Local Area Network and internet in a medium scale manufacturing industry. **8**

3. a) "Convergence is of computing, consumer electronics, which is further powered by content, and communications. Through this convergence, digitization is creating products that cannot be categorized as software of communication or electronics. The walls are coming down. How is this convergence occurring ? One aspect is proliferation of smart phones. Smart phones-they would even have sensors installed in them-should be in the hands of large urban as well as rural population world over. The coming hand-held devices will connect to the web for e-mail, business information, music, video clips, and lesson plans from anywhere, anytime".

   Answer the following :

   Explain in your own words what is Convergence Technology ? In its occurrence what is the significance of rise of smart mobile devices' technology ? **8**

   b) In your opinion, what are the different challenges faced by an emerging organization due to "globalization" ? **8**

4. a) Explain how we can use information for competitive advantages in the organization. **6**

   b) Discuss the impact of Convergence Technology on banking organizations. **4**

   c) List any six consumer electronics products. Explain how consumers are benefitted due to globalization by taking case of any one of the products. **6**

5. Write short notes **(any 4)** : **16**

   i) Project management

   ii) Supply chain management

   iii) Information systems errors

   iv) Importance of Decision making in business

   v) Safety management in Industry

   vi) Total Quality Management.

SECTION – II

6. a) What are information integrity attributes ? Explain in your own words the significance of business information integrity for business competitive advantage and continuity planning. **8**

   b) "Information is considered to be an important asset for any company in the modern competitive world". Justify the statement with suitable example. **8**

7. a) Explain the methodology of problem solving using system dynamics method. **6**

   b) Compare the terms 'productivity' and 'efficiency' in a competitive environment. **6**

   c) Explain with examples significance of data communication in the modern industrial management scenario. **6**

8. a) "Till 19th century land was the key factor and it determined the strategic advantage for industry (by way of agriculture) and business (by way of trade). In contrast in the industrial era of 20th century the power source, initially the steam engine and later the internal combustion engine or the electric motor, became the key factor in determining strategic advantage. This initially gave rise to traditional, family owned manufacturing industries textile, steel, mining, automobiles, etc.- and businesses managed by owners in an ad hoc, owner designed and controlled manner. With the 20th century rise of automation of

material and energy processing technologies aided by computerized information systems (IS), however, these industries and businesses for competitiveness further transformed into Quality industrial and business units. Impetus for this change signifying a dramatic shift in decision making in industrial and business economies came from the technological shift in the factors that produced strategic economic advantage".

Some of these factors defining paradigms having implications for Traditional Business and Quality Business are : *Information* factor of Minimal information, Cost-based *approach* factor, Economic factor, *Risk* factor.

Answer the following :

Discuss the dramatic shift in decision-making by comparing traditional business with quality business based on any two factors of your choice selected from above. **8**

b) A manager is required to have skills such as communication skill, human skills, computer skills, time management skills, technical skills. Explain any two of these skills. **8**

9. a) Describe the process of decision making under certainty, uncertainty and risk. **8**

b) Inventory is detailed list of those movable items which are necessary to maintain the equipment and machinery in good working order. What will be the advantages of having good inventory control ? **8**

10. Write short notes on the following **(any 4)** : **16**

i) Causal loop diagram

ii) Types of feedback loops

iii) Dynamo

iv) Information Integrity

v) Cost Benefit Analysis

vi) MIS for decision making.

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9. a) What are the different antennas used at low frequencies, medium frequencies and high frequencies and also write why the practical antennas used in the different frequency ranges are different. **8**

   b) Calculate the radiation resistance of a single turn and an eight turn small circular loop when the radiation resistance of the loop is $\lambda / 25$ and the medium is free-space. **8**

OR

10. Write short note on each of the following antennas giving its structural details, dimensions, radiation pattern, illustrative diagrams, specifications, features and applications.

    a) Tower Radiator

    b) Rhombic Antenna

    c) Loop Antenna

    d) Marconi Antenna. **16**

11. a) What is Yagi Uda Antenna ? Explain its construction and properties with reference to directivity, bandwidth and principle of operation. Compare it with Rhombic Antenna. **8**

    b) Calculate the beam width between first nulls of 2.5 m parabloid reflector used at 8 GHz. What will be its gain in decibels ? **8**

OR

12. Write short note on each of the following antennas giving its structural details, dimensions, radiation pattern, illustrative diagrams, specifications, features and applications.

    a) Micro strip Antenna

    b) Lens Antenna

    c) Parabolic Reflector

    d) Slot Antenna. **16**

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6. a) Draw the radiation pattern of the antenna given its radiation intensity as $U(\theta) = \cos^2 \theta$.

   b) Draw the flow chart or block diagram for computing the fields radiated by an antenna i.e. electric field and magnetic for a given source and explain the antenna analysis.

   c) Find the power radiated and maximum directivity of an antenna given its radiation density $W_{rad} = A_0 \frac{\sin\theta}{r^2} \hat{a}_r \; W/m^2$. **18**

SECTION – II

7. With reference to the Hertzian Dipole, find the following :

   a) Specify the current

   b) Vector Magnetic potential

   c) Far field components of Electric and Magnetic fields

   d) Radiation density, Radiation intensity

   e) Radiated power, Radiation Resistance

   f) Directivity

   g) Draw the radiation pattern. **18**

OR

8. a) Draw the radiation pattern of an End-fire linear array of eight elements with half wavelength uniform spacing and uniform amplitude distribution. Find the side lobe, null directions. **9**

   b) Design a broad side Dolph-Tschebhysheff array of 8 elements with half wave length spacing between elements and with major to minor lobe ratio to be 26 dB. Find the excitation coefficients. **9**

3. a) Explain the fundamental equation free space propagation. A 2 MHz circuit consists of a transmitting antenna with a 25 dB gain and a receiving antenna with a 20 dB gain with respect to isotropic antennas. Input power to transmitting antenna is 200 W. What is the maximum power received at a distance of 200 km over a free space ? **8**

   b) Define the terms Maximum Usable Frequency (MUF), Skip distance, Virtual height, Critical frequency. A radio communication link is to be established via Ionosphere. Consider maximum virtual height to be 100 km at the point of path. Let the critical frequency to be 2 MHz. Distance is 600 km. Find the Maximum Usable Frequency. **8**

OR

4. Explain the following propagation modes with the illustrative diagrams. Also, write bands of frequency for which these modes are suitable.
   a) Ground wave
   b) Sky wave
   c) Space wave
   d) Ionosphere. **16**

5. Explain the following antenna parameters with the help of illustrative diagrams and mathematical expressions and their significance.
   a) Radiation pattern
   b) Radiation Intensity
   c) Radiation Density
   d) Radiated Power
   e) Radiation Resistance
   f) Effective Aperture
   g) Effective Length. **18**

OR

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T.E. (E&TC) (Semester – II) Examination, 2011
WAVE THEORY AND ANTENNAS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **three** questions from **each** Sections.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*
*6) Non programmable calculators are **allowed**.*

SECTION – I

1. A plane wave traveling in the +y direction in a lossy medium
$(\varepsilon_r = 4, \mu_r = 1, \sigma = 10^{-2} \text{ mhos/m})$ has $\overline{E} = 30\cos(10^9 \pi t + \pi/4)\,\hat{a}_z \text{ V/m}$ at y = 0.
Find :
a) $\overline{E}$ at $y = 1\,m, t = 2\,n\,sec$
b) The distance travelled by the wave to have a phase shift of 10°
c) The distance travelled by the wave to have its amplitude reduced by 40%
d) $\overline{H}$ at $y = 2\,m, t = 2\,n\,sec$. **16**

OR

2. State Poynting theorem and explain its significance. In a nonmagnetic medium
$\overline{E} = 10 \sin\,(4\pi \times 10^7\, t - 0.9x)\,\hat{a}_z \text{ V/m}$
Find
a) ε_r, η
b) The time average power carried by the wave
c) The total power crossing 100 cm^2 of plane 3x + y = 10. **16**

P.T.O.

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
CONTROL SYSTEM COMPONENTS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain with neat sketch the working of reed relay and give its application. **8**

   b) Give the application of the following types of switches.
      i) Selector Switch
      ii) Level switch
      iii) Limit switch
      iv) DIP switch
      v) Thumbwheel switch. **10**

OR

2. a) Compare contactor with relay. **8**

   b) Give the specifications of the following :
      i) Toggle switch
      ii) Temperature switch. **10**

3. a) What is meant by an interlock ? Explain by giving examples. **8**

   b) Draw using standard symbols electrical wiring diagram for direct online starter. **8**

OR

P.T.O.

4. a) Draw using standard symbols any two electrical wiring diagrams related to MCC. **8**

   b) Discuss the conditions against which a motor needs protection. **8**

5. a) Explain with neat sketch the working of Bleed and non-bleed type of pneumatic relay. **8**

   b) Develop using standard symbols, pneumatic circuit diagram for reciprocation of double acting cylinder with delayed retraction. **8**

OR

6. a) Explain with neat diagram construction and working of quick exhaust valve and give its application. **10**

   b) Explain any two special type of pneumatic cylinders. **6**

SECTION – II

7. a) Give the classification of hydraulic pumps. Explain the working of any one type. **8**

   b) Develop using standard symbols, hydraulic circuit diagram for anti cycle repetition. **8**

   c) In a hydraulic power supply why an oil cooler is required. **2**

OR

8. a) Explain with neat diagram construction and working of sequence valve and give its application. **10**

   b) Compare hydraulic systems with pneumatic system based on the following :
      i) Power developed
      ii) Installation and running cost
      iii) Maintenance
      iv) Application. **8**

9. a) Explain with the help of neat sketch the working of volumetric type of dry feeder. **8**

   b) Explain the working of high/low selector and give its application. **8**

OR

10. a) Compare fuse and circuit breaker. **8**

    b) What is fluidics ? Explain Tesla's fluid diode and Coanda effect. **8**

11. a) Explain purging protection method, its types and advantages of purging. **10**

    b) Explain sanitary pipe fittings. **6**

OR

12. a) Explain compression tube fittings. **8**

    b) Compare intrinsic and explosion proof protection methods. **8**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
ELECTRONIC INSTRUMENTATION (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II.***

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

5) Your answers will be valued as a whole.

*6) **Use** of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Calculate rms, average and peak to peak values of sinusoidal, rectangular and triangular waveform varying from – 1v to + 1v. **6**

   b) Short note on Peak Reading Voltmeter. **6**

   c) Explain true RMS reading voltmeter with neat block diagram. **6**

OR

2. a) Explain Q meter with the of help neat diagram **8**
      i) Working principle
      ii) Two applications.

   b) Explain Digital Multimeter with neat block diagram. **8**

   c) Give two difference between active and passive component. **2**

P.T.O.

3. a) Explain function generator with block schematic. **8**

   b) Short note on Arbitrary Waveform Generator. **8**

OR

4. a) What is Frequency Synthesizer ? Explain Indirect Frequency Synthesizer with neat diagram. **12**

   b) Short note on Ramp wave generator. **4**

5. a) Explain Dual Trace Oscilloscope with Alternate and Chop Mode with neat waveforms and block diagram. **10**

   b) Explain significance of delay line and Z-axis modulation in oscilloscope. **6**

OR

6. a) Explain following probe specifications in oscilloscope : **8**
      i) Aberration
      ii) Attenuation factor
      iii) Bandwidth
      iv) Capacitance

   b) Give four differences between Analog Storage and Digital Storage Oscilloscope. **8**

SECTION – II

7. a) Explain following performance characteristics of D/A convertor.
      i) Resolution
      ii) Accuracy
      iii) Settling Time
      iv) Power Supply Rejection Ratio. **8**

   b) What is largest value of output voltage for an 8 bit DAC that produces 1.0 volts for a digital input of 00110010. **4**

   c) Give two difference between R-2R and binary weighted type of DAC. **4**

OR

8. a) Calculate conversion time of 12 bit successive approximation type of ADC, if clock frequency is 1 MHz. **2**

   b) Explain Dual slope ADC with neat block diagram. State its advantages. **8**

   c) Explain characteristics of sample and hold circuit with neat diagram. **6**

9. a) Explain universal counter with block diagram. **8**

   b) Explain any four sources of errors in digital instrument. **8**

OR

10. a) Explain Autozeroing and Autoranging technique in digital instrumentation. **8**

    b) Explain following modes of universal counter with diagram and wave form **6**

       i) Totalizing

       ii) Ratio Mode **8**

11. a) Give necessity of Distortion Meter. Determine the total harmonic distortion if the fundamental component is 4 of volts, second harmonic is of 1 volt, third harmonic is of 0.2 V and fourth harmonic is of 0.05 volts (All values are in R.M.S) **10**

    b) Explain significance of virtual Instrumentation with case study. **8**

OR

12. a) Short note on (**any 2**) : **18**

       i) Frequency Selective and Heterodyne Wave Analyzer

       ii) Spectrum Analyzer with Swept Frequency Techniques with its application

       iii) Build and explain any one application of virtual instrumentation.

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T.E. Instrumentation and Control (Semester – II) Examination, 2011
DIGITAL SIGNAL PROCESSING FUNDAMENTALS
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
5) Assume suitable data, if necessary.

SECTION – I

1. a) Define a discrete time system. What are the properties of a discrete time system and how are they classified ? **10**

   b) Check, whether the following signals are periodic or non-periodic. If periodic, find the fundamental period. **8**

   1) $h_1(n) = n\cos\left(\frac{\pi}{4}n\right)u(n)$

   2) $h_2(n) = 3^n u(-n+10)$

OR

2. a) Determine zero input response for a second order difference equation. $y(n) - 3y(n-1) - 4y(n-2) = x(n)$. **8**

   b) Explain the operations performed on a signal. **4**

   c) Find the linear convolution of the following sequences. **6**

   $x(n) = \{\underset{\uparrow}{1}, 2, 1, 1\}$

   $h(n) = \{3, 2, \underset{\uparrow}{1}, 1\}$

P.T.O.

3. a) A causal discrete time LTI system is described by **8**

$$y(n) = \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$$

Where, x(n) and y(n) are the input and output of the system respectively.

1) Determine the system function H(z).
2) Determine the impulse response of the system.
3) Determine the step response of the system.

b) Plot the magnitude response of the LTI system described by, $h(n) = (0.9)^n u(n)$. **8**

OR

4. a) Plot the frequency response of the system described by. **8**

$$y(n) + \frac{1}{2}y(n-1) = x(n) - x(n-1).$$

b) Obtain the direct-I and direct-II form realization of a system described by the equation, **8**

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1).$$

5. a) Determine the circular convolution using DFT and IDFT method of the sequences given below : **8**

$x_1(n) = \{1, 2, 1, 1\}$

$x_2(n) = \{2, 1, 2, 1\}$

b) State the properties of the Discrete Time Fourier Transform (any four) : **8**

OR

6. a) Find the linear convolution using circular convolution method if the sequences are given by, **8**

$$x(n) = \{1, \underset{\uparrow}{2}, 2, 1\}$$

$$h(n) = \{2, \underset{\uparrow}{1}, 1\}$$

Verify the results using linear convolution.

b) What is the relation between Z-transform and DFT ? **8**

SECTION – II

7. a) Sketch the signal flow graph of 8 point decimation in time FFT algorithm. **8**

   b) Determine the DFT of x(n) = {1, 1, 1, 1} using decimation in frequency FFT algorithm. **8**

OR

8. a) Obtain the 8-point DFT of the given sequence using DIT FFT algorithm. **8**
   x(n) = {1, 1, 2, 1}.

   b) Explain the concept of bit reversal in FFT algorithms. **8**

9. a) Design the causal linear phase FIR filter for following specifications : **8**

$$H_d(e^{j\omega}) = \begin{cases} e^{-j\alpha\omega}, & \omega_{c1} \le |\omega| \le \omega_{c2} \\ 0, & \text{otherwise} \end{cases}$$

   $\omega_{c1} = 1\,\text{rad/sec}$, $\omega_{c2} = 2$ rad/sec and M = 5, using hamming window.

   b) Explain the Gibb's phenomenon in detail. **8**

OR

10. a) What is a linear phase filter ? What are the necessary conditions for linear phase filter ? **8**

    b) Design the band pass FIR filter for following specifications : **8**

    Lower cut-off frequency = 200 Hz

    Higher cut-off frequency = 300 Hz

    Sampling frequency = 1000 Hz

    Length of filter = 7

    Use blackman window.

11. a) A digital Butterworth filter satisfies the following conditions : **12**

$$0.9 \le \left|H(e^{j\omega})\right| \le 1, \quad 0 \le |\omega| \le 0.2\pi$$

$$\left|H(e^{j\omega})\right| \le 0.2, \quad 0.3\pi \le |\omega| \le \pi$$

Determine :

1) Order of the filter
2) Cut-off frequency of analog filter
3) Pole locations of analog filter
4) Transfer function of analog filter

Use bilinear transformation and assume T = 1 s.

b) Compare FIR and IIR filters. **6**

OR

12. a) An IIR low pass filter is required to meet the following specifications : **14**

Pass band peak to peak ripple : ≤ 1 dB

Stop band edge : 1.2 kHz

Stop band attenuation : ≥ 40 dB

Stop band edge : 2.5 kHz

Sample rate : 8 kHz.

Design using impulse invariance method.

b) What is the frequency warping effect in BLT method ? **4**

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
POWER PLANT INSTRUMENTATION (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
*4) Assume suitable data **if** necessary.*
*5) **All** questions are **compulsory**.*

SECTION – I

1. a) What are different methods of liquid to liquid separation ? Explain any one method in detail with neat diagram. **8**

   b) Why following devices are needed in a Power Plant and What purpose do they serve ; **8**
   i) FD/ID Fans
   ii) Blowers
   iii) Pumps
   iv) Air compressor.

   OR

2. a) Write different methods of Distillation practices. Explain any one method in detail. **10**

   b) Give the detailed classification of various Unit Operations. **6**

3. a) What is LMTD ? Drive equations for LMTD any type of heat exchanger. **10**

   b) Draw a neat diagram for Cross flow and Counter flow type Cooling Tower. **6**

   OR

4. a) Derive material and Energy Balance equation for any type of Boiler. **10**

   b) What are different methods of heat transfer ? Explain with suitable example. **6**

5. a) Give the brief steps involved in choosing the appropriate voltmeter and potential transformer for making the three phase voltage measurement. **6**

   b) What is important necessary precaution need to be taken in this voltage measurement ? **2**

   c) What are basic components of wind energy conversion systems explain in brief with neat sketch ? **10**

OR

6. a) Explain the need and principal of following measurements in Power Plant. **6**
   i) Steam Pressure
   ii) Smoke Density Measurement
   iii) Radiation Detection.

   b) Discuss advantages and disadvantages of Hydro-electric power plant over any other method of power generation. **6**

   c) What are the factors affecting the site selection for Thermal Power Plant ? **6**

SECTION – II

7. a) What is a British thermal unit (Btu) ? **2**

   b) Provide a sketch and describe the operation of the Rankine steam cycle. What is the advantage of superheating the steam ? **8**

   c) Explain in brief Swelling and Shrinking effects in Boiler. What is a remedial measure for swelling and Shrinking in Boiler Drum Level Control. **8**

OR

8. a) What is a Superheater ? What advantage does it serve in the overall power plant operation ? Where is the Superheater located in the boiler ? **6**

   b) Draw and explain main steam and water circuit of Boiler / Turbine unit. **8**

   c) Explain in brief the basic principle of a Deaerator with neat sketch. **4**

9. a) Enlist various parameters to be measured under turbine supervisory instrumentation system. **4**

   b) Explain in brief about the type of the Sensor / Transducer used, Location of the Sensor / Transducer and Principle of measurement for any four Parameters of Turbine Supervisory Instrumentation System. **12**

OR

10. a) Why is superheated steam used in turbine operation ? What are the disadvantages of using wet steam in a turbine ? **6**

   b) What are some of the common causes of turbine vibration ? How is turbine performance affected over time ? Where do the major losses occur, and how can they be corrected ? **10**

11. a) What is a Nuclear Reactor ? Describe various parts of Nuclear Reactor. **8**

   b) Why superheating is necessary in Diesel plant ? What are the various methods used in superheating the diesel engine ? **8**

OR

12. a) What is BWR ? Draw the sketch of Direct cycle BWR. **5**

   b) Explain in brief the FBR with neat sketch. **5**

   c) How the waste is disposed off in a Nuclear Power Plant ? What are the main difficulties in handling the radioactive waste ? **6**

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T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
INSTRUMENTATION SYSTEM DESIGN
(Common to 2003 & 2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*3) Assume suitable data if **necessary**.*

SECTION – I

1. a) Explain the various phases of product life designing. **8**

   b) What is significance of Index of protection ? Explain the IP 56. **8**

   OR

2. a) Explain the DIN and ANSI standard. **8**

   b) To reduce the probability of failure of the instrumentation system, explain the proper design techniques. **8**

3. a) How the ESD protection is achieved in the equipment design ? **8**

   b) What is the rms thermal noise voltage at the input of an amplifier if it is operating over the frequency range of 20-22 MHz which has 12 KΩ input resistance at 25°C ? (Boltzmann's constant = 1.38×10^{-23} J/K). **8**

   OR

4. a) Explain the Contact and Burst noise in detail. **8**

   b) Explain the multipoint and hybrid grounds. **8**

5. It is desired to interface CMOS based microcontroller to a 12 V relay having the input resistance of 200 Ω . Select the proper IC to achieve the interfacing. Draw the complete circuit diagram of interfacing and explain the working. Explain the complete architecture of the interfacing IC. Also list the features of the IC. **18**

   OR

6. a) Explain the how the AD 594 can be used as stand alone Celsius thermometer and also explain the alarm facility with suitable diagram. **12**

   b) Explain with help of diagram, the method of the zero and span adjustment of XTR 110. **6**

SECTION –II

7. a) It is desired to drive a 5V, 100 Ω relay to MCT2E IC using the 3 V battery. The CTR of the MCT2E is 6. Draw the interfacing diagram and explain the working. **9**

   b) Design the MOD 40 up counter and MOD 40 down counter using 7217. Draw the connection diagrams. **9**

OR

8. a) Design the digital voltmeter using the IC 7107 for the 2 V range. Explain features of the 7107 IC. **9**

   b) Explain how 7217 can be used as frequency counter. **9**

9. a) What are the considerations you will do while planing the layout of the PCB? **8**

   b) What are the multilayer PCB explain with an application ? **8**

OR

10. a) Give the designing rules for analog circuit PCB. **8**

    b) What are the rules you will follow to place the component on PCB ? **8**

11. a) How the virtual instrumentation helps in collecting the computerized data in process control ? **8**

    b) What are the causes of the Unreliability ? **8**

OR

12. a) Explain the terms availability and traceability. **8**

    b) Explain the necessity of documentation from up gradation and repair point of view. **8**

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T.E. (Civil) (Semester – I) Examination, 2011
STRUCTURAL DESIGN – I
(2003 Course)

Time : 4 Hours Max. Marks : 100

Instructions *: 1) Answer **1** or **2**, **3** or **4** questions from Section **I** and **5** or **6**, **7** or **8** questions from Section **II***
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** I.S. 800, 875, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) What are advantages and disadvantages of construction in structural steel. **5**

b) An I – section used as a bracket connected to flange of column as shown. It is carrying a load of 120 kN at free end at a distance of 250 mm from the column flange. Design the welded connection. **12**

Refer to figure 1 (b)

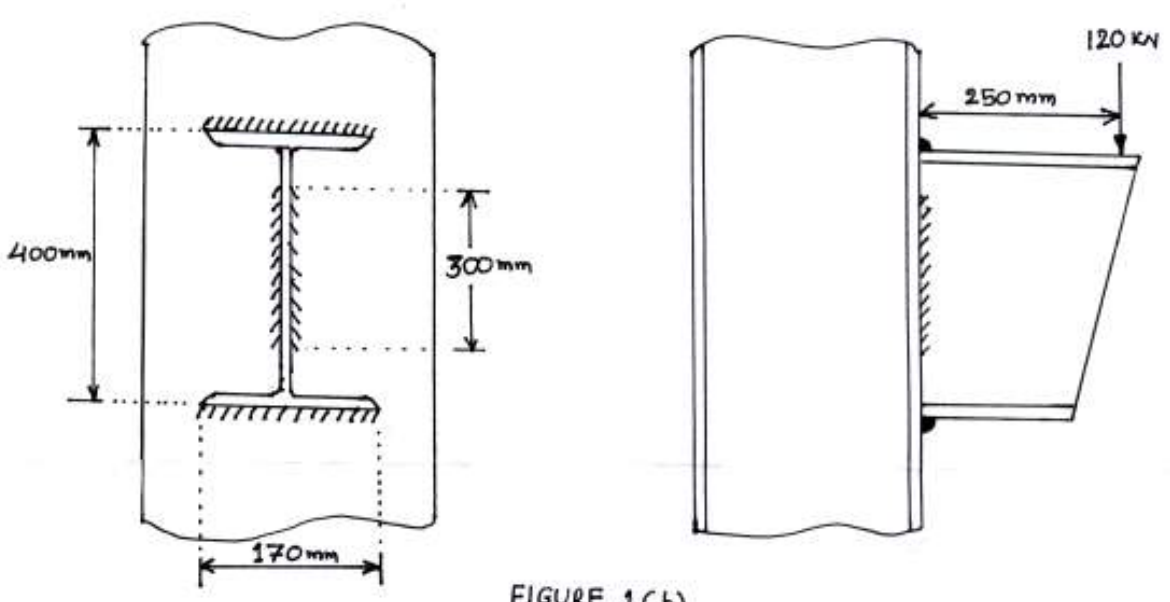

FIGURE 1(b)

P.T.O.

c) A tie member of a roof truss carries a load of 200 kN . Design a unequal angle section with longer leg connected to gusset plate of suitable thickness. Design bolted connection. **8**

OR

2. a) Differentiate between black bolts and HSFG bolts. Explain in detail with diagrams. **7**

b) An ISLB 300 secondary beam transmit an end reaction of 125 kN to the web of ISHB 400 main beam. Design bolted frame connection. Top flanges of both beams are at same level. Draw neat diagram showing details. **10**

c) A strut of tower carries axial load of 200 kN resulting due to wind load. The unsupported length of member is 3 m. Design a single angle section with welded connection. **8**

3. a) Explain the steps in design of gantry girder in details. **9**

b) A simply supported beam of 5 m effective span carries udl of 30 kN/m on entire span along with a central point load of 50 kN. Compression flange of beam is laterally supported only at ends and centre of beam. The ends are restrained against torsion. Design a cross section of beam. Apply usual checks. **16**

OR

4. a) Calculate moment resisting capacity of a built-up beam comprising of ISMB 450 with a flange plate of 250 ×12 mm one each on both the flanges. Also calculate maximum super imposed udl the beam can carry on simply supported span of 6 m. The compression flange is laterally supported throughout the length. **8**

b) Design a welded plate girder to carry udl of 120 kN/m on entire span. Effective span is 18 m. Compression flange is laterally supported throughout the length. Design should include economical cross-section, one curtailment and end bearing stiffner. **17**

SECTION – II

5. The roof truss of industrial building is as shown in figure 5.1. It is claded with G.I sheets with unit weight 180 N/m^2. The trusses are placed 6 m c/c and has span 20 m. The rise of truss is 1/4th of span. The wind load intensity is 1000 N/m^2 suction, which acts normal to the roof.
   a) Calculate intensity of load per panel point due to D.L, L.L and W.L. **12**
   b) Calculate the reaction at the support of truss due to D.L, L.L, W.L. **4**
   c) Design the connection of truss to column (assume ISHB 350) at roller support. **6**
   d) Draw and show design details with appropriate schematic diagram. **3**

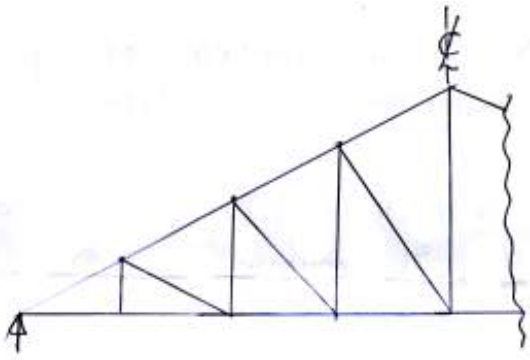

fig 5.1

OR

6. The foot over bridge is N-Type girder as shown in fig 6. a,b. The span of bridge is 18 m with spacing of girders 2.25 m. c/c. The clear walking width between main girders is 3 m. The live load on walkway is 4.0 kN/m^2 . The load on truss is 900 N/m due to dead load and 7.25 kN/m due to live load .

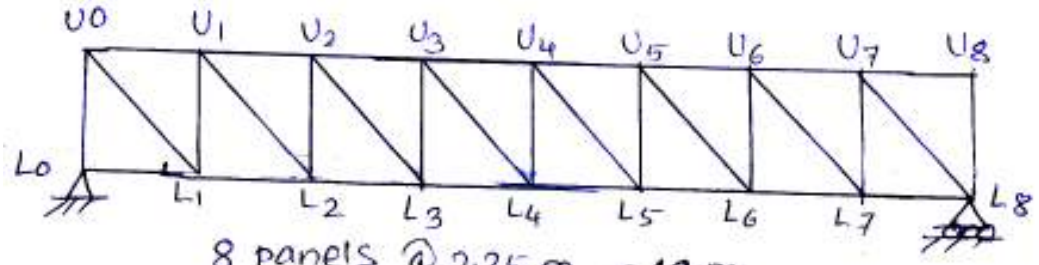

fig 6.a,b

   a) Find force in members L_3 , L_4, U_3 U_4. **12**
   b) Design the raker for above foot over bridge. **8**
   c) Illustrate the concept of plateless joint with appropriate sketch. **5**

7. a) Design a built up column to carry axial load of 750 kN. The column is restrained in position but not in direction at both ends. **10**

   b) Design the moment resisting column base for a column ISHB 350 @ 661.2 N/m subjected to axial load of 1050 kN and 60 kNm moment. **8**

   c) Compute the allowable load on pinned-end light gauge steel strut of 2.4 m length (f_y = 206 N/ mm^2). The Section of column is of all unstiffened elements. **7**

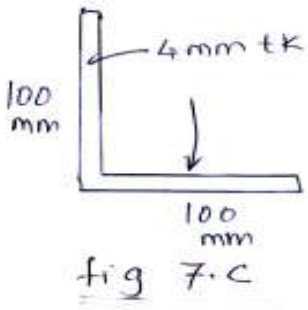

fig 7.c

OR

8. a) Design connecting system as battens with welded connection for a column with 2 ISMC 350 placed back to back with clear distance 220 mm between their back. The effective length of column is 5.9 m. Both ends of column are restrained in position and direction and carry axial load of 1400 kN. **10**

   b) Design the suitable column base for the above column. Allowable bearing pressure on concrete is 4 N / mm^2. **8**

   c) Fig. 8. C shows light gauge column section with all elements stiffened. Compute allowable load for column length 3.2 m, fy = 235 N / mm^2.

   Both ends of column are pinned. **7**

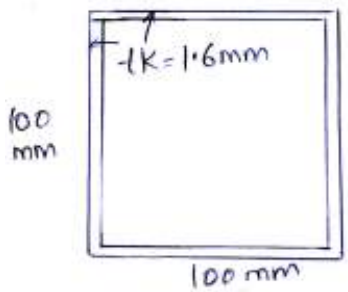

fig 8.C

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T.E. (Instrumentation & Control) (Sem. – II) Examination, 2011
CONTROL SYSTEM DESIGN (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) What is necessity of compensator in control system ? What is selection criterion of compensators ? Realise all three basic compensators electrically. **8**

   b) The open loop transfer function of the system is given by $G(S) = \frac{1.06}{S(S+1)(S+2)}$. Compensate the given system to meet the following specifications $\xi = 0.491$, $W_n = 0.673$ rad/sec. Static velocity error constant is 0.53/sec. It is desired to increase the static velocity error constant kV to about 5/sec without appreciably changing the location of dominant closed loop poles. **10**

OR

2. a) Design a suitable compensator using root locus approach for a unity feedback control system having open loop transfer function as:

   $G(S) = \frac{1}{S(S+2)(S+7)}$

   To meet following specifications

   i) Overshoot about 20%

   ii) Settling time of 4 Sec. **12**

   b) Find that the point $S_1 = -3.3 + 2.8j$ is on root locus of the system having transfer function $G(S) = \frac{7(S+2)}{S(S+5)(S+1)}$ **6**

3. a) The unity feed back system whose open-loop transfer function is

   $G(S) = \frac{K}{S(S+1)(S+2)}$

   Design a suitable lead-lag compensator to get desired specifications :
   PM= 50°
   GM be 10db.or more
   and static velocity error constants kV = 10/sec. **10**

   b) Draw Bode plot of lead and lag compensator and explain it properly. **6**

OR

P.T.O.

4. a) Consider a unity feedback system with open loop transfer function is:

$$G(S) = \frac{1}{S^2}$$

Design a compensator using Bode-plot approach to meet the following specifications.

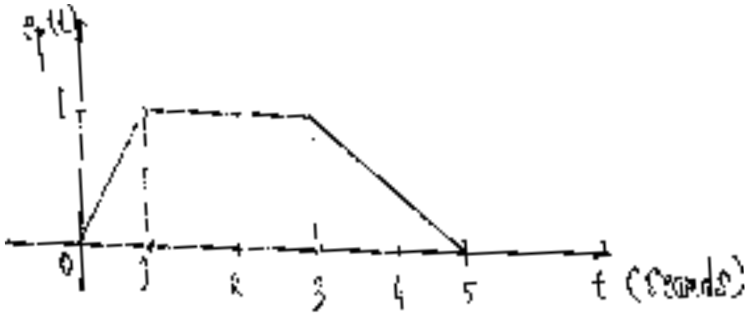
i) $\xi \geq 0.5$

ii) Phase margin $\geq 50°$ **10**

b) Draw a Bode plot (Magnitude plot only) for compensated system designed above. **6**

5. a) What is composite control mode ? Write the characteristics of all 3-types of composite control mode. **6**

b) Error signal $e_p(t)$ produces an output in $e_p(t)$.



The three mode controller with $K_p=5$, $K_I=0.7S^{-1}$, $K_D=0.5S$ and $P_I(O) = 20\%$ Draw a plot of the controller output. **10**

OR

6. a) Show that for a system having 1/S term will not exhibit offset for a set point change when proportional controller is used. **6**

b) The following transfer function is obtained from step response of the system.

$$G(S) = \frac{5e^{-3.5s}}{20S+1}$$

Find the parameters for P, PI and PID using Cohen-Coon method. **10**

SECTION – II

7. a) A unity feedback control system having forward path transfer function given below:

$$G(S) = \frac{4.5}{(S+3)(S+5)}$$

To meet following specifications design a PID controller using root locus method.

i) $kV = 10\ Sec^{-1}$ ii) $\xi = 0.8$ iii) $\omega_n = 2.8$ rad/sec **10**

b) Design a controller for following first order system:

$$G(S) = \frac{2}{3S+1}$$

using direct Synthesis approach and given that the desired closed-loop behaviour is $Q(S) = \frac{1}{5S+1}$ **6**

OR

8. Design a PID controller for a unity feedback system whose open loop transfer function is : $G(S)\,H(S) = \frac{100}{(S+2)(S+3)(S+5)}$

So that the phase margin of the system will be 45° and 4 rad/sec and steady state error will be 10% for unit ramp input. **16**

9. a) The matrix A is : $A = \begin{bmatrix} 0 & 1 \\ 0 & -2 \end{bmatrix}$

Compute e^{At} by use of the i) Similarly transformation method ii) Laplace transformation method. **8**

b) Consider a system defined by :

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix}=\begin{bmatrix}-1 & -2 & -3\\ 0 & -1 & -1\\ 1 & 0 & -1\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}+\begin{bmatrix}2\\ 0\\ 1\end{bmatrix}u$$

$$Y=\begin{bmatrix}1 & 1 & 0\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}$$

Check whether system is completely state controllable and completely observable or not. **8**

OR

10. a) Determine the state transition matrix using Cayley-Hamilton theorem for matrix

$$A=\begin{bmatrix}0 & -1\\ 2 & 3\end{bmatrix}$$ **6**

b) A system is defined by following transfer function, check its controllability and observability:

$$G(S)=\frac{2(S+1)(S+4)}{S(S+2)(S+3)}$$ **10**

11. a) Consider the system defined by

$$\dot{X}=AX$$

$$Y=CX$$

Where $A=\begin{bmatrix}-1 & 0\\ -1 & -2\end{bmatrix}$; $C=[1\ \ 0]$

Design a full order state observer. The desired eigen values for the observer matrix are $\mu_1=-5$; $\mu_2=-5$; **8**

b) Consider a system defined by

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-1 & 1\\ 0 & 2\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}1\\ 0\end{bmatrix}u\ ;$$

$$Y=\begin{bmatrix}0 & 1\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}$$

I) Show that the system cannot be stabilized by state feed back control scheme u= –k X whatever matrix k is chosen.

II) Also show that it is not possible to estimate and observed all states by using any observer gain matrix k_e. **10**

OR

12. a) Write a short note on performance index. Explain each in brief. **8**

b) Determine the observer gain matrix using Ackermann formula for a given system:

$$A=\begin{bmatrix}0 & 1\\ 0 & -2\end{bmatrix},\ B=\begin{bmatrix}0\\ 1\end{bmatrix};\ C=\begin{bmatrix}1 & 0\end{bmatrix}$$

Assume that the observer poles need to locate at S = –8, S = –8 **10**

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[3963] – 301

T.E. (Printing) Examination, 2011
OFFSET MACHINES – I
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answers to ***two*** *Sections should be written in* ***separate*** *books.*

SECTION – 1

1. Explain the following (**any two**) :

   1) Explain types of Blanket and ideal requirement of offset Blanket. **8**

   2) Explain types of Transfer Drum. **8**

   3) Explain the Bearer contact and Bearer clearance. **8**

OR

1. Explain the following : **16**

   1) Pin Register Systems

   2) Cylinder Gap

   3) Plate Clamp

   4) Cylinder Packing

2. 1) Explain the manufacturing Process of Positive working P.S. Plate. **8**

   2) Differentiate between Thermal CTP and Violet CTP plate processing. **8**

OR

2. 1) Explain the role of Silver halide layer in CTP plate. **8**

   2) Differentiate between Conventional and CTP technology. **8**

P.T.O.

3. 1) Explain the different methods of Metering system of sheet fed offset inking unit. **9**

   2) Explain inking roller materials for conventional and hybrid UV machines. **9**

OR

3. 1) Explain the multi roller inking system with diagram. **9**

   2) List down various types of inks used in offset machines. **9**

SECTION – 2

4. 1) Explain Developments and modifications in dampening system construction. **9**

   2) Explain in short fountain solutions and their characteristics. **9**

OR

4. 1) With help of diagram explain ant two continuous Dampening systems. **9**

   2) Explain the role of different constituents used in Fountain solution. **9**

5. 1) Explain the functioning of IR dryers and UV dryers. **8**

   2) Explain the role of Side and Front lay in sheet fed machine. **8**

OR

5. 1) Explain in short mechanism in delivery system of offset machine. **8**

   2) List down various parts in feeders of offset machines. **8**

6. 1) State the plan of daily Press Maintenance of a inking system and dampening system of single color machine. Write a check list. **8**

   2) Explain any four types of waste generated in press room. **8**

OR

6. 1) Explain in short following Press Standards for density, dot gain trapping and contrast for GRACoL, SWOP, FOGRA and ISO. **16**

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[3963] – 302

T.E. (Printing) Examination, 2011
PRINTING NETWORK TECHNOLOGY AND OPTO ELECTRONICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. A) Draw and explain block diagram of communication system. Explain necessity of modulation. **10**

   B) State "Sampling Theorem". Explain pulse amplitude modulation (PAM). **8**

   OR

2. Write short notes on **(any three) :** **18**

   1) Quantization
   2) Multiplexing technique
   3) Pulse coded modulation
   4) Frequency modulation.

3. A) Explain data encryption and decryption. **8**

   B) Explain the losses in fiber optic cable with suitable diagrams. **8**

   OR

4. A) Draw and explain block diagram of basic fiber optic communication system. **8**

   B) Explain construction of step index and graded index types of fiber optic cable. **8**

5. A) Explain RFID technology. **8**

   B) Explain sheet thickness measurement application. **8**

   OR

6. A) Explain Wi-Fi technology. **8**

   B) Explain any one application of optoelectronics in field of printing in detail. **8**

P.T.O.

SECTION – II

7. A) Explain different types of Operating System (OS). **10**

   B) Explain any four UNIX commands. **8**

OR

8. Write short notes on **(any three) :** **18**

   1) MAC operating system.

   2) Design issues of operating system.

   3) Windows NT.

   4) Directory structure of UNIX.

9. A) Explain different design issues for the layer structure. **8**

   B) Explain POP3 protocol. **8**

OR

10. A) Explain TCP/IP reference model. **8**

    B) Explain SMTP and HTTP protocol. **8**

11. A) Explain what is ISDN ? **8**

    B) Explain Bridges and routers. **8**

OR

12. A) Explain modems and hubs. **8**

    B) Explain VPN and VSAT. **8**

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[3963] – 305

T.E. Printing Examination, 2011
MANAGEMENT INFORMATION SYSTEMS AND COST ESTIMATION
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*
5) Assume suitable data, if ***necessary****.*

SECTION – 1

1. List down the various types of business organisations and explain any two types in detail with suitable examples. **16**

   OR

   Explain the difference between the elements of Competitive Environment for the Manufacturing industry and service industry with suitable examples. **16**

2. Explain the role of MIS in the process of deciding the strategy for the printing industry with suitable examples. **16**

   OR

   Draw the workflow of CIP3 and CIP4 technology. **16**

3. Explain the structure of Decision support system with suitable examples. **18**

   OR

   Explain the structure of Group Decision Support System with suitable examples. **18**

SECTION – 2

4. Write short notes on **(any 4)** : **16**
   a) Data Definition Language.
   b) Data Manipulation Language.
   c) Data Dictionary.
   d) Data Warehouse
   e) Data mining
   f) Data Base Management System.

P.T.O.

5. Prepare the cost sheet with reference to the following data. **16**

   Direct material : 27300

   Direct labor : 15600

   Direct expenses : 6420

   Factory overheads are charged at 75% on labor cost.

   Administration overheads are charged at 25% on factory cost.

   Selling and Distribution overheads are 40% on total cost.

   Profit 10% of the cost of sales.

   OR

   Write short note on **(any 4)** : **16**

   a) Direct cost

   b) Indirect cost

   c) Material cost

   d) Labor cost

   e) Overhead cost

   f) Fixed cost

   g) Variable cost.

6. A) Estimate the cloth roll of 60 cms wide and 40 meter in length will be required for making 5000 books in A4 size and with 25 mm spine. **9**

   B) How many boards of 20”×30” size will be required for making cases for 10,000 books in Demy 1/4 size ? **9**

   OR

   Explain in detail with suitable example the difference between Order Qualifier and order Winner. Suitable examples. **18**

[3963] – 306

T.E. (Printing) Examination, 2011
OFFSET MACHINES – II
(2008 Pattern)

Time : 3 Hours | Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answers to ***two*** *Sections should be written in* ***separate*** *books.*

SECTION – I

1. Explain the following (**any two)** : **16**
   1) Importance and role of clamp trucks for web handling in web offset press. Different reel stands use and their purpose.
   2) Different types of patterns used during splice preparation.

OR

1. Explain the following : **16**
   1) Vertical/Stack Press
   2) Cylinder configurations
   3) Splicing in Zero speed splicing
   4) Dancer roller

2. 1) Compare conventional inking system and anilox inking system in web offset with neat figures. **8**
   2) Explain any 2 types of dampening systems used in web offset. **8**

OR

2. 1) Cylinder gaps in web offset **16**
   2) Quick set and heat set inks used in web offset
   3) Construction of blanket in web offset machine
   4) Cylinder packing and its importance.

3. 1) Explain setting of quickset inks and heat set inks on press and compare it with sheetfed inks. **18**

OR

3. 1) Explain jaw folding mechanism. **9**
   2) List down various parts of former folder and chopper folder and explain its role. **9**

P.T.O.

SECTION – II

4. Explain the following terms w.r.t. web tension : **18**
   1) Surface speed
   2) Draw
   3) Slip.

OR

4. Explain variation in tension in infeed section, printing unit and folder and factors affecting the variation. **18**

5. Explain remoisturising unit, sidelay sensors, recirculation systems and web break detectors used on web presses. **16**

OR

5. 1) State checklist of maintenance of former folders. **8**
   2) Explain preventive and breakdown maintenance and total productive maintenance. **8**

6. Explain following press troubles : **16**
   1) Web break in chill roll section
   2) Ink flying in press room
   3) Doubling or slurring
   4) Dot gain on press

OR

6. Explain following paper problems : **16**
   1) Blistering in dryer
   2) Web cuts
   3) Picking and linting
   4) Web out of round

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[3963] – 307

T.E. (Printing) Examination, 2011
STATISTICAL PROCESS CONTROL
(2008 Pattern)

Time : 3 Hours | Max. Marks : 100

***Instructions** : 1) **All** questions are **compulsory**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Assume **suitable** data, **if necessary**.*

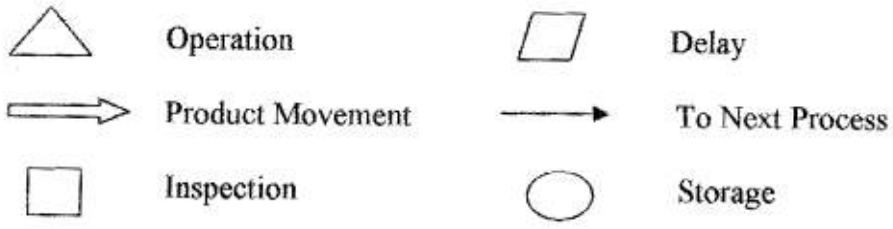
SECTION – 1

1. A) Explain different tools used in SPC . **8**

   B) Explain the concept Quality and TQM with suitable examples. **8**

OR

1. A) With following symbols, prepare a flowchart for the process of 'Pre make ready operations on single color offset machine'. **16**



2. A) Explain Histogram in short. **4**

   B) With suitable examples, explain the different shapes of Histogram. **12**

OR

P.T.O.

2. From the given data, arrange the data, prepare frequency distribution table and draw the Histogram on the graph paper. **16**

0.912	0.910	0.904	0.905	0.910	0.911
0.914	0.912	0.910	0.913	0.908	0.914
0.907	0.909	0.913	0.912	0.909	0.913
0.902	0.906	0.909	0.907	0.906	0.908
0.915	0.909	0.910	0.911	0.912	0.909
0.910	0.909	0.908	0.910	0.909	0.907

Note : From G chart, the recommended number of groups should be 7 for number of measurements between 30 to 40.

3. A) Explain process variation concept. And also types of variations with diagram and suitable examples. **18**

OR

3. A) Explain the following : **18**
   a) Measures of Accuracy or Centering
   b) Measures of Precision or Spread
   c) Normal Distribution.

SECTION – 2

4. A) Prepare X bar R chart from the given data on graph paper. **16**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	933	911	889	882	903	890	892	908	895	916
	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note : Take fractional values only up to two digits
Shewhart's constants A2 = 0.577
D3 = 0
D4 = 2.114

OR

4. A) Prepare X bar S chart from the given data on graph paper. **16**

Sample No.	1	2	3	4	5	6	7	8	9	10
Measurements	933	911	889	882	903	890	892	908	895	916
	897	898	915	913	930	940	912	920	920	890
	885	900	905	930	890	895	895	896	922	891
	900	905	902	900	890	909	896	894	928	920
	879	862	873	871	900	915	902	906	926	915

Note : Take fractional values only up to two digits
Shewhart's constants : A3 = 1.427
B3 = 0
B4 = 2.089

5. A) Explain what is Pareto chart. **4**

B) Prepare the Pareto chart on the graph paper from the given data, also show the cumulative percentage chart on the same on the graph. **12**

Sr. No.	**Defect Category**	**Number of Shirts**
1	Loose threads	2300
2	Hemming wrong	1650
3	Material flaw	300
4	Collar wrong	250
5	Cuffs wrong	200
6	Buttons	100
7	Stitching	100
8	Button holes	50
9	Material tear	50
	TOTAL	5000

OR

5. Comment on the following : **16**

   a) Cause and Effect Analysis.

   b) Scatter diagram.

6. A) Explain DOE with suitable examples from printing industry. **9**

   B) Define Six Sigma and its benefits. **9**

OR

6. Explain in detail Cp and Cpk analysis with suitable diagrams. **18**

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[3963] – 308

T.E. (Printing) Examination, 2011
DIGITAL WORKFLOW AND IMAGE SETTING
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Note** : 1) **All** questions are **compulsory.
*2) Write answers to different Sections on **separate** answer sheets.*

SECTION – I

1. What is jobflow ? Explain the different steps used in the same. **16**

OR

1. Compare and contrast between conventional and digital workflow. **16**

2. Write short notes on :
   1) Pre-flight check
   2) OPI/APR software. **16**

OR

2. Explain following in details :
   1) Archiving - Purpose and ways of doing it
   2) Trapping. **16**

3. What are different modules used in workflow ? Explain each in details. **18**

OR

3. Write short notes on :
   1) JDF workflow 2) PDF workflow. **18**

P.T.O.

SECTION – II

4. Explain rational and irrational screening with neat diagrams. **18**

OR

4. Explain raster image processor in terms of

   a) Objectives

   b) Functions. **18**

5. Explain fundamental steps in digital image processing with neat diagram. **16**

OR

5. What is image compression ? Why it is required ? What are different ways of compression ? **16**

6. Explain :

   1) Drop on demand 2) Continuous flow

   Types inkjet printer with principle diagram of working. **16**

OR

6. Explain the working principle with neat diagram for electro photographic printer. **16**

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[3963] – 309

T.E. (Printing) Examination, 2011
TECHNOLOGY OF FLEXOGRAPHY
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) **All** questions are **compulsory**.*
*2) Answers to **two** Sections should be written in **separate** books.*

SECTION – I

1. A) Explain in detail Rubber Plate making. **8**

   B) Compare between Rubber and Photopolymer Flexo Plate. **8**

   OR

   A) Draw a schematic diagram of properly processed flexo plate and describe any four parts. **8**

   B) Mention the safety Regulations to be followed for flexo plate processing. **8**

2. A) Mention the specification of Negative for flexo plate. **8**

   B) State two problems and remedies related to flexo plate mounting. **8**

   OR

   A) Describe any one flexo plate mounting techniue in detail. **8**

   B) Describe briefly what precautions are to be taken when handling of raw and used plates. **8**

3. A) Explain in detail the stages involved in conventional Flexo plate making. **10**

   B) State the purpose and effect of main-Exposure. **4**

   C) State the purpose and & effect of Post-Exposure. **4**

   OR

   A) Explain in detail standardization of conventional flexo plate. **10**

   B) Name the washout solvent used for conventional Flexo plate. **4**

   C) State the purpose and effect of Washout and drying. **4**

P.T.O.

SECTION – II

4. A) Explain in detail the workflow of digital flexo plate making. **8**

   B) Explain the features and application of flexo process. **8**

OR

   A) Explain in detail Flexo machine principles. **8**

   B) Compare Digital flexo plates with conventional plates. **8**

5. A) Explain in detail different flexo press configurations. **10**

   B) Write down different flexo product and applications. **8**

OR

   A) Explain in detail sections of flexo press. **10**

   B) Purpose of fountain and Anliox roller. **8**

6. A) Explain in detail role of Aniox roller in flexography. **8**

   B) Write notes on : **8**

   1) Factors affecting Anliox selection
   2) Anliox cell configurations
   3) Anliox maintenance and cleaning
   4) Anliox covering.

OR

   A) Different ink metering systems used in flexography. **8**

   B) Explain in detail role of fountain roller and impression cylinder in flexography. **8**

[3963] – 310

T.E. (Printing) Examination, 2011
THEORY OF PRINTING MACHINES AND MACHINE DESIGN
(2008 Pattern)

Time : 4 Hours Max. Marks : 100

***Instructions** : 1) Answer **3** questions from **S**ection **I** and **3** questions from **S**ection **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*5) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Sketch two teeth of a gear and show the following :
face, flank, top land, bottom land, addendum, dedendum, tooth thickness, space width, face width and circular pitch. **8**

b) Two gears in mesh have a module of 8 mm and a pressure angle of 20°. The larger gear has 57 while the pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find

i) The number of pairs of teeth in contact

ii) The angle of action of the pinion and the gear wheel

iii) The ratio of the sliding to rolling velocity at

a) The beginning of contact

b) The pitch point

c) The end of contact. **10**

OR

2. a) Derive an expression for the length of the arc of contact in a pair of meshed spur gear. **12**

   b) What are the main tooth profiles of gear teeth which fulfill the low of gearing ? Compare them. **6**

3. a) Explain briefly the differences between simple, compound and epicyclic gear trains. What are the special advantages of epicyclic gear trains ? **10**

   b) How the velocity ratio of epicyclic gear train is obtained by tabular method ? **6**

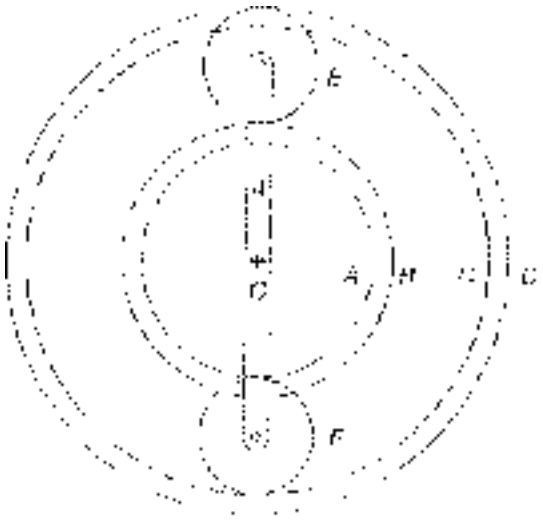
OR

4. In the epicyclic gear train shown in Fig. the compound wheels ‘A’ and ‘B’ as Internal wheels ‘C’ and ‘D’ rotates independently about the axis ‘O’. The wheels ‘E’ and ‘F’ rotates on the pins fixed to arm ‘a’. All the wheels are of the same module. The number of teeth on the wheels are $T_A = 52$, $T_B = 56$, $T_E = T_F = 36$.

   Determine the speed of ‘C’ if :

   i) the wheel ‘D’ fixed and arm ‘a’ rotates at 200 rpm. clockwise.

   ii) the wheel ‘D’ rotates at 200 rpm counterclockwise and the arm ‘a’ rotates at 200 rpm clockwise. **16**



5. A cam with a minimum radius of 25 mm is to be designed for a knife-edge follower with the following data :
   - To raise the follower though 35 mm during 60° rotation of the cam
   - Dwell for next 40° of the cam rotation
   - Descending of the follower during the next 90° of the came rotation.
   - Dwell during the rest of the cam rotation.

   Draw the profile of the cam if the ascending and descending of the cam is with simple harmonic motion and the line of stroke of the follower is offset 10 mm from the axis of the cam shaft.

   What is the maximum velocity and acceleration of the follower during the ascent and the descent if the cam rotates at 150 rpm ? **16**

OR

6. What are the different types of motion which a follower can move ?

   Draw and explain the displacement, velocity and acceleration diagrams for any two follower motions. **16**

SECTION – II

7. a) A transmission shaft of cold drawn steel 27 Mn2 (S_{ut} = 500 N/mm^2 and S_{yt} = 300 N/mm^2) is subjected to a fluctuating torque which varies from –100N-mm to + 400 N-mm. The factor of safety is 2 and the expected reliablity is 90%.

   Neglecting the effect of stress concentration, determine the diameter of the shaft.

   Take K_a = 0.8, K_b = 0.85, K_c = 0.897

   Assume the distortion energy theory of failure. **8**

   b) What is Stress concentration ? What are its causes and explain the methods of reducing stress concentration. **8**

OR

8. a) Explain the terms with neat sketches :
      i) Soderberg diagram
      ii) Goodman diagram
      iii) Modified Goodman diagram **8**

   b) Explain the effect of following modifying factors on endurance strength :
      i) Surface finish factor
      ii) Size factor
      iii) Reliability factor
      iv) Modifying factor to account stress concentration. **8**

9. A spur pinion having 20 teeth is to mesh with a gear having 43 teeth. The pinion and gear are to be made of plain carbon steels having ultimate tensile strengths of 600 N/mm^2 and 400 N/mm^2 respectively. The pinion is to be driven by a three phase induction motor having a speed of 1440 r.p.m. and 10 kW rating. The starting torque of the motor is twice the working torque. If the surface hardness of the gear pair is to be 400 BHN, design a gear pair with a factor of safety of 1.5.

   Assume velocity factor accounts for the dynamic load.

   Assume 20° full depth involute tooth system.

   Y = 0.484 – (2.87/Z) and b = 10 m

   First choice of std. modules in mm recommended by ISO :

   1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40.

   K = 0.16 [BHN/100]^2 K_a = 2 and K_m = 1. **18**

OR

10. a) Explain causes and remedies for the following gear tooth failures,
      i) Bending failure
      ii) Destructive pitting failure
      iii) Abrasive wear. **8**

    b) Explain the Equivalent spur gear and virtual number of teeth related to Helical gear. **10**

11. a) Enumerate the steps for selecting the bearing from manufacturer's catalogue. **12**

    b) Define static and dynamic load carrying capacity of rolling contact bearing. **4**

OR

12. a) Describe with neat sketches , the different kinds of rolling contact bearings. **8**

    b) A deep-groove ball bearing having bore diameter of 60 mm and rotating at 1440 rpm is subjected to a radial force of 2500 N and an axial force of 1200 N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2. If the expected rating life is 25000 hours, calculate the required basic dynamic capacity of the bearing. **8**

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T.E. (Chemical) (Sem. – I) Examination, 2011
INDUSTRIAL ORGANIZATION AND MANAGEMENT
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instrutions : *1) Answer **any three** questions **each** from **S**ection – **I** and **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume **suitable** data, **if necessary**.*

SECTION – I

UNIT – I

1. Write distinguishing points for partnership and Joint Stock Company. State and explain the formation and function of partnership with its merits and demerits. **16**

OR

2. What is management ? Explain in detail various functions of management. State role of managers in a changing global business environment. **16**

UNIT – II

3. a) What is recruitment ? Explain sources of manpower and recruitment procedure. **8**
   b) Define Job Evaluation. Explain any two methods of job evaluation along with merits and demerits. **8**

OR

P.T.O.

4. a) What is Industrial Fatigue ? Write down various causes and effects of Industrial fatigue. **8**

   b) Explain manpower planning. State various objectives and benefits of manpower planning. **8**

UNIT – III

5. a) State various functions of purchase department. **9**

   b) Explain the process of purchase through quotation, tender and comparative statement. **9**

OR

6. Explain the following **(any three)** : **18**

   i) Bin cards ii) Stores ledger

   iii) LIFO, FIFO iv) Inventory control.

SECTION – II

UNIT – IV

7. a) Distinguish between marketing and selling. **8**

   b) Explain advertising. Enlist various advantages of advertising. **8**

OR

8. a) Write an explanatory note on sales and channel of distributions. **8**

   b) Explain in detail Marketing mix. **8**

UNIT – V

9. a) Explain role of international trade in supporting Indian Economy. **8**

   b) Explain the various steps involved in exporting goods to a foreign based customer. **8**

OR

10. a) Explain in detail any two duties related to import and export. **8**

    b) Write an explanatory note on patent and Patent Act. **8**

UNIT – VI

11. Write short notes on : **18**

    i) MRTP and FERA

    ii) Flow diagram and string diagram.

    iii) Work study.

OR

12. a) Define time study. Illustrate how will you carry out time study in chemical organisation. **9**

    b) Write an explanatory note on Contract Act. **9**

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T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL PROCESS TECHNOLOGY (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*

SECTION – I

1. a) Describe Solvay process with detail process flow diagram. **12**

   b) Explain various types of process diagrams. **6**

   OR

2. a) Compare unit operations with unit processes. **6**

   b) Describe production of Mg from sea water and give its applications. **12**

3. a) Discuss production of Ammonia with its engineering problems. **8**

   b) Describe the process used for production of phosphoric acid. **8**

   OR

4. a) Describe the production method for producing H_2SO_4 acid. **8**

   b) Explain engineering problems associated with the production of urea. **8**

5. a) Write in detail about sugar production. **8**

   b) Describe the absolute alcohol production process. **8**

   OR

6. a) Write about the production of various starch derivatives. **8**

   b) Explain how paper is produced with a neat diagram. **8**

P.T.O.

SECTION – II

7. a) Explain the procedure of destructive distillation of coal. **8**

   b) Discuss production of penicillin. **8**

OR

8. a) What is interesterification ? Explain. **8**

   b) Draw a neat diagram and explain hydrogenation of oil. **8**

9. a) Explain production of water gas and give its applications. **8**

   b) Discuss refinery operations in detail. **8**

OR

10. Draw neat diagram and explain any two refinery operations in detail. **16**

11. a) Describe production of Isopropyl alcohol. **8**

    b) Explain production of ethylene with detailed diagram. **10**

OR

12. Draw flow diagram and explain in brief (**any three**) : **18**

    a) Production of Methanol

    b) Production of Acetone.

    c) Production of phenol.

    d) Production of Cumene.

    e) Production of styrene.

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T.E. Chemical (Semester – I) Examination, 2011
CHEMICAL ENGINEERING THERMODYNAMICS – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) For a binary system show that any thermodynamic solution property is related with its component partial molar properties as

$\overline{M}_1 = M + x_2\, dM/dx_1$

$\overline{M}_2 = M - x_1\, dM/dx_1$. **8**

b) The need arises in a laboratory for 2000 cm^3 of an antifreeze solution consisting of 30 mol% methanol in water. What volumes of pure methanol and of pure water at 25°C must be mixed to form 2000 cm^3 of antifreeze at 25°C ? The partial molar volumes are given as $\overline{V}_1 = 37$ cm^3/mol, $\overline{V}_2 = 18$ cm^3/mol. Also find n, n_1, n_2 and total volume V ? **8**

OR

2. a) Derive the following :

i) Fundamental property relation for open systems

$d(n\,G) = (nV)\,dp - (ns)\,dT + \sum \mu_i dhi$

ii) Gibbs – Duhem equation

$\sum x_i d\overline{M}_i = 0$. **9**

P.T.O.

b) Estimate the fugacity of isobutylene as a gas

a) at 553.15 K and 20 bar

b) 553.15 K and 100 bar

Given data – T_C = 417.9 K, P_C = 40 bar, Acentric factor = 0.194. **7**

3. a) What is Poynting factor ? From steam table determine a good estimate for f/f^{sat} for liquid water at 423.15 K and 150 bar where f^{sat} is the fugacity of saturated liquid at 423.15 K. **8**

b) Derive the relation to show the variation of activity coefficient with respect to

i) Temperature

ii) Pressure. **8**

OR

4. The excess Gibbs energy of a binary liquid mixture at T and P is given by

$G^E/RT = (-2.6x_1 - 1.8x_2)\, x_1x_2$.

a) Find expressions for $\ln \gamma_1$ and γ_2.

b) Show that these expressions satisfy Gibbs-Duhem equation.

c) Plot G^E/RT, $\ln \gamma_1$ and $\ln \gamma_2$ as calculated by the equation for G^E/RT and equations developed in part a) V/s x_1. Label points $\ln \gamma_1$ and $\ln \gamma_2$ and show their values. **16**

5. Assuming the validity of Raoults law do the following equations for the benzene (1) / Toluene (2) System.

i) Given x_1 = 0.33 and T = 373.15 K, find y_1 and P

ii) Given y_1 = 0.33 and T = 373.15 K, find x_1 and P

iii) Given x_1 = 0.33 and P = 120 KPa, find y_1 and T

iv) Given y_1 = 0.33 and P = 120 KPa, find x_1 and T

v) Given T = 387.15 K, P = 120 KPa, find x_1 and y_1

vi) Why is Raoults law likely to be an excellent VLE model for this system at the stated conditions ? **18**

Component	A	B	C
Benzene (1)	13.8594	2773.78	–53.08
Toluene (2)	14.0098	3103.01	–53.36

OR

6. a) A liquid mixture of cyclohexane (1) phenol (2) for which $x_1 = 0.60$ is in equilibrium with its vapor at 417.15 K. Determine the equilibrium pressure P and vapor composition y_1 from the following information.

$l\text{n}\ \gamma_1 = Ax_2^2$, $l\text{n}\ \gamma_2 = Ax_1^2$ at 417.15 K, $P_1^{sat} = 1.24$ bar, $P_2^{sat} = 0.89$ bar. The system forms an azeotrope at 417.15 K for which $x_1^{a2} = y_1^{a2} = 0.294$. **10**

b) Binary system Acetonitrile (1) / nitromethane (2) conforms closely to Raoults law. Vapor pressures for the pure species are given by the following antoine equations.

$$l\text{n}\ P_1^{sat} / \text{KPa} = 14.2724 - \frac{2945.47}{T - 49.15}$$

$$l\text{n}\ P_2^{sat} / \text{KPa} = 14.2043 - \frac{2972.64}{T - 64.15}$$

T is in K. Prepare a graph of P – x – y for a temp. of 348.15 K. **8**

SECTION – II

7. a) Comment on phase equilibrium and stability. **8**

b) In a binary mixture the activity coefficient γ_1 of the component 1, in the entire range of composition is given by

$R\ l\text{n}\ \gamma_1 = Ax_2^2 + Bx_2^2$ where R, A and B are constants. Derive the expression for activity coefficient of component 2. **8**

OR

8. a) Derive the Clausius-clapeyron equation using the criteria of phase equilibrium. **8**

b) Explain any two methods of consistency tests for VLE data. **8**

9. a) What is reaction co-ordinate ? Develop expressions for the mole fractions of reacting species as a function of reaction co-ordinate for

i) A system initially containing 2 mol NH_3 and 5 mol O_2 and undergoing the reaction

$4\ NH_3\ (g) + 5\ O_2\ (g) \rightarrow 4\ NO\ (g) + 6H_2O\ (g)$.

ii) A system initially containing 3 mol H_2S and 5 mol O_2.

$2\ H_2S\ (g) + 3O_2\ (g) \rightarrow 2\ H_2O\ (g) + 2\ SO_2\ (g)$

iii) A system initially containing 3 mol NO_2, 4 mol NH_3, 1 mol N_2

$6\ NO_2\ (g) + 8\ NH_3\ (g) \rightarrow 7\ N_2 + 12\ H_2O\ (g)$. **12**

b) Describe phase rule and Duhems theorem for reacting systems. **6**

OR

10. a) Determine the number of degress of freedom for each of the following systems.
    i) A system of two miscible non reacting species which exists as an azeotrope in VLE.
    ii) A system prepared by partially decomposing $CaCO_3$ into an evacuated space.
    iii) A system prepared by partially decomposing NH_4Cl into an evacuated space.
    iv) A system consisting of the gases CO, CO_2, H_2, H_2O and CH_4 in chemical equilibrium. **10**

    b) Calculate the equilibrium constant at 298 K for the reaction N_2O_4 (g) $\rightarrow$ 2 NO_2 (g). Given that the standard free energies of fomation at 298 K are 97540 J/mol for N_2O_4 and 51310 J/mol for NO_2. **8**

11. a) Calculate the fraction of pure ethane that would dehydrogenate at 750 K and 5 atm, if the following reaction goes to equilibrium.

$$C_2H_6(g) \leftrightarrow C_2H_4(g) + H_2(g)$$

ΔG^0 for the reaction at 75°K = 42.578 KJ. Assume ideal behavior. **10**

    b) Explain the relation of equilibrium constant to compositions for gas phase reactions. **6**

OR

12. a) Acetic acid is esterified in the liquid phase with ethanol at 100°C and atmospheric pressure to produce ethyl acetate

CH_3COOH (l) + C_2H_5OH (l) $\rightarrow$ $CH_3COOC_2H_5$ (l) + H_2O (l)

If initially there is one mole of each acetic acid and ethanol, estimate the mole fraction of ethyl acetate in the reaction mixture at equilibrium. Data for standard enthalpies and Gibbs free energies of formation for all the chemical species at 25°C are given as follows.

Chemical species	ΔH_f° (KJ)	ΔG_f° (KJ)
CH_3COOH (l)	–484.500	–389.900
C_2H_5OH (l)	–277.690	–174.780
$CH_3COOC_2H_5$ (l)	–463.25	–318.280
H_2O (l)	–285.830	–237.129

12

    b) Explain multireaction equilibria. **4**

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T.E. (Chemical) (Semester – II) Examination, 2011
CHEMICAL REACTION ENGINEERING – I
(New) (2008 Pattern)

Time : 3 Hours Total Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Figures to the **right** indicate **full** marks.*
4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables are allowed.
*5) Assume suitable data, **if** necessary and clearly mention assume data.*

SECTION – I

1. a) Discuss about molecularity, order of reaction and rate constant. **6**

   b) How kinetic model is tested, explain rules for matching the predicted rate expression and found experimentally. **6**

   c) For a gas reaction at 400 K the rate is reported as $\frac{-dp}{dt} = 3.66\, P_A^2$ atm/hr.

      i) What are the units of the rate constant ?

      ii) What is the value of rate constant for this reaction if the rate equation is expressed as

      $$-r_A = \frac{-1}{V}\frac{dNa}{dt} = KC_A^2 \text{ mol/m}^3\text{.s.}$$ **6**

OR

2. a) Show that the following scheme.

   $$N_2O_5 \underset{K_2}{\overset{K_1}{\rightleftarrows}} NO_2 + NO_3^*$$

   $$NO_3^* \xrightarrow{K_3} NO^* + O_2$$

   $$NO^* + NO_3^* \xrightarrow{K_4} 2\,NO_2$$

   is consistent and can explain the observed first order decomposition of N_2O_5. **12**

   b) On doubling the concentration of the reactant, the rate of reaction triples. Find the reaction order. **6**

P.T.O.

3. a) Explain integral and differential method of analysis in detail. **4**

   b) Derive integrated rate expression for first order reaction $A \longrightarrow$ product with variable volume system which is as follows

   $$-\ln(1-X_A) = -\ln\left(1-\frac{\Delta V}{\in_A V_o}\right) = Kt\ .$$ **6**

   c) At certain temperature, the half life periods and initial concentrations for a reaction are

   $t_{1/2} = 420\,\text{sec},\ C_{Ao} = 0.405$ mol/lit

   $t_{1/2} = 275\,\text{sec},\ C_{Ao} = 0.64$ mol/lit. **6**

OR

4. a) Aqueous A at a concentration C_{AO} = 1 mol/lit is introduced into a batch reactor where it reacts away to form product R according to stoichiometry $A \rightarrow R$. The concentration of A in the reactor is monitored at various times as shown below

t min	0	100	200	300	400
C_A mol/m^3	1000	500	333	250	200

   For C_{AO} = 500 mol/m^3 find the conversion of reactant after 5 hours in batch reactor. **12**

   b) A 10– minute experimental run shows that 75% of liquid reactant is converted to product by a $\frac{1}{2}-$ order rate. What would be the fraction converted in a half-hour run ? **4**

5. a) Develop performance equation for plug flow reactor with its graphical representation. **10**

   b) One liter per minute of liquid containing A and B (C_{AO} = 0.10 mol/liter, C_{BO} = 0.01 mol/liter) flow into a mixed reactor of volume V = 1 liter. The materials react in a complex manner for which the stoichiometry is unknown. The outlet stream for the reactor contains A, B and C (C_{Af} = 0.02 mol/liter. C_{Bf} = 0.03 mol/liter, C_{cf} = 0.04 mol/liter). Find the rate of reaction of A, B and C for the conditions within the reactor. **6**

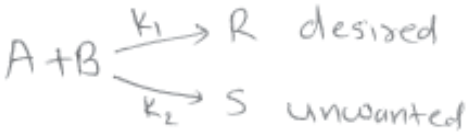
OR

6. a) Derive equation for mixed flow reactors of different sizes in series and determine the best system for a given conversion. **8**

   b) An aqueous reactant stream (4 mol A/liter) passes through a mixed flow reactor followed by a plug flow reactor find the concentration at the exit of the plug flow reactor if in the mixed flow reactor C_A = 1 mol/liter. The reaction is second-order with respect to A, and the volume of the plug flow unit is three times that of the mixed flow unit. **8**

SECTION – II

7. Consider the aqueous reactions. **18**



$$\frac{dC_R}{dt} = 1.0\ C_A^{1.5}\ C_B^{0.3} \text{ mol/lit.min}$$

$$\frac{dC_S}{dt} = 1.0\ C_A^{0.5}\ C_B^{1.8} \text{ mol/lit.min}$$

For 90% conversion of A find the concentration of R in the product stream. Equal volumetric flow rates of the A and of B streams are fed to the reactor, and each stream has a concentration of 20 mol/liter of reactant. The flow in the reactor follows :

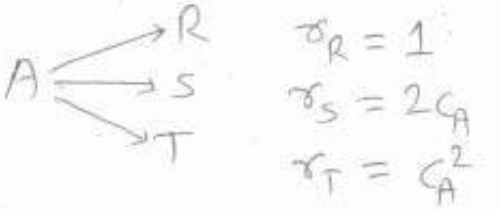
a) Plug flow

b) Mixed flow

c) Plug flow with low concentration of B when plug flow A – with mixed flow B.

OR

8. Often a desired reaction is accompanied by a variety of undesired side reactions, some of higher order, some of lower order. To see which type of operation gives the best product distribution. Consider the parallel decomposition of A, C_{AO} = 2



Find the maximum expected C_S for isothermal operations. **18**

a) in a mixed reactor

b) in a plug flow reactor.

9. A sample of the tracer hytane at 320 K was injected as a pulse to a reactor and the effluent concentration measured as a function of time resulting in the following data :

t(min)	0	1	2	3	4	5	6	7	8	9	10	12	14
C(g/m^3)	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

a) Construct figures showing C(t) and E(t) as function of time.

b) Determine fraction of material leaving the reactor that has spent between 3 and 6 min in the reactor.

c) Determine fraction of material that has spent 3 min or less in the reactor. **16**

OR

10. Thermal cracking of propane is carried out in a flow reactor. Pure propane at 100°C is introduced and leaves at 500°C. The composition of the exit gas and the thermodynamic properties of constituents are given below. It is assumed that the reaction is thermal cracking of propane are as follows :

$C_3H_8 \longrightarrow C_2H_4 + CH_4$

$C_3H_8 \rightleftharpoons C_3H_6 + H_2$

Species	**Exit gas Composition %**	**DH_{f298} K cal/g mol.C**	**Average C_P k.Cal/g.mol C**
CH_4	17	–17.889	10.8×10^{-3}
C_3H_8	50	–24.820	22.0×10^{-3}
C_2H_4	13	12.496	12.22×10^{-3}
C_3H_6	5	4.879	10.06×10^{-3}
H_2	15	0	6.92×10^{-3}

Calculate the heat effects in the system. **16**

11. a) Explain the product distribution in PFR in series parallel reactions. **8**

b) With sketch discuss in detail the non-adiabatic operations. **8**

OR

12. Write a note on (**any three**) :

a) Tank in series model and two parameter model.

b) Residence Time Distribution (RTD) and its relationship with F and C curve.

c) Micro and Micro fluid

d) Dispersion model. **16**

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T.E. Chemical (Semester – II) Examination, 2011
CHEMICAL ENGINEERING DESIGN – I (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer to the **two** Sections should be written in **separate** answer books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Discuss the materials of construction for process equipments. **8**

   b) Describe optimization and optimization techniques. **8**

OR

2. a) Discuss in brief non destructive tests for vessels and joints. **10**

   b) Write on plastics as material of construction for chemical plants. **6**

3. a) Define pressure vessel and explain design of pressure vessel subjected to external pressure. **8**

   b) Calculate the thickness of a torrispherical head (100-6) and (80-6), Elliptical head (2:1) and hemispherical head for a pressure vessel having design pressure 7 kg/cm^2. Diameter of vessel is 1.5 m and permissible stress is 1250 Kg/cm^2. Welded joint efficiency is 85%. **8**

OR

4. a) A pressure vessel is to be designed for a internal pressure of 0.3 N/mm^2. The vessel has nominal diameter of 1.2 m. The vessel is madeup of stainless steel with permissible stress of 130 N/mm^2 and no corrosion allowance is necessary. If the weight of the vessel and its contents is 3200 Kg and torque due to offset piping is 500 N-m, find stresses due to combined loading. **8**

P.T.O.

b) Discuss :

i) Gasket selection and classification

ii) Reinforcement of nozzels. **8**

5. a) Explain various types of constructions used for high pressure vessels. **6**

b) Explain various types of roofs used for storage vessels. **6**

c) Explain Hortonspheres as storage vessels. **6**

OR

6. a) A high pressure vessel is to be operated at 100 MN/m^2. The inside diameter of the vessel is 30.5 cm. A steel having yield stress 466 MN/m^2 is selected for fabrication. Estimate the wall thickness required by various theories with factor of safety 1.6. **8**

b) Explain in brief the various types of losses during storage of volatile liquids. **6**

c) A storage tank is to store 30000 Kgs of Benzene having density 800 Kg/M^3. Due to space limitations the maximum tank diameter can be 2.4 m. Estimate the height of the tank if the liquid is filled up to 90% of the capacity of the storage tank. **4**

SECTION – II

7. a) Discuss the design of tall vertical column. **10**

b) Give the step by step method for designing the skirt thickness due to dead weight of the vessel, due to wind load and due to seismic load. **6**

OR

8. a) Explain in detail the design procedure for saddle support. **8**

b) With neat sketches explain the leg support and lug support for the vertical vessels. **8**

9. A light oil is to be cooled in a 1:2 shell and tube Heat Exchanger at a rate of 54430 Kg/Hr from 100°C to 38°C. Cooling tower water is used as cooling medium which is available at 16°C and can be heated up to 32°C. Tubes of 19 mm OD and 16 mm ID are available with 16 feet length. Use the following data

Properties of light oil -

Specific heat = 2345 J/Kg°K, Density = 850 Kg/m^3,

Viscosity = 2 cp, Thermal conductivity = 0.142 W/m°K

Properties of water -

Specific heat = 4187 J/Kg°K, Density = 1000 Kg/m^3,

Viscosity = 0.68 cp, Thermal conductivity = 0.623 W/m°K

Fouling resistance on both sides may be taken as 0.0004 m^2K/W. Metal wall resistance can be neglected. As a first estimate take overall heat transfer coefficient as 450 W/m^2°K. Design the exchanger in detail. **18**

OR

10. a) With neat sketches explain various types of baffles used for shell and tube heat exchangers. **6**

b) Water is heated in a double pipe heat exchanger using dry saturated steam supplied on the annulus side. Steam condenses at 320°K and there is no subcooling. Water flows at 2 m/s through the tube of 25 mm outside diameter and 2500 mm length. Calculate the overall heat transfer coefficient based on outside diameter, if the water inlet and outlet temperatures are 293 and 295°K respectively. How would the outlet temperature change if the water velocity is increased by 50% ?

Data for water

Density = 1000 Kg/m^3, Specific heat = 4.18 KJ/Kg°K

Inside film heat transfer coefficient may be estimated by following equation applicable for water.

$h_i = 4280\ (0.00488\ T-1)\ (V)^{0.8}(d)^{-0.2}$, W/$m^2$.°K

Where T = mean water temperature, °K

V = Water velocity m/s,

d = may be taken as pipe OD im m. **12**

11. a) Suggest a suitable thermal design for a condenser to be used for condensing 4.2 Kg/s of steam. Steam will be condensed at pressure of 4.13 KN/m^2. Steam has a dryness fraction of 0.92. Cooling water is available at 17°C and for economic reason temperature rise has to be limited up to 1.2 m/s through the tubes. The exchanger has two passes on tube side. Tubes of 19.05 mm OD and 15.75 mm ID can be used. Estimate the number of tubes, their length, tube bundle diameter and the shell diameter. Overall heat transfer coefficient based on external areas of tubes = 3400 W/m^2°K. **10**

b) Explain various methods of feeding for multiple effect evaporators. **6**

OR

12. a) What are the advantages of plate heat exchanger ? With neat sketches show the various flow patterns in plate heat exchanger. **6**

b) A single effect evaporator is to be operated at absolute pressure of 0.13 bar. Estimate the heat transfer area necessary to concentrate 4500 Kg/hr of Caustic soda solution from 10% to 40% (by weight) using saturated steam at 117°C as heating media. The overall heat transfer coefficient may be taken as 1.25 KW/m^{20}C.

Data -

Specific heat of feed = 4000 J/Kg°C

Specific heat of product = 3260 J/Kg°C

Feed temperature = 18°C

BPR of solution = 30°C

Density of boiling liquid = 1390 Kg/m^3

The liquid level in the evaporator is 1200 mm above the heating surface. **10**

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T.E. (Production, Prod S/W) (Semester – I) Examination, 2011
KINEMATICS AND DESIGN OF MANUFACTURING MACHINES
(2003 Course)

Time : 4 Hours Max. Marks : 100

***Instructions**: 1) Solve Que. No. **1** or Que. No. **2**, Que. No. **3** or Que. No. **4**, Que. No. **5** or Que. No. **6** from Section-**I** and Que. No. **7** or Que. No. **8**, Que. No. **9** or Que. No. **10**, Que. No. **11** or Que. No. **12**. From Section-**II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Assume suitable data, **if necessary**.*

*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

Unit No. 01

1. a) Explain various Kinematics principles used in the operation of gear hobbing machine used to generate helical gear. **10**

   b) Explain the following terms related to Kinematic Synthesis.

      i) Function Generation

      ii) Dimensional Synthesis

      iii) Path Generation. **6**

OR

2. a) Explain the following Kinematic chain representation with figure :

      i) E-21 ii) C-13

      iii) K-25 iv) K-23. **8**

P.T.O.

b) In a slider crank mechanism, the crank AB = 100 mm and the connecting rod BC = 400 mm. The line of the stroke of the slider is offset by a perpendicular distance of 25 mm. If the crank rotates at an angular velocity of 20 rad/s and angular acceleration of 12 rad/s^2 when the crank is inclined at an angle of 30°, determine the following :

i) the linear velocity and acceleration of the slider and

ii) the angular velocity and angular acceleration of the connecting rod. **8**

Unit No. 02

3. a) What is difference between the endurance strength and the endurance limit ? Explain how you will find endurance limit of the material ? **8**

b) A steel bar is subjected to two dimensional stresses; the tensile stress along the X-axis varies from 45 MPa to 100 MPa, whereas the tensile stress along the Y-axis varies from 5 MPa to 75 MPa. The corrected endurance strength of the component is 260 MPa. The ultimate strength is 650 MPa. Determine the factor of safety by maximum distortion energy theory. Use the Goodman's fatigue criterion for failure. **8**

OR

4. a) Define following : **6**

i) Notch sensitivity

ii) Fatigue stress concentration factor K_f

iii) Fatigue.

b) A stepped shaft is subjected to a uniform torque of 200 Nm and a completely reversed bending moment of 550 Nm at the step. The shaft is made up of cold drawn steel with ultimate tensile strength of 650 N/mm^2 and yield strength of 380 N/mm^2. The theoretical stress concentration factor for bending and torsion are 2 and 1.6 respectively.

Notch sensitivity = 0.96

Size factor = 0.85

Reliability factor = 0.868

Surface finish factor = 0.9

If the factor of safety is 1.5, determine the diameter of the shaft corresponding to the expected life for infinite life. (Use distortion energy theory). **10**

Unit No. 03

5. a) Define gear ? State advantages and limitations of gear drive. **4**

   b) What is the significance of formative number of teeth in the design of helical gear ? **4**

   c) A pair of spur gears with 20° full depth involute consist of 18 teeth pinion meshing with 40 teeth gear. The module is 4 mm while the face width is 40 mm. The permissible bending stress for steel gear pair is 150 N/mm^2. The gears are machined to meet the specification of grade 8 and heat treated to surface hardness of 300 BHN. The service factor and factor of safety are 1.75 and 2.0 respectively. Determine :

   i) the optimum speed for maximum power transmitting capacity; and

   ii) the maximum power transmitted by the gear pair at the above speed.

   Use following data :

   For Grade $8 \rightarrow e = 16 + 1.25 \left[m + 0.25\sqrt{d}\right]$

   $$Fd = \frac{enpZpbrprg}{2527\sqrt{rp2 + rg2}} \cos\phi$$

   $$Y = 0.484 - \frac{2.87}{Z}.$$ **10**

   OR

6. a) Compare helical and spur gear for following respects : **6**

   i) Gear ratio ii) Power transmitted

   iii) Speed iv) Axial thrust

   v) Noise vi) Mode of engagement.

b) A helical pinion having 21 teeth to be made up of plain carbon steel 55C8 (S_{ut} = 720 N/mm^2) is to mesh with a gear to be made up of plain carbon steel 40C8 (S_{ut} = 580 N/mm^2). The gear pair is required to transmit 10 kW power from an electric motor running at 1000 r.p.m. to a machine running at 300 r.p.m. The starting torque of the motor is 150% of the rated torque. The factor of safety required is 2.0. The face width is 10 times the normal module and tooth system is 20° full depth involute. The helix angle is 25°. The gears are to be machined to meet the specifications of grade 7. The gear and pinion are to be case hardened to 300 BHN and 350 BHN respectively. Design the gear pair by using the dynamic factor and Spoott's equation for dynamic load.

Use following data :

For Grade $7 \rightarrow e = 11.0 + 0.9\left[m_n + 0.25\sqrt{d}\right]$

$$Fd = \frac{e.np.Zp.b.rp.rg}{2527\sqrt{rp2 + rg2}}\cos\phi n\cos\psi, \qquad Z' = \frac{Z}{\cos 3\psi}$$

and $Y' = 0.487 - \frac{2.87}{Z'}$; $\quad Kv = \frac{5.6}{5.6 + \sqrt{V}}$. **12**

SECTION – II

Unit No. 04

7. a) What do you understand by antifriction bearing ? Give detailed classification of rolling contact bearing ? **4**

b) How bearings are designated ? Explain in detail. **4**

c) A single row deep groove ball bearing operates with the following work cycle

Element No.	Element Time%	Radial Load 'Fr' KN	Thrust Load 'Fa' KN	Radial Factor 'X'	Thrust Factor 'Y'	Race Rotating	Service Factor	Speed in Rpm.
1	40	4	1	0.56	1.4	Inner	1.5	800
2	25	3	1	0.56	1.6	Outer	2.0	1500
3	35	No Load	No Load	-	-	Outer	-	750

If the expected life of the bearing is 10,000 Hrs. with reliability of 95%, calculate the basic dynamic load rating of the bearing so that it can be selected from the manufacturer's catalogue based on 90% reliability.

If there are six such bearings in the system, what is the probability that all bearing will survive for 10,000 Hrs ? **8**

OR

8. a) How you will select bearing from manufacturer's catalogue ? Explain in detail. **6**

b) Select a single row deep groove ball bearing with the operating cycle listed below, which will have a life of 15000 hrs.

Fraction of Cycle	Type of Load	Radial Load (N)	Thrust Load (N)	Speed (rpm)	Service Factor
1/10	Heavy Shocks	2000	1200	400	3.0
1/10	Light Shocks	1500	1000	500	1.5
1/5	Moderate Shocks	1000	1500	600	2.0
3/5	No Shocks	1200	2000	800	1.0

Assume radial and axial load factors to be 1.0 and 1.5 respectively and the inner race rotates. **10**

Data for Deep Groove Ball Bearing selecting is :

Bearing No.	6015	6215	6315	6415
C (KN)	31	52	90	120

Unit No. 05

9. a) What is concurrent engineering ? What is its significance in the product design ? **6**

   b) A machine shaft runs at a mean speed of 200 rpm. It requires a torque which varies uniformly from 1200 Nm to 3600 Nm during the first half revolution. During the next one revolution, the torque remains constant and then it decreases uniformly to 1200 Nm during next one revolution and then remains constant for the next two revolutions, thus completing the cycle of loading. The machine is coupled by a constant speed motor to which is connected a solid flywheel having a radius of 0.85 m. If the fluctuation of speed is $\pm 2\%$ of mean speed, find

   i) Power of the motor

   ii) Mass of the flywheel

   iii) Thickness of flywheel if $\rho = 7200$ kg/m^3

   iv) Find the maximum stresses in the flywheel, Assume $\mu = 0.3$. **12**

OR

10. a) Write short notes on construction of flywheel. **6**

    b) Explain the guidelines to be followed in the design of the parts for the following processes

    i) Forging

    ii) Welding. **8**

    c) Distinguish between ‘machine design’ and ‘ergonomic design’. **4**

Unit No. 06

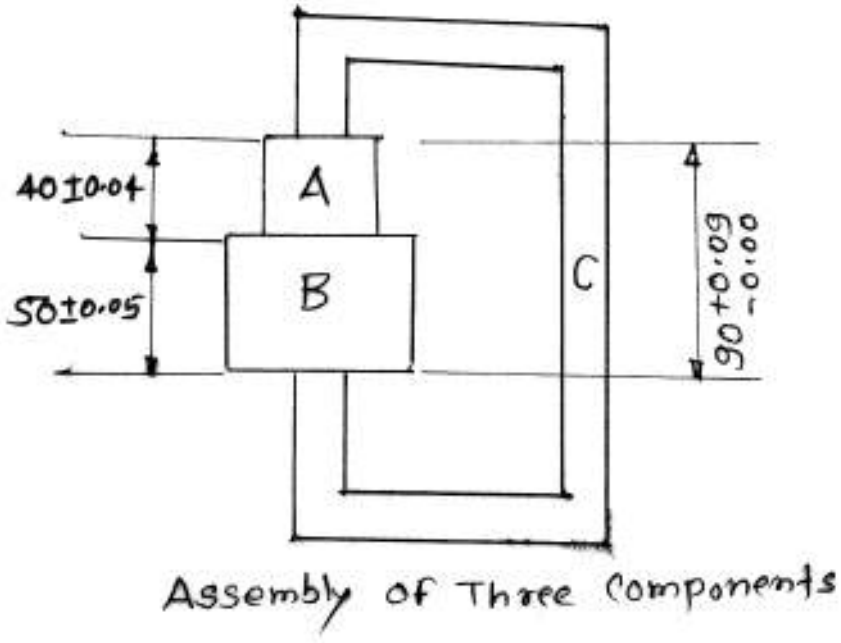
11. a) What is adequate design and optimum design ? Explain with suitable examples. **6**

b) An assembly of 3 components A, B and C is shown in figure. Find the percentage assemblies where interference is likely. Assume normal distribution.

Areas under normal distribution curve are given below :

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
Area	0.3849	0.4032	0.4192	0.4332	0.4452	0.4554	0.4641	0.4713	0.4772

Assume linear interpolation for intermediate values. **10**



Assembly of Three Components

OR

12. a) Explain the following terms used in the statistical analysis of the engineering problems :

i) Mean

ii) Variance

iii) Standard deviation

iv) Standard variable. **6**

b) In a light weight equipment, a shaft is transmitting a torque of 900 Nm and is to have a rigidity of 90 Nm/degree. Assume a factor of safety of 1.5 based on yield stress. Design the shaft with minimum weight. Assume maximum shear stress theory of failure. Use the following data for the materials. **10**

Material	**Mass Density (Kg/m^3)**	**Material Cost (Rs/N Weight)**	**Yield Strength (Mpa)**	**Shear modulus (GPa)**
Steel Alloy	8500	16	130	80
AL-Alloy	3000	32	50	26.7
Titanium Alloy	4800	480	90	40
Magnesium Alloy	2100	32	20	16

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T.E. (Chemical) (Semester – II) Examination, 2011
PROCESS INSTRUMENTATION AND CONTROL (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define instrumentation and classify the instrument based on function. **8**
   b) Differentiate between accuracy and precision. **6**
   c) What is calibration ? State the methods for calibrating the measuring instrument. **4**

OR

2. a) Explain static and dynamic characteristics of measuring instruments. **8**
   b) Differentiate between Analog and Digital instrument. **4**
   c) Explain the importance of instrumentation the process industries. **6**

3. a) Describe the operating principle, construction and working of thermocouple used for temperature measurement. **8**
   b) Describe Bourdon Pressure Guage. **8**

OR

4. a) Write shorts notes on : **8**
      1) Thermistor 2) RTD.
   b) Describe working of LVDT. **6**
   c) List various units of pressure used in practice. **2**

P.T.O.

5. a) How will you differentiate between direct and indirect level measuring methods ? List various direct and indirect methods. **8**

   b) Describe the following flowmeters : **8**

      i) Rotameter

      ii) Pitot Tube.

OR

6. a) Write short notes on : **8**

      1) Bob and tape method

      2) Air purge method.

   b) Explain the principle, construction and working of Orifice meter. **8**

SECTION – II

7. Describe with neat diagram the following techniques of composition analysis. **16**

   a) X-ray absorption spectroscopy

   b) Mass spectroscopy.

OR

8. Write short notes on : **16**

   1) HPLC

   2) Gas Chromatography

   3) Refractometry

   4) pH meter.

9. a) Describe heat exchanger automatic control system with block diagram. **8**

   b) Describe characteristics of second order system. **8**

OR

10. a) State differences between first order and second order system. **8**

    b) State the differences between SERVO and REGULATORY operation. **8**

11. a) An air to open valve on the inflow controls level in a tank. When the process is at the set point the valve opening is 50%. An increase in outflow results in the valve opening increasing to a new steady state value of 70%. What is the resulting offset if the controller PB is

    i) 50% ii) 25%. **9**

    b) Explain with diagram distributed control system. **9**

OR

12. a) State the differences between feedback and feed forward control. **9**

    b) Explain with diagram centralized digital control computerized system. **9**

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[3963] – 322

T.E. (Petroleum Engineering) (Semester – I) Examination, 2011
PETROLEUM GEOLOGY – I
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *: i) Answers to the **two** Sections should be written in **separate** books.*
*ii) Neat diagrams should be drawn **wherever** necessary.*
*iii) Attempt **any three** questions from Section **I** and Section **II**.*
*iv) Figures to the **right** indicate marks.*

SECTION – I

1. a) Using a sketch, explain relative abundance of igneous, sedimentary and metamorphic rocks in terms of weight and volume proportion. **6**

   b) What is relationship between the rate of solubility of quartz, and calcite with pH of water ? **5**

   c) Give suitable classification based on mode of occurrence of igneous rocks. **5**

OR

1. a) What are clay minerals ? Distinguish between cohesive and incohesive clay minerals. How are these recognized in the field ? Discuss their signification in the sedimentary rocks. **10**

   b) Explain the term 'Rock Cycle' with the help of a neat diagram. **6**

2. a) What is physical and chemical weathering ? Discuss any two modes of physical weathering. **8**

   b) Discuss with the help of neat diagrams, convergent and divergent plate margins. **8**

OR

2. a) How is occurrence of an earthquake is discussed on the basis of elastic rebound theory ? **8**

   b) Draw and explain the triangular classification of mass movements. **8**

3. a) How are faults recognized in field ? What are sealing faults/clay smears ? Discuss their behavior and significance ? **8**

P.T.O.

b) A sandstone bed is recorded in boreholes A and C at a depth of 300 and 650 m respectively. Its presence in borehole B is insignificant or minor. The boreholes are taken along E-W direction with a spacing of 500 m. A fault dipping 45° towards west is interpreted at a depth of 600 m in borehole C. The sandstone dips at an angle of 5° towards East and it has a vertical thickness of 150 m. Classify the fault. What is the heave, throw and net slip of the fault ? At what depth fault would be interpreted in borehole A and C ? **10**

OR

3. a) Describe anyone geometric classification of folds. How is the relationship of wavelength and amplitude useful in ascertaining the persistence and penetration of folds ? **12**

b) Distinguish between plunging and non plunging folds with the help of neat diagram. **6**

SECTION – II

4. a) Explain with suitable diagrams how compaction, recrystallisation and dissolution as post depositional changes alter the original nature of sediments/sedimentary rocks. **10**

b) Discuss in brief mud supported and grain supported framework of sedimentary rocks. **6**

OR

a) What are the major components of carbonate rocks ? Discuss Dunham's scheme of classification of carbonate rocks. **10**

b) What is a textural maturity of sediments ? What are the various criteria applied to explain it ? **6**

5. a) How to interpret the sedimentary environments using the various trace fossils ? **6**

b) What are microfossils ? Explain the importance of microfossils in the exploration of hydrocarbons. **10**

OR

5. a) Discuss in brief various marine depth zones with suitable diagram. **10**

b) Explain in brief the concept of index fossils and zone fossils ? **6**

6. a) Following sedimentary sequence is encountered. (F During preliminary investigations (Figure : 0.1). Reconstruct the chronology of events based on emergence and submergence of coast. Discuss in brief the geological conditions promoting the regression and transgression of sediments. **10**

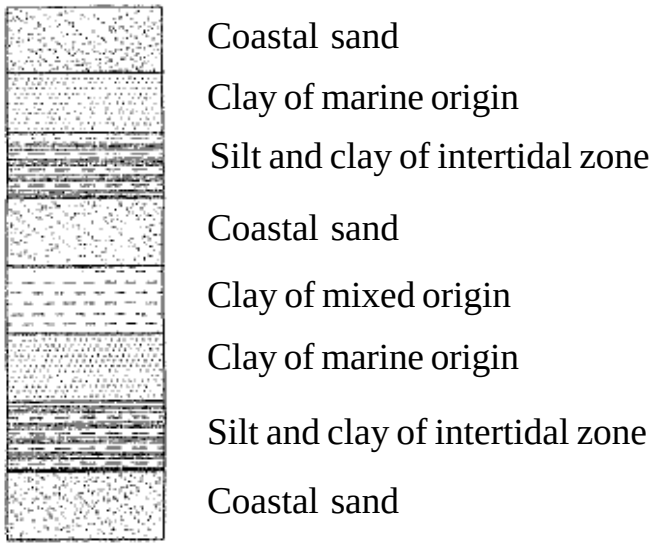

Figure : 0.1

b) Write in tabular form Geological Scale and important events in it. **8**

OR

6. a) Following subsection is revealed in exploratory drilling. Give chronology of events in tabular form. **10**

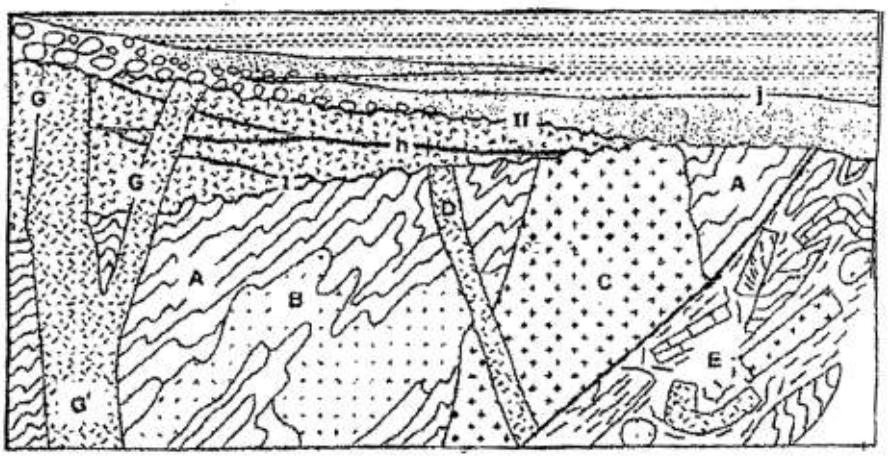

Figure. 2

b) What is unconformity ? Discuss in detail the various types of unconformities with the help of neat sketches. **8**

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T.E. (Petroleum) (Sem. – I) Examination, 2011
HYDROCARBON PROPERTIES AND THERMODYNAMICS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*
*4) Use of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*
*6) Refer to Steam Tables if **required**.*

SECTION – I

1. a) Define : State Function, Closed System, Enthalpy, Entropy. **8**

   b) A heat exchanger is used to heat 876 kg/min of water from 23.7° C to 76.5°C. For this purpose, saturated steam at 100° C enters heat exchanger and leaves as saturated liquid at 100° C. Calculate entropy change of water, steam and universe in 1 minute. Get relevant data from steam table. **8**

OR

2. a) State 2^{nd} Law of Thermodynamics and provide its mathematical expression explaining all the associated terms. **4**

   b) Explain Joule Thomson Expansion with help of neat diagram and elaborate its usefulness. **6**

   c) With help of neat sketch explain the operation of Carnot Cycle and derive the equation of its efficiency. **6**

3. a) Discuss the major limitations of Ideal Gas laws and the need of development of Real gas equations. **6**

   b) Discuss the van der Waal equation of state with help of P-V diagram and elaborate its major contribution. **6**

   c) Explain the contribution of various thermodynamic relations with help of suitable example. **6**

OR

4. a) The critical temperature and pressure of ethane are 305.43 K and 48.84 bar. Calculate molar volume of the gas at 765 K and 5.6 MPa using
   i) Ideal Gas Law
   ii) Van der Waals equation of state
   iii) Truncated form of virial equation. **10**

   b) Write down complete expression of any two equation of state with proper explanation of all the associated terms. **4**

   c) Define and explain following : Compressibility factor, Acentric factor. **4**

5. a) Define Chemical potential and activity coefficients. Provide their physical significances. **4**

   b) Derive and discuss: i) Clapeyron Equation ii) Clausius – Clapeyron Equation. **6**

   c) Discuss the Gibbs-Duhem equation and provide its expression in different forms. In this context highlight its major field of application. **6**

OR

6. a) The van Laar constant A and B for iso-octane and n-decane are 3.745 and 2.78 repectively at 250° C. Calculate activity coefficient of the compounds in a solution containing 72 mol% iso-octane. **8**

   b) It is desired to prepare 14.7 lit of 50 mol percent ethanol – water mixture. Determine volumes of ethanol and water need to be mixed in order to prepare the required solution. The partial molar volumes of ethanol and water are : 56.9×10^{-6} and 16×10^{-6} m^3/mol respectively.
   Additional data: molar volumes of pure components are,
   $v_{ethanol} = 57.9\times10^{-6}$ m^3 /mol and $v_{water} = 18\times10^{-6}$ m^3/mol. **8**

SECTION – II

7. a) With help of neat sketch discuss how VLE data can be generated for a multi-component mixture. **6**

   b) Explain the stepwise procedure to evaluate bubble point of a multi-component mixture. **6**

   c) Write down the expression of Phase Rule and Discuss its thermodynamic basis. **6**

OR

8. The system n-pentane, n-hexane and n-heptane forms an ideal solution. If feed stream of overall composition x_1=0.13,x_3=0.41and rest x_2 is continuously fed to a flash vaporizer maintained at 187 kPa and 119° C. Determine compositions of liquid and vapor streams leaving the flash unit. Also estimate fraction of feed vaporized in the unit. **18**

	A	**B**	**C**
n-pentane	6.876	1075.780	233.205
n-hexane	6.911	1189.640	226.280
n-heptane	6.894	1264.370	216.640

Antoine equation are given by : $\log P^{vap} = A - \frac{B}{t + C}$

Where, t is in °C and P^{vap} is in Torr. (1 Torr = 133.322 Pa)

9. a) Give mathematical representation of Darcy's law with proper explanation of all the associated terms. Highlight heterogeneity of petroleum reservoir from permeability perspective. **8**

   b) With help of neat diagram explain wetting of solid surface by liquid. In this context discuss imbibition and drainage mechanism. **8**

OR

10. a) Write down Laplace Young Equation with proper explanation of all the terms associated in it. Highlight its application in flow through porous media. **8**

    b) With help of mathematical expressions explain effect of curvature on equilibrium of Bubble. Discuss the physical relevance as well. **8**

11. a) Draw a neat phase diagram to explain the formation of gas Hydrates at higher pressure region. **6**

    b) It is believed that occurrence of Gas Hydrates is an important reason of Bermuda Triangle – Explain with proper reasoning. **6**

    c) Name all the gases which can produce gas hydrates. **4**

OR

12. a) Draw a schematic diagram to explain typical vapor-liquid-solid solution model for wax precipitation in petroleum mixture. Provide relevant mathematical expressions to explain the Thermodynamics associated with the process. **6**

    b) With help of neat sketch explain the precipitation of asphaltenes from bulk crude in presence of resin compounds. **6**

    c) Write a short note on EOS Modeling for Wax precipitation. **4**

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T.E. (Petroleum) (Semester – I) Examination, 2011
PETROLEUM PRODUCTION OPERATIONS
(2008 Pattern) (New)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer Q. No. **1** or **2**, Q. No. **3** or **4**, Q. No. **5** or **6** from Section – **I** and Q. No. **7** or **8**, Q. No. **9** or **10**, Q. No. **11** or **12** from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, calculator is **allowed**.*
*6) Assume suitable data **if** necessary.*

SECTION – I

1. a) Draw the neat schematic sketch of a typical Christmas tree and discuss its design considerations in brief. **9**

   b) Explain the role of a surface choke. Draw the schematic sketch of it and discuss various ways of well flow control. **9**

   OR

2. a) Draw the neat schematic sketch of a typical Wellhead equipment and write the various components used in it. **9**

   b) Discuss various types of safety valves used in oil and gas wells and their purpose in brief. **9**

3. a) List various bottom hole production equipments or tools and their functions in brief. **8**

   b) Draw the typical schematic sketch of a sub-surface well, producing from three sands using two tubings. Select number of packers, casing-tubing arrangement and other features for efficient production. **8**

   OR

P.T.O.

4. a) Write the functions of packer fluid and well completion fluid. **6**

   b) Classify types of packers and explain 'packer unseating mechanism' in brief. **10**

5. a) Draw the schematic sketch and explain various flow regimes/flow patterns during two phase flow through vertical and horizontal pipe line. **8**

   b) What is the difference between surface GOR, solution GOR and GLR ? Draw the generic graph and explain the concept of 'optimum GLR' in brief. **8**

OR

6. a) What are the applications of multiphase Co-relations ? Explain any one with its mathematical equations in brief. **6**

   b) Explain in brief Gilbert's method its procedure to optimize vertical lift performance. **6**

   c) Write a note on 'Heading cycle' or 'choke performance' in brief. **4**

SECTION – II

7. a) Compare in detail between Jet and Bullet perforation along with their applications. **9**

   b) Write various types of well completion methods and discuss merits, demerits of cased perforated hole completion in brief. **9**

OR

8. a) What is well activation ? Explain the use of nitrogen gas in well activation. **4**

   b) Draw sketch and describe in well completion for horizontal or multilateral well. **8**

   c) Write the applications of Drill Stem Testing. **6**

9. a) Define oil formation volume factor, gas formation volume factor and show its variation with reservoir pressure. Also define, oil viscosity, gas viscosity and compressibility factor with their oil field units. **10**

   b) Draw the generic nature of graph and indicate the typical trend of IPR for reservoirs having solution gas drive, gas cap drive and bottom water drive mechanism. Indicate various parameters on it. **6**

OR

10. a) What is skin damage ? Derive Standing's Correlation to account for skin damage using Vogel's work. **8**

    b) Following data is available : **8**

    Reservoir pressure = 32,00 psia

    Tested flowing bottom-hole pressure, pwf-1 = 2,100 psia

    Tested production rate at pwf-1 = 490 stb/day

    Tested flowing bottom-hole pressure, pwf-2 = 1,100 psia

    Tested production rate at pwf-2 = 7800 stb/day.

    Assume n = 1 and c = 0.0001 stb/day-psi^{2n}

    Construct IPR for a saturated oil reservoir using any two methods.

11. a) Discuss in detail various workover problems for oil wells and their remedy in brief. **8**

    b) What is liquid loading of gas wells ? Write the reasons for this problem and solution in brief. **8**

OR

12. a) Write in brief short notes on following : **10**

    i) Water and gas coning

    ii) Horizontal well applications.

    b) What is well stimulation ? Write the objectives of two types of stimulation methods. **6**

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[3963] – 328

T.E. (Petroleum) (Semester – II) Examination, 2011
PETROLEUM PRODUCTION ENGINEERING – I (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answer Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**, from Section – **I** and Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12** from Section – **II**.*

*ii) Answers to the **two** Sections should be written in **separate** books.*

*iii) Neat diagrams must be drawn **wherever** necessary.*

*iv) Black figures to the **right** indicate **full** marks.*

*v) Use of logarithmic tables, Slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*vi) Assume suitable data, **if** necessary.*

SECTION – I

1. a) In which of the following well conditions you will select ESP, Intermittent gas lift and PCP. **9**

   High/Low – GOR, PI, BHP

   Poor/fair/good/excellent/not applicable

   – applications in handling of viscous fluid, paraffin, solids handling capability. Offshore, deviated hole, High and low volume lift capability. **9**

   b) Calculate the casing pressure at 8300 ft, required to open the valve if, Ab = 0.77 $inch^2$, R = 0.087, Pd = 743 psi, Pt = 333 psi. What is the tubing effect caused by tubing pressure ? How much pressure it would require to open the valve in the casing if, tubing pressure is zero psi at valve depth. Also explain meaning of spread and find its value for this valve. **9**

OR

2. a) In order to select the ALT for the following data, calculate, flowing bottom hole pressure required in each case, if the flowing frictional resistance is to be neglected. Well depth = 6000 ft. wellhead pressure = Pwh is given below

   i) Well is standing full of water, gradient = 0.467 psi/ft. Pwh = 200 psi.

   ii) Well is standing full of 42° API Oil exerts a gradient of 0.354 psi/ft. Pwh = 250 psi.

   iii) Well is making solution gas with oil column exerts a gradient to an average of 0.233 psi/ft. Pwh = 100 psi.

   iv) Injected gas into the well bore gives reduced fluid pressure gradient as 0.14 psi/ft. Pwh = 100 psi.

P.T.O.

b) Draw the schematic sketch of casing pressure operated gas lift valve and derive the equation to calculate closing pressure under operating conditions. **9**

3. a) Use the following data and decide depth for point of gas injection. Also prove that, for a continuous flow injection,

P_{wh} + Gfa.L + Gfb (D-L) = Pwf.

Depth = 8800 ft. Expected rate = 980 bbls/day. Tubing size = $2\frac{3}{8}$ inch. Pwh = 150 psig, SBHP = 2850 psig. P.I. = 2.8, solution GOR = 280, SCF/STB, Sp. Gravity of injection gas = 0.68, S/C available pressure = 980 psig, °API = 41, S/C Temp. = 122 °F B.H. Temp. = 222 °F.

275 psi/1000 ft = flowing gradient of FBHP. 22.5 psi/1000 ft = casing pressure gradient. Substract 100 psi from point of balance. **10**

b) Calculate the total injection gas necessary if, optimum GLR = 650 SCF/STB, Formation GLR = 230 SCF/STB while desired oil production (100% oil) is 980 bbls/day. Also explain the concept of 'Optimum GLR' in brief. **6**

OR

4. Prepare a pressure depth scale and describe in detail design procedure for a typical Intermittent gas lift well using either single – point or multi-point injection, standard valves, time cycle control or choke control at the surface. Assume suitable data to explain the graph and procedure. **16**

5. a) Describe in brief the phenomena of liquid fall back into gas phase during Intermittent gas lift cycles. **6**

b) Why the SRP system is furnished with counter balance ? Illustrate how will you approximate the ideal counter balance effect. Also explain the indicate using dynagraph, the meaning of fluid pound, gas pound and gas lock conditions in SRP. **10**

OR

6. a) % length of each section of the tapered rod string is given below : **12**

Well depth = 8300 ft,

1 inch rods = 36.9% = 2.9 lb/ft

7/8 inch rods = 36.0% = 2.22 lb/ft

3/4 inch rods = 27.1% 1.63 lb/ft

If the maximum stress should be within the allowable working stress, check this string and give your comments.

Sp. Gravity of fluid = 0.91, Plunger diameter = $2\frac{1}{4}$ inch, Pumping speed = 18 SPM and Stroke length = 54 inch. Sucker rods are available in 25 ft lengths. Allowable working stress = 50,000 psi. You can use the expression Wf = 0.433 G (L.Ap – 0.294.Wr) to Calculate fluid weight in lbs.

b) Write the factors influencing the shape of dynamometer card. (dynagraph). **4**

SECTION – II

7. a) Draw the typical pump performance curve for a submersible pump used in ESP. Explain various parameters and their reading on it. **8**

   b) Draw the neat schematic sketch of subsurface assembly of ESP and indicate all the components in it. Explain the function of every component in brief. **10**

OR

8. a) It was desired to produce water of Sp. Gravity 1.07 (No gas) at the rate of 1300 bbls/day from 5350 ft deep well. The static liquid level = 2300 ft. Casing = $5\frac{1}{2}$ inch O.D. Tubing = $2\frac{3}{8}$ inch O.D. T = 154 °F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3100 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump. Tubing friction is given as 31.5 ft/1000 ft. At the surface there is 2300 ft of 2.0 inch flow line with an increase in elevation = 43 ft., with friction = 31.5 ft/1000 ft. Calculate TDH and total HP, if pump with 0.38 HP/stage is available and each stage gives a head of 24 feet. **12**

   b) Write a note on, 'Protector or Seal Section' of ESP and show its position on a subsurface schematic. **6**

9. a) Write the Inflow and Outflow expressions applicable at the bottom hole and wellhead of the wellbore and explain them in brief. **4**

   b) Draw the schematic graphs for the following, to explain the meaning of : **12**

      i) IPR, TPR with operating point.

      ii) IPR, TPR without operating point (TPR above IPR).

      iii) Wellhead pressure Vs flowrate to indicate operating point of S/C flow line.

      iv) Pressure drop across the sandface Vs flowrate for specific tubing profile and perforation with operating point.

OR

10. Following data is available, indicating bottom hole flowing pressure Vs gas flow rate production and pressure drop in 2.441 inch tubing against the said flow rate and well conditions. Workout the operating points to know the perforation sizing, flow capacity and pressure loss across the sandface. **16**

Q_{sc} Mscfd	Pwfs. Psia	ΔP psi (d = 2.441)
25,000	5700	470
20,000	5550	1470
15,000	5450	2200
10,000	5350	3060
5,000	5200	3710

Given Data : (Relevant)

T_S = 100 °F, $\gamma_g = 0.83$, $\in = 0.0006$ inch, H = 12,300 ft,

T_R = 263 °F $\mu_g = 0.011$ Cp, r_e = 1140 ft, r_w = 0.50 ft., S = 0,
h = 20 ft., Perforation diameter = 0.7 inch., z = 0.97, Gravel permeability = 40 darcys., Screen O.D. = 3.06 inch., Hole

diameter = 12.25 inch, 4, 8 and 12 perforations per foot are to be checked.

11. a) Calculate the maximum acid injection rate using, safety margin 250 psi and maximum expected surface injection pressure at above rate for following job.

30 ft thick, 40 md sandstone pay zone at a depth of 9,000 ft is to be acidized with 1.07 Sp. Gravity acid solution and viscosity of 1.2 Cp using 2 inch ID coiled tubing. Fracture gradient is 0.7 psi/ft. Wellbore radius is 0.328 ft.

Assume : reservoir pressure = 4100 psia.,

drainage area radius = 1600 ft and S = 9

b) Write and explain chemical reactions one each for matrix acidization of Carbonate and Sandstone mineral in brief. Also explain the meaning of dissolving power of acid. **6**

OR

12. a) Use the inflow equations, drianage area concept and fracture conductivity defied skin factor given below. r_w = 0.35 inch,

re = 1790 ft., S = –3.58. Calculate the productivity ratio, fold of increase in well productivity after fracturing job. **4**

b) Explain the hydraulic fracturing process using a typical surface read-out graph. Also write the various properties and selection criteria for fracturing fluid. **12**

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T.E. (Production) (Semester – I) Examination, 2011
MATERIAL FORMING (Common with Pro. S/W)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

UNIT – I

1. a) Explain and sketches the stress strain diagram for the material exbiting. **8**
   i) Rigid and elastic behaviour.
   ii) Rigid with strain hardening
   iii) Plastic behaviour
   iv) Elastic-Plastic behaviour.

   b) What are the assumptions in material forming ? What are the different methods used for the analysis of forming processes ? **8**

OR

2. a) Explain the effect of temperature, strain rate and friction on metal forming process. **8**

   b) Calculate the work done in deforming a rod of aluminium to fracture the diameter of the rod is 10 mm and length 250 mm. Young's modulus is 670 kN/mm^2, yield stress 75 MPa, work hardening index 0.25. What percentage of work done was used for elastic deformation ? **8**

P.T.O.

UNIT – II

3. a) Explain the different methods for the cleaning and finishing of a forged component. **8**

   b) Explain the following :

      i) Isothermal forging **5**

      ii) P/M forging. **5**

OR

4. a) Derive an equation for the forging pressure, required in open die forging with sticking friction. **14**

   b) Explain the importance of fillet and corner radius as well as draft in forging dies. **4**

UNIT – III

5. a) Explain various lubricants used in drawing operation of aluminium wire, steel wire and copper wire. **4**

   b) Derive and equation for total drawing stress in wire drawing considering. Friction at die land. **12**

OR

6. a) Show that maximum reduction possible in strip drawing operation is 60% Assuming coefficient of friction $\mu = 0.05$ and semi-die angle 15°. **8**

   b) Explain how the stock is prepared prior to the wire drawing operation. **8**

SECTION – II

UNIT – IV

7. a) Determine deformed radius of curvature of steel rolls 600 mm diameter rolling the copper strip of 1000 mm wide, 75 mm thick with 20% reduction and yield stress of copper is 675 N/mm^2, E = Young's moduls = 2.01 MN/ mm^2 and Poisson's ratio = 0.35. **6**

   b) Discuss the methods of automatic gauge control. **6**

   c) Explain roll camber. **4**

OR

8. a) Explain the methods used to reduce the separating force in rolling. **6**

   b) Explain rolling defects with causes and remedies. **6**

   c) Explain any one with neat sketch. **4**

      i) Sendzimer mill

      ii) Planetary mill.

UNIT – V

9. a) Explain the following :

      i) CCD and shape factor **4**

      ii) Porthole dies **4**

      iii) Hookers process. **4**

   b) Explain lubrication process and lubricants used in extrusion processes. **4**

OR

10. a) Explain the variation of extrusion pressure with ram travel in direct, indirect and hydrostatic extrusion process with proper graph. **8**

    b) Sketch the plant layout generally for forward extrusion process and also state the accessories required. **8**

UNIT – VI

11. a) Explain with proper sketch vertical power spinning machine. State its applications. **6**

    b) Explain the importance of field shapers and drivers in EMF with neat sketch. **6**

    c) Explain Radial draws forming with neat sketch. **6**

OR

12. Write short note on :

    i) Various types of coils used in EMF **6**

    ii) Field shapers and drivers in EMF **6**

    iii) Stretch draw forming. **6**

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T.E. (Petroleum Engg.) (Semester – II) Examination, 2011
PETROLEUM EQUIPMENT DESIGN AND DRAWING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Define role of Design engineer in process equipment design. **4**

   b) Find the length of belt necessary to drive a pulley of 80 cm diameter running parallel at a distance of 12 meters from the driving pulley of diameter 480 cm.
   i) If belt is open
   ii) If belt is crossed. **6**

   Assume permissible tensile stress of 100 N/mm^2 and poison ratio as 0.3

   c) Discuss in details about 'General procedure for Process Equipment design'. **6**

OR

2. a) An cross belt 100 mm wide connects two pulleys mounted on parallel shafts with their centers 2.4 m apart. The diameter of the larger pulley is 450 mm and that of the smaller pulley 300 mm. The coefficient of friction between the belt and the pulley is 0.3 and the maximum stress in the belt is limited to 14 N/mm width. If the larger pulley rotates at 120 r.p.m., find the maximum power that can be transmitted. **6**

   b) Differentiate between Mechanical Design and Process Design. **3**

   c) Write in detail about Code and Standards. Enlist the names of organizations which develop these Codes and standards. **7**

P.T.O.

3. Design a cast-iron protective type flange coupling to connect shafts in order to transmit 15 hp at 500 rpm. The following permissible stresses may be used.

   Shear stress for shaft, bolt and key material = 400 KgF/Cm^2

   Crushing stress for bolt and key = 800 KgF/cm^2

   Shear stress for cast iron = 80 KgF/cm^2

   Width and thickness of the key used is 12 mm. **16**

   OR

4. a) Discuss various types of belt drives along with their classification criteria. Define velocity ratio of a belt drive. **8**

   b) The load on a member consists of an axial pull of 30 kN, with shear force of 15 kN, find the diameter of member according to :

      a) Maximum Normal Shear Stress Theory
      b) Maximum Shear Stress Theory
      c) Maximum Principal Strain Theory
      d) Maximum Strain Energy Theory. **8**

5. a) Discuss various types of pumps used in petroleum industry along with equation for horsepower capacity for any two. **6**

   b) Give detailed classification of compressors. Explain working of reciprocating compressors along with neat sketch. **6**

   c) Discuss hydraulic and pneumatic circuits with sketch. **6**

   OR

6. Write short notes on (any four) : **18**

   a) Mud circulation.
   b) IS-2825 & IS-4503.
   c) Power transmission mechanism on rig.
   d) Brake used in draw works of drilling rigs.
   e) Types of valve used at production facility.

SECTION – II

7. a) Discuss with neat sketch different types of heads along with various pressure ranges to be used in design of pressure vessel .Write formulae to design any two heads. **6**

   b) Design a Shell of Pressure vessel with following data :

   Shell Data :

   Internal diameter (Approx) = 1400 mm

   Material = Stainless Steel

   Permissible stress at 150° = 140 N/mm^2

   Internal pressure = 0.35 N/mm^2

   Weight = 38000 N

   Joint efficiency (Shell) = 0.85

   Joint efficiency (Head) = 1.00

   Torque Offset piping = 500 N-m. **10**

OR

8. a) What do you mean by nozzle compensation ? Explain area for area method of nozzle compensation with neat sketch. **7**

   b) A cylindrical thermic fluid storage tank has 1.0 m inside diameter. It is subjected to an internal pressure of 3.0 kg/cm^2. Permissible stress for the material is 1260 kg/cm^2. Welded joint efficiency is 85%. Weight of the vessel with all its contents is 5000 kg. Torque exerted due to offset piping is 60 kg-m. The thermic fluid storage tank has torispherical head. Crown radius of the head is equal to the diameter vessel. Knuckle radius of head is 6% of the diameter of the vessel. Stresses induced due to wind load can be neglected. Calculate the minimum thickness required for the cylindrical shell and torispherical head. Also calculate the resultant stresses induced in shell. **9**

9. a) Discuss advantages and disadvantages of fixed tube, floating head and U tube heat exchangers. Draw neat sketch of any two. **8**

   b) Discuss Fouling in Heat exchanger in details. What are the consequences of fouling ? **8**

OR

10. a) Calculate the shell diameter and Nozzle thickness of shell and tube heat exchanger :

Data :

Permissible stress	=	95 N/mm^2
No.of Passes	=	2
No.of tubes	=	54 (with 2 pass U-Bundle)
Spacing between tubes	=	2.5 cm (Square pitch)
β	=	0.7
Joint Efficiency	=	85%
Pressure	=	0.5 N/mm^2
Nozzle inlet and outlet diameter	=	75 mm.

12

   b) Discuss various types of head and closure used in shell and tube heat exchangers. **4**

11. a) Discuss the various parts of storage tanks other than head, shell and bottom plate. **6**

   b) Explain the procedure to calculate thickness of tall storage vessels at different height. **6**

   c) Explain the design consideration for designing shaft of agitator. **6**

OR

12. Write short notes on :

   a) Types of Agitator used in industry (with neat sketch)

   b) Types of losses in storage tanks

   c) Loss minimization techniques in storage tanks

   d) Baffles and Tie rods in shell and tube heat exchanger. **18**

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T.E. (Petrochemical) (Semester – I) Examination, 2011
APPLIED HYDROCARBON THERMODYNAMICS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is **allowed**.*
*5) Assume suitable data, **if necessary**.*
*6) Refer to steam tables if **required**.*

SECTION – I

1. a) Explain Joule Thomson Expansion with help of neat diagram and elaborate its usefulness. **8**

   b) A rigid tank of 12.67 m^3 volume contains steam of quality 67.2% at pressure of 3.13 bar. Determine the amount of heat is to be added in order to have only saturated steam in the tank. Evaluate final pressure in the tank. **8**

OR

2. a) An inventor claims to have designed a heat engine which absorbs 1234 kJ/s of energy from a source at 600°C and delivers 675 kW power. He further states that ambient atmosphere is at 27°C which is considered as sink for the heat engine. Is his claim valid - Justify your answer. **6**

   b) Estimate approximate pressure at which a boiler is to be operated if it is desired to boil water at 187°C. Obtain relevant information from steam table. **6**

   c) State 1st Law of Thermodynamics and provide its mathematical expression explaining all the associated terms. **4**

P.T.O.

3. a) Write down complete expression of any two equation of state with proper explanation of all the associated terms. **6**

   b) Derive expression of law of corresponding states using van der Waals equation of state. **6**

   c) Explain following : **4**

   Compressibility factor, Residual Properties.

OR

4. a) Explain the contribution of various thermodynamic relations with help of suitable example. **6**

   b) Discuss the major limitations of Ideal Gas laws and the need of development of Real gas equations. **4**

   c) Calculate molar volume of acetylene at 235°C and 1.87 bar using van der Waals equation of state.
   Given that, the critical temperature = 309 K and critical pressure = 61.6 atm for the unsaturated hydrocarbon. **6**

5. a) A person weighting 68 kg wants to skate on ice at –2.1°C with skates having 18 mm^2 area of contact with a flat surface, will he be able to skate ? **6**

   [Specific volume of ice and water at 0°C are 1.091×10^{-3} m^3/kg and $1.0\times10^{-3} m^3/kg$ respectively. Enthalpy of melting of ice is 6.002 kJ/mol]

   b) Derive and discuss : **6**

   i) Clapeyron Equation

   ii) Clausius - Clapeyron Equation.

   c) Define following with proper thermodynamic basis : **6**

   i) Chemical Potential

   ii) Partial Molar properties.

OR

6. a) Discuss the Gibbs-Duhem equation and provide its expression in different forms. In this context highlight its major field of application. **6**

   b) From the following vapor pressure data for carbon tetrachloride (CCl_4), evaluate the heat of vaporization in this range : **6**

t(°C)	25	35	45	55
P^{vap}	113.8	174.4	258.9	373.6

   c) Explain with help of suitable example how VLE data of a multicomponent mixture can be generated in lab scale. **6**

SECTION – II

7. a) State Phase Rule. Discuss its thermodynamic basis. **6**

   b) Assume that cold drinks contain only CO_2 (1) and H_2O (2), determine the composition of the vapor and liquid phases in a sealed can at 8°C. Henrys constant for CO_2 in water at 8°C is about 987 bar. **6**

   c) In multi-component VLE, explain the flash calculations with help of flow chart. **6**

OR

8. Antoine's constants for Benzene and Toluene are given as follows : **18**
   $\log_{10} P^{vap} = A - B/(t + C)$ where P^{vap} is in mm Hg and t is in °C

	A	**B**	**C**
Benzene	6.90565	1211.033	220.790
Toluene	6.95334	1343.943	219.377

   Assuming ideal solution, calculate

   a) The composition of vapor and liquid in equilibrium at 795 mm Hg pressure and 245°C

   b) The total pressure and composition of the vapor in equilibrium with a equimolar liquid mixture available at 140°C

   c) Vapor and liquid flow rates leaving flash chamber operating at 987 mm Hg pressure and 130°C temperature, if the feed contains 60 mol% toluene with a feed flow rate is 487 kmol/hr.

9. a) Develop an expression for determination of Fugacity coefficient for a van der Waal gas. Determine fugacity and fugacity coefficient for n-octane vapor at 427 K and 0.2 MPa
Given : a = 3.789 Pa $(m^3/mol)^2$ and b = 2.37×10^{-4} m^3/mol. **8**

b) The van Laar constant A and B for iso-octane and n-decane are 3.745 and 2.78 respectively at 250°C. Calculate activity coefficient of the compounds in a solution containing 72 mol% iso-octance. **8**

OR

10. Volume of a mixture of two organic liquids 1 and 2 is given by
$V = 138.7 - 14.3\ x_1 - 3.115x_1^2$
where V is volume in m^3/mol at 1.0 bar and 300 K. **16**

a) Find the expressions for partial molar volumes.

b) Find the volumes of pure 1 and 2 required to be mixed in order to obtain 1000 m^3 of a solution containing 40 mol% of 1.

11. a) Mixtures of CO and CO_2 are to be processed at temperatures between 900 and 1000 K, It is desired to know under what conditions solid carbon might deposit according to the reaction : **8**

$CO_2(g) + C(s) = 2\ CO(g)$

For the reaction, the equilibrium constants are : K = 0.178 at 900 K and

K = 1.58 at 1000 K

b) Write short notes on : **8**

i) Effect of temperature and pressure on equilibrium conversion

ii) Heterogeneous chemical equilibrium.

OR

12. For the catalytic dehydration of 1-butene to 1,3-butadiene, **16**

$C_4H_8(g) = C_4H_6(g) + H_2(g)$

Carried out at 900 K and 1 atm., with a ratio of 10 mol of steam per mol of butene, determine the extent of reaction at equilibrium. Also determine the extent of reaction in absence of steam.

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T.E. (Petrochemical) (Semester – I) Examination, 2011
MASS TRANSFER – I (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. Answer the following questions in brief : **16**

   a) Explain molecular diffusion by giving suitable examples.

   b) State and explain Fick's Law. Give meaning of all terms involved in it.

   c) Classify mass transfer operations by giving suitable examples.

   d) Give correlations for estimation of diffusivity in gases and explain the terms involved in it.

OR

2. A narrow tube is partially filled with liquid and maintained at a constant temperature. A gentle stream of a gas is passed across the open end of the tube. As the liquid evaporates, the level drops slowly. At a given time t, this level in the tube is Z from the top. Derive an expression to calculate the value of diffusivity of liquid vapor in the gas. **16**

P.T.O.

3. a) Gas A is diffusing from a gas stream at point 1 to a catalyst surface at point 2 and reacts instantaneously and irreversibly as follows : $2A \rightarrow B$. Gas B diffuses back to the gas stream. Derive the final equation for NA at constant pressure P and steady state in terms of partial pressure. **9**

   b) Discuss in brief methods to conduct the mass transfer operations. **7**

OR

4. a) Calculate the amount of diffusion of acetic acid (A) in 2 hours across a film on non-diffusing water (B) solution 1 mm thick at 17°C when the concentration on opposite side of the film are 9 and 3 weight % acid respectively. The diffusivity of acetic acid in solution is 0.95×10^{-9} m^2/sec. Data : At 17°C is given below :

   Density of 9% solution = 1012 kg/m^3

   Density of 3% solution = 1003 kg/m^3,

   Molecular weight of acetic acid = 60,

   Molecular weight of water = 18. **8**

   b) Discuss the Winklemann's method for estimation of diffusivity of vapors. **8**

5. a) An absorption into water. In this process, ammonia is transferred by molecular diffusion through a stagnant gas layer 2 cm thick and then through stagnant water layer 1 cm thick. The concentration of ammonia at the outer boundary of the gas layer is 3.42 mole% and the concentration of ammonia at the lower boundary of the water layer is essentially zero. Other useful data for the system (T = 15 C, P = 1 atm.) :

   $D_{NH_3-air} = 0.215\ cm^2/s,\ D_{NH_3-H_2O} = 1.77 \times 10^{-5}\ cm^2/s$

   Equilibrium data for ammonia in air over aqueous solutions : **10**

P_{NH_3} **in air (mm Hg)**	5	10	15	20	25	30
C_{NH_3} **in water (mole/cm^3 $\times 10^6$)**	6.1	11.9	20.0	32.1	53.6	84.8

b) H_2 gas flows through a tube of neoprene rubber having ID = 30 mm and OD = 55 mm. The pressure and temperature of the gas are 3 std. atm. pressure and 298 K respectively. If the solubility of hydrogen in rubber is $S = 55\times10^{-3}\frac{m^3(NTP)}{m^3\cdot rubber\cdot atm.}$ and diffusivity of H_2 through rubber $D_{AB} = 1.8\times10^{-10}\ m^2/sec$. Calculate rate of H_2 loss per unit length of tube due to diffusion. **8**

OR

6. Write short notes on : **18**

i) Theories of mass transfer.

ii) Analogy between heat, mass and momentum transfer.

iii) Comparison of tray and packed towers.

SECTION – II

7. The average heat transfer coefficient for natural convection from a single sphere in a large body of fluid is given by

$$\frac{hd}{k} = 2 + 0.6\left(\frac{d^3\rho^2 g\beta\beta\Delta}{\mu^2}\right)\left(\frac{c_p\mu}{k}\right)^{1/3} \text{ for } Gr^{1/4}\,Pr^{1/3} < 200$$

Where d is the diameter of the sphere and the fluid properties are evaluated at the mean temperature of the sphere and bulk fluid. Using the analogy between mass and heat transfer, calculate the instantaneous rate of sublimation at the surface of a naphthalene sphere in air at 140°C and 1 atm.

Explain the analogy between Nu = Sh, Sc = Pr, Gr = Gr_{AB}.

Data :

$P^{vap}_{naphthalene}$ = 0.2 atm, $D_{AB} = 5.9\times10^{-6}$ m^2/s, $d = 7\times10^{-2}$ m

$\rho_{air} = 0.850 kg/m^3$, $\mu_{air} = 2.5\times10^{-5} kg/m.s$ **18**

OR

8. a) Calculate the value of mass transfer coefficient and flux of mass transfer from a sphere of naphthalene to air at 45°C and 1 atm flowing at velocity of 0.305 m/s. The diameter of sphere is 25.4 mm. The diffusivity of naphthalene in air at 45°C is 6.92×10^{-6} m^2/s and vapor pressure of solid naphthalene is 0.555 mm of mercury.

Data : $\mu = 1.93\times10^{-5} Pa.s, \rho = 1.113 kg/m^3$

You may use the following correlation :

$Sh = 2 + 0.552\ Re^{0.53} + Sc^{0.33}$

Where, $Sh = K'_c \frac{d_P}{D_{AB}}$. **12**

b) For equimolar counter-diffusion from a sphere to a surrounding stationary infinite medium, the mass flux N_{Ai} of the diffusing component A at the interface is given by $N_{Ai} = D_A (C_{Ai} - C_{Ab}) /R$ where D_A is the diffusivity, R the radius of the sphere and C_{Ai} and C_{Ab} the molar concentrations of A at the interface and at a point far away from the sphere. Show that the Sherwood number, based on the diameter of the sphere, is equal to 2. **6**

9. a) Discuss the theory of wet-bulb thermometry. Under what conditions the wet-bulb temperature and adiabatic saturation temperature will be identical ? **8**

   b) Classify the equipments for Humidification and Dehumidification operations.

   Explain the different types of cooling towers used in process industries. **8**

OR

10. In a drying experiment, a tray dryer containing a single tray of 1 m^2 area is used to dry crystalline solids. The following data has been collected :

Sr. No.	Time, Hour	Weight of wet material, kg
1	0	5.314
2	0.4	5.238
3	0.8	5.162
4	1.0	5.124
5	1.4	5.048
6	1.8	4.972
7	2.2	4.875
8	2.6	4.819
9	3.0	4.743
10	3.4	4.667
11	4.2	4.524
12	4.6	4.468
13	5.0	4.424
14	6.0	4.340
15	Infinite	4.129

   i) Calculate and plot the drying rates. Find the critical moisture content.

ii) If dry air is available at 313 K with an absolute humidity of 0.01 kg water per kg dry air and the dryer is maintained at 363 K, calculate the amount of air required in first hours.

Assume that the air is heated upto 363°K and the dry air leaves the dryer at 363°K with 5% saturation.

Test the consistency of falling rate period (choose critical moisture content and any one point in the falling rate period). **16**

11. a) In a laboratory drying test with a solid material the following relation for the falling rate period was obtained,

$$\frac{dX}{d\theta} - 0.8\,(X - 0.05)$$

Where X is the moisture content on dry basis of θ is the time in hours.

The critical moisture content is 1.5 kg moisture per kg of dry material.

Calculate :

a) the time required for drying the material from $X_1 = 4.5$ to $X_2 = 0.15$.

b) the equilibrium moisture content. **8**

b) Classify industrial dryers. Discuss the working principles and construction of Rotary drum dryer with neat sketch. **8**

OR

12. Write short notes : **16**

i) Rate of drying curve.

ii) Humidity Chart.

iii) Classification of mass transfer operations.

iv) Principles of UF, NF and MF.

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T.E. (Petrochemical Engineering) (Semester – I) Examination, 2011
INSTRUMENTATION AND INSTRUMENTAL ANALYSIS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. A) a) Explain the types of measurement uncertainties in detail. **8**

   b) Define :Accuracy, Precision, Repeatability, Reproducibility, Hysterisis, Drift, Fidelity, Dead zone. **8**

   OR

   B) a) Give the classification of the measuring instruments. **8**

   b) Explain hierarchy of standards and calibration. **8**

2. A) a) Explain the principle, construction and working of a radiation pyrometer. **8**

   b) Explain any one method of high pressure measurement in detail. **8**

   OR

   B) a) Explain the level measurement method for slurries. **8**

   b) Explain torque measurement technique in detail. **8**

3. A) a) Give the classification of flow measurement techniques and explain working of Rotameter in detail. **9**

   b) Explain control valve characteristics and its utility. **9**

   OR

   B) a) What are the factors to be considered while selecting a control valve ? **9**

   b) Draw with neat labels the working sketch of vortex shedding flow meter and turbine flow meter. **9**

P.T.O.

SECTION – II

4. A) a) Give the functions of the Quality control laboratory in a Petroleum Refinery. **8**

   b) What are international norms and specifications for Petroleum products ? **8**

OR

B) a) Classify analysis instruments. **8**

   b) Give the working principle of spectroscopic analysis, Chromatographic analysis, Crystallography, electrochemical analysis. **8**

5. A) a) Write a short note on Nuclear Magnetic Resonance (NMR). **8**

   b) Write a short note on gel permeation chromatography. **8**

OR

B) a) Give the classification of spectroscopic and chromatographic techniques for Analysis of fuels. **8**

   b) Write a note on the mass spectrometer. **8**

OR

6. A) a) Explain how you will characterize lubricants by analytical techniques. **9**

   b) Explain thermal conductivity gas analyzer. **9**

OR

6. B) a) Explain composition analysis using refractive index method. **6**

   b) Describe in brief pH measurement. **6**

   c) Discuss the various methods of density measurement. **6**

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T.E. (Petrochemical) (Semester – II) Examination, 2011
PETROCHEMICAL PROCESSES – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **3** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** answer books.*

*3) Figures to the **right** indicate **full** marks.*

*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*

*5) Assume suitable data, **if** necessary.*

SECTION – I

1. a) Explain the following terms : **8**

   i) Reid Vapour Pressure

   ii) Octane Number

   iii) Cloud Point

   iv) Smoke Point.

   b) Write a short note on the composition of petroleum. **8**

OR

2. a) Explain the reasons as to why the inorganic theory was given up in favour of organic theory. **8**

   b) What are the various low boiling products from a refinery ? **8**

P.T.O.

3. a) Describe with the help of a flow sheet a typical propane deasphalting unit. **8**

   b) Enlist the various crude distillation products. **6**

   c) What are the advantages of the ebullated bed reactor process ? **4**

OR

4. a) How is dewaxing of lube done with ketone ? **8**

   b) Discuss the importance of blending. Write a note on the line blending process. **6**

   c) Explain the need for desalting of crude. **4**

5. a) Draw a neat labeled diagram of a typical FCC unit. Discuss the role of regenerator. **8**

   b) Discuss the modified Claus process for sulphur recovery from refinery gases. **8**

OR

6. a) Write a note on the types of petroleum coke. Also give the uses of petroleum coke. **8**

   b) Give the need for air blowing of bitumen and explain the process for the same. **8**

SECTION – II

7. a) Explain the semi-regenerative process for catalytic reforming. **8**

   b) Write a note on disproportionation of toluene. **8**

OR

8. a) Give the various steps in the production of hydrogen by steam. **10**

   b) Write a note on the various reforming catalysts. **6**

9. a) Describe the process for the manufacture of polystyrene by bulk polymerization. **8**

   b) Give the various process technologies for the manufacture of polypropylene. **6**

   c) Give the flow diagram for the manufacture of polyvinyl chloride. **4**

OR

10. a) Write a note on the formaldehyde resins. **8**

    b) Give the various characteristics of polymers. **6**

    c) Give the flow diagram for the manufacture of polyethylene. **4**

11. a) Draw a neat labeled flow sheet for the manufacture of dimethyl terepthalate (DMT) clearly mentioning all the raw materials, intermediate products and final products. **8**

    b) Give the various routes for the manufacture of adipic acid. Write the equations for any two routes. **8**

OR

12. a) Give the process steps involved in the manufacture of nylon-66. **8**

    b) Give the manufacturing process for polyester from purified terepthalic acid (PTA). **8**

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T.E. (Production) (Semester – I) Examination, 2011
PRODUCTION PLANNING AND CONTROL
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **any three** questions from **each** Section.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Your answers will be valued as a **whole**.*

*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*7) Assume suitable data, **if necessary**.*

SECTION – I

Unit – I

1. a) What is production planning ? Explain the levels of production planning and factors which determine production planning. **9**

   b) Explain with block diagram functions of PPC. **9**

OR

2. a) Explain different types of production systems with their advantages, disadvantages and applications. **9**

   b) Explain how other departments in an Industry are associated with production planning and production control department. **9**

P.T.O.

Unit – II

3. a) Define forecasting. What are the different factors considered in forecasting ? **8**

   b) There is a correlation between the population of the city and micromax mobile hand set sold. The relation is shown in the following table :

Population in lakh	18	22	26	32	36	46
No. of Micromax mobile sold (X1000)	26	30	36	42	52	58

   Estimate the sales of micromax mobile for the cities with population 60 and 64 lakhs. **8**

OR

4. a) Explain with figure various demand patterns used in sales forecasting. **8**

   b) The following table gives the demand for 10 years.

Years	1	2	3	4	5	6	7	8	9	10
Demand	15	18	16	22	21	24	26	28	21	25

   1) Calculate the demand for the 11^{th} year using simple moving average method for the moving average period of 3 months.
   2) Calculate MFE (Mean Forecast Error).
   3) Calculate MAPE (Mean Absolute Percentage Error). **8**

Unit – III

5. a) Draw a route sheet/process sheet for any components manufactured at your workshop. Assume component drawing dimensions and sequence of operations. **8**

   b) Define process planning. Explain framework of process engineering with block diagram. **8**

OR

6. a) Explain briefly the concept of "Line of Balance". **8**

b) What are the factors affecting process planning ? Also explain which information is to be collected for process planning. **8**

SECTION – II

Unit – IV

7. a) What are the factors which influence on make or buy decision ? **8**

b) Explain in brief evolution (stages of Development) of ERP. (Enterprise Resources Planning). **8**

OR

8. a) What are the different documents used in purchase department ? Draw any two standard forms used in purchase department. **8**

b) Explain in brief master production schedule and BOM. **8**

Unit – V

9. a) What is stockout cost ? Why stockouts occur in an industry ? **8**

b) The annual demand for a component is 8000 units. The carrying cost is Rs. 561/unit/year, the ordering cost is Rs. 55/- per order and the shortage cost is Rs. 770/unit/year.

Find optimal values of the following :

i) Order quantity **2**

ii) Cycle time **2**

iii) Max. level **2**

iv) Represent the system Graphically. **2**

OR

10. a) Explain ABC analysis in detail. **8**

b) Annual requirement of an item is 3000 units. Each item costs the company Rs. 8. The manufacturer offers discount of 4 percent if 450 or more quantities are purchased. The ordering cost is Rs. 35 per order and inventory cost is 17 percent.

Whether it is advisible to accept discount ? Comment. **8**

Unit – VI

11. a) Explain 'value stream mapping' in brief. **9**

b) What are the functions of scientific store management ? Draw any two documents used in store. **9**

OR

12. a) Compare JIT system with MRP system. **9**

b) What are the techniques used for controlling wastages and surplus materials ? **9**

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T.E. (Polymer) (Semester – I) Examination, 2011
POLYMER CHEMISTRY – I (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory****.*
2) Answer to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) Explain any one method to determine weight average molecular weight in polymers. **8**

   b) Discuss determination of $\overline{M}v$ by Ubbelohde viscometer. **9**

   OR

2. a) Explain GPC to determine MWD in polymers. **8**

   b) Explain the following with suitable examples. **9**

      1) Polydispersity index.

      2) Effect of non-stoichiometric functionality on polymerization.

3. a) Compare emulsion and suspension polymerization in detail. **8**

   b) Explain kinetics of cationic polymerization. **9**

   OR

4. a) Explain how inhibition and retardation affect polymer growth. **8**

   b) Write a note on selection of initiators for particular polymerization technique. **9**

5. a) Write a note on ROP giving suitable example. **8**

   b) Explain the importance of Carother's equation. **8**

   OR

6. a) Give the advantages and disadvantages of melt polycondensation. **8**

   b) Give the mechanism of step polymerization for bifunctional and trifunctional monomers. **8**

P.T.O.

SECTION – II

7. a) Give the significance of copolymers with suitable commercial polymer. **8**

   b) Write a note on cationic and anionic copolymerization. **9**

OR

8. a) Discuss Q-e scheme and its importance in detail. **8**

   b) Write a note on types of copolymerization behavior. **9**

9. a) Compare random and chain end degradation. Predict the products for the same using suitable polymers. **8**

   b) Explain how polymer modification helps to obtain the important products. **9**

OR

10. a) Discuss biodegradation in detail. **8**

    b) Explain sulphur and non sulphur vulcanization. **9**

11. a) Discuss various types of isomerism in polymers. **8**

    b) Explain how will you get isotactic and syndiotactic products using metallocene catalysts. **8**

OR

12. a) Discuss bimetallic mechanism of polymerization. **8**

    b) Explain with suitable examples how stereoregular polymers differ in property from that of non-stereoregular polymers. **8**

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
POLYMER CHEMISTRY – II (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) **All** questions are **compulsory**.*
*2) Answer to the **two** Sections should be written in **separate** books.*
*3) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain synthesis of Novolak in detail with suitable chemical reactions. **8**

   b) Give in detail the manufacture of UF moulding material. **8**

   OR

2. a) Discuss the industrial manufacture process of phenolic resins and its recipe. **8**

   b) Enlist the properties and applications of silicone resins. **8**

3. a) Predict with suitable reactions the various ways by which polyesters can be prepared. Give the properties and uses of saturated polyester resins. **8**

   b) Give the manufacturing process and reactions involved in the synthesis of vinyl ester resins. **8**

   OR

4. a) Give synthesis, properties and applications of unsaturated polyester resins. **8**

   b) Compare the properties of epoxy, polyester and vinyl ester resins and justify the applications based on properties. **8**

5. a) Explain the various curing reactions for epoxy resins. **9**

   b) Mention the various reactions and side reactions that isocyanate undergoes during polyurethanation. Also write a note on PU foams. **9**

   OR

P.T.O.

6. a) Give the preparation of epoxy resin. Write a note on epoxy equivalent and hydroxyl equivalent. **9**

   b) Write a note PU based rubbers and RIM. **9**

SECTION – II

7. a) Predict the product prepared using pyromellitic dianhydride and aromatic diamines. Mention the distinguishing properties and applications for the same. **8**

   b) Give the synthesis and applications of polyamides. **8**

OR

8. a) Write a note on modified polyimides. **8**

   b) Explain why polyacetals can be accepted as an engineering material. Explain the degradation processes for the same. **8**

9. a) Enlist commercially important PAEKs. Mention general properties and uses for the same. **8**

   b) Discuss in short the preparation, structure-properties and applications of PPO. **8**

OR

10. a) Differentiate between polyetherification and polysulphonylation process for the manufacture of polysulphones. Give the laboratory method for the preparation of the same. **8**

    b) With proper correlation give the general properties and applications of PPS. **8**

11. Write a note on : **18**

    i) Conducting polymers ii) Polymers in drug delivery.

OR

12. Write a note on : **18**

    i) Polymer nanocomposites ii) Plasma polymerization.

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T.E. (Polymer Engineering) (Semester – II) Examination, 2011
INSTRUMENTATION AND PROCESS CONTROL (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) Draw **neat** diagrams **wherever** necessary.*
*3) Numbers to the **right** indicate **full** marks.*
*4) Assume **suitable** data, if **necessary.***
*5) **Use** of logarithmic table, electronic pocket calculators is **allowed.***

SECTION – I

1. a) Describe static characteristics of measuring instrument and explain the difference between static error and dynamic error. **8**

   b) A voltmeter with range of 0-12 V gives the following data in calibration test. What is the accuracy of the measuring instrument as percentage of full-scale deflection ? What will be the actual reading if the voltmeter shows 5V ? **6**

Instrument	0	2	4	6	8	10	12
Reading (V)							
Deviation (V)	0	– 0.1	– 0.2	– 0.1	0	+ 0.1	+ 0.3

   c) Define term Fidelity. **2**

OR

2. a) With the help of neat sketch and example in detail different parts of measuring equipment. **8**

   b) A transmitter, relay and receiver are used in measuring pressure at remote point. The specified accuracies are : **4**

   Transmitter within $\pm$ 0.25 %
   Relay within $\pm$ 1.0 %
   Receiver within $\pm$ 0.75 %

   Calculate least accuracy and root square accuracy.

   c) Write short note on calibration of measuring instrument with example. **4**

P.T.O.

3. a) Explain the principle of RTD also explain the calibration of RTD with the help of *callendar* equation. **9**

   b) Write short note on radiation pyrometer. **9**

OR

4. a) Define transducers and explain principle and working of piezoelectric transducer. **8**

   b) Write short note on reference junction compensation of thermocouple. **4**

   c) List the different types of pressure indicators and write short note on pressure measurement of corrosive fluids. **6**

5. a) With a neat sketch explain construction, working, advantages, disadvantages and applications of Rotameter. **8**

   b) A venturimeter is to be fitted in a pipe 0.25 m in diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow is 8.1 m^3 / min. Find the least diameter of the throat to ensure that the pressure head does not become negative. Take coefficient of discharge $C_d = 0.96$. **8**

OR

6. a) List out the different level indicator and explain any one of them in detail. **8**

   b) Write short-note on Density measurement system. **8**

SECTION – II

7. a) A thermometer is observed to exhibit the first order dynamics with time constant 20 sec is placed in temperature bath and after it reaches steady state temperature of 30° C, temperature of bath is linearly increased with time at 10° C / min. Find the response of the thermometer from steady state. **10**

   b) Explain the following terms :

   i) Overshoot ii) Decay ratio

   iii) Rise Time iv) Response time. **8**

OR

8. a) Differentiate between Manual Vs Automatic Control Operations. Discuss the objectives of process control. **8**

   b) Discuss with neat diagrams Non-interacting system and Interacting systems. Derive the transfer function for the Non-interacting system. **10**

9. a) Discuss in detail the functioning of Negative and Positive Feedback Control System with neat diagram and one example each. **10**

   b) Explain with neat sketch the response of typical control system showing the effects of various modes of control action. **6**

OR

10. a) Discuss with neat diagram standard block diagram with all standard symbols used for feedback control system. **8**

    b) Derive the equation of Overall Transfer function applicable for feedback control system. **8**

11. a) Discuss the physical programmable Logic control diagram for water oil separation system and Bottle filling plant. **10**

    b) Discuss with neat diagram the mode of Proportional-Integral (PI) control action. **6**

OR

12. a) Explain the followings :
    i) Cascade Control of Liquid Level in a Tank.
    ii) Digital Control System. **10**

    b) Discuss with neat diagram the mode of Proportional-Derivative (PD) control action. **6**

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T.E. (Polymer) (Semester – II) Examination, 2011
POLYMER PROCESSING OPERATIONS – I (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) **All** questions are **compulsory**.*
*2) Answers to **2** Sections to be written in **separate** answer books.*
*3) Figures to **right** indicate **full** marks.*
*4) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive an expression for pressure flow and drag flow in a single screw extruder. **8**

   b) Explain the effect of temperature and channel depth on extruder and die characteristics. **5**

   c) Write a note on mixing in single screw extruders. **5**

OR

2. a) Explain the contiguous solids melting model. Compare it with dispersed solids melting medel with reference to a single screw extruder. **8**

   b) Explain the effect of helix angle on the axial melting length in a single screw extruder. **4**

   c) Write a note on barrier screws. **6**

3. a) Explain with a neat sketch, the complete line for cast film coating of paperboard. **8**

   b) Discuss internal calibration system used for pipes with a neat sketch. **8**

OR

4. a) Explain the complete line for blown film extrusion with a neat sketch. What is gusseting ? **9**

   b) What are the various types of manifold designs used in sheet dies ? Explain the complete line for sheet manufacturing. **7**

P.T.O.

5. a) Bring out difference in processing by injection molding of crystalline and amorphous materials with the help of a P–V–T diagram. **6**

   b) Discuss in short, the importance of hold on a packing phase. **3**

   c) Discuss any one injection molding problem with remedial measures. **3**

   d) Write in short about applications and injection molding processing conditions of any two of the following materials (i) ABS (ii) PP (iii) Polycarbonate. **4**

OR

6. a) Discuss processing of rigid PVC fittings and machinery requirement for the same. **4**

   b) Cycle time break up for a chair molding on a sequential machine is as follows :

Refill time	→	20 secs
Cooling time	→	19 secs
Mold slow open	→	0.5 secs
Mold fast open	→	1sec
Mold slow down	→	0.5 secs
Mold fast close	→	1 sec
Mold slow close	→	1 sec
Mold safety	→	2 secs
Fill time	→	3.5 secs
Hold time	→	3 secs
Core I out	→	1 sec
Core II out	→	1 sec
Core I in	→	1sec
Core II in	→	1 sec

   Draw a bar chart and find cycle time assuming core operations take place after complete mold opening. **8**

   c) Explain screw position based V–P switchover. **4**

SECTION – II

7. a) Discuss low pressure injection molding process and applications of the same. **6**

   b) Describe the various points on which injection molding of thermosets differs from injection molding of thermoplastics. Discuss machine features. **6**

   c) Write a short note on gas assisted injection molding. **4**

OR

8. a) Write in short about principles of pattern making injection molding machine. **4**

   b) Discuss dip coating and slush molding with applications. **6**

   c) Explain injection compression molding with applications. **6**

9. a) With a neat sketch, explain coil and cut off unit for coiled extrusions. **5**

   b) Explain with a neat sketch, die used for making hollow core panel. **5**

   c) Write a short note on extrusion of cellular products. **6**

OR

10. a) Explain with a neat sketch, arrangement for making magnetized plastic strips. **6**

    b) Explain in-line corrugator unit with a neat sketch. **5**

    c) Explain with a neat sketches construction of round and flat setting dies. **5**

11. a) Assuming your own cycle times, draw a bar chart showing cycle of compression molding and discuss the process. **6**

    b) Derive an expression for force required or clamp tonnage required for compression molding of a circular disk. **6**

    c) Explain the molding defects encountered during the transfer molding and suggest remedies. **6**

OR

12. a) Draw a neat sketch of the mold used for DMC and discuss features of DMC molding. **6**

    b) Discuss any 2 techniques of preheating in compression and transfer molding. **6**

    c) Draw a sketch of semipositive mold and discuss features. **6**

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T.E. (Production/Prod. Sandwich) (Sem. – I) Examination, 2011
METAL CUTTING AND TOOL DESIGN
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Attempt **one** question of **each** Unit from Section – **I** and Section – **II**.*
*2) Answer to the questions should be written in **separate** books.*
*3) **Draw** neat diagram **wherever** necessary.*
*4) Assume **suitable** data, if **required**.*

SECTION – I

UNIT – I

1. a) A tubing of 50 mm outside diameter is turned on a lathe at a cutting speed of 25 m/min and feed 0.6 mm/rev, the rake angle of a tool 22 degree. The cutting force is 500 N and feed force 250 N, the length of continuous chip in one revolution is 50 mm, calculate :

i) chip thickness ration, ii) chip thickness,
iii) shear plane angle, iv) coefficient of friction
v) velocity of chip along tool face. **10**

b) Explain different velocities in metal cutting and show their inter relationship. **5**

c) Explain the procedure for force measurement in drilling operation. **5**

OR

2. a) During machining of C-25 steel with 0-10-6-6-8-90-1 mm (ORS) shaped cutting tool, the following observations have been made.

   i) Depth of cut = 2.5 mm, ii) Feed = 0.25 mm/rev,

   iii) Speed = 100 m/min, iv) Tangential cutting force = 1000 N,

   v) Feed thrust force = 550 N, vi) Chip thickness = 0.4 mm.

   Calculate :

   i) Shear force, ii) Normal force at shear plane,

   iii) Friction force, iv) Coefficient of friction,

   v) Specific energy in cutting. **10**

   b) Draw merchant force circle diagram. Explain different relation seen in the force circle diagram. **6**

   c) Draw sketches and state the conditions for formation of different chips. **4**

UNIT – II

3. a) Explain different types of carbide tip styles. **8**

   b) Draw the tool geometry along with a one tooth and label the important part of plain milling cutter. **7**

OR

4. a) What is tool signature ? Explain tool signature in ORS method. **7**

   b) Explain the effect of Point angle, helix angle, chisel edge angle on force in drilling. **8**

UNIT – III

5. a) Explain Taylor's equation for determining tool life. State different factors affecting on tool life. **7**

   b) Write a short note on :

      i) Machineability and machineability index,

      ii) Economics of tooling. **8**

OR

6. a) Explain with neat sketch heat affected zone in metal cutting. **7**

   b) State the functions and type of lubricants used in metal cutting. **8**

SECTION – II

UNIT – IV

7. a) What are formed tools ? Explain flat form and circular form tool. **7**

   b) Explain the various design aspect of a broach. **8**

OR

8. a) Mild steel jobs are to be reamed to obtain hole of 25 ± 0.3 mm, calculate the tolerances on the reamer and wear allowance, if the over size cut by the reamer varies from 4 to 10 microns and manufacturing tolerance extends up to 20 microns. Draw the sketch of tolerance zone for above reamer diameter and show the dimension on it. **8**

   b) With neat sketch explain various elements of a twist drill. **7**

UNIT – V

9. a) Explain the design considerations in jig and fixture design. **7**

   b) Write a short note on :

      i) 3-2-1 principle, ii) Modular fixture. **8**

OR

10. a) What are the locators ? Explain design aspect of locater. **8**

    b) Explain selection criteria for clamping devices. **7**

UNIT – VI

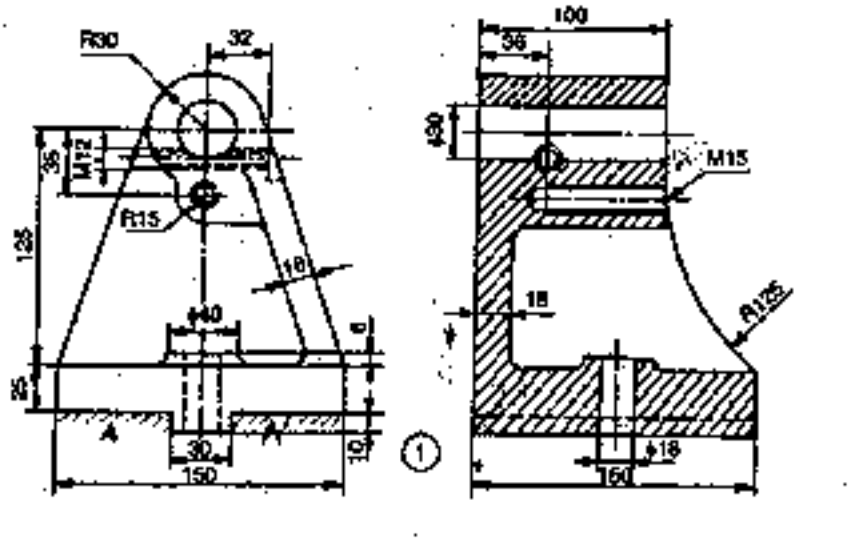
11. Design a jig for drilling ϕ 30 mm holes for a component shown in Fig. no. 1 **20**

OR

12. Design a Milling fixture to machine at A-A' place to get 30 mm dimension for a component shown in Fig. no. 1 **20**

Draw minimum two views of your design, show the component in position, name all important elements in drawing, write a part list of your design and draw detail view for locating, clamping and bushing.

FIG 01



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T.E. (Polymer) (Semester – II) Examination, 2011
POLYMER RHEOLOGY (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Your answers will be valued as a **whole**.*

*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) What principle is followed while deriving continuity equation ? With the help of Cartesian coordinates system explain the principle. **6**

   b) Write a short note on normal stress. Also give the significance of normal stress difference. Give one eg. to explain the effect of normal stresses. **6**

   c) Explain strain tensors for following two cases : **6**

   i) Uniaxial extension ii) Simple shear.

OR

2. a) On what principle is Couchy's equation based and explain all the terms appearing in the equation. **5**

   b) Explain the time dependent as well as time independent fluids with egs. **5**

   c) What leads to melt fracture and how can it be avoided ? **3**

   d) Explain with a plot the behaviour of polymers in regards its viscous as well as elastic component when it is stressed and later relaxed. **5**

P.T.O.

3. a) Explain the WLF equation with the help of time temperature graph taking any one eg. **5**

   b) Write a short note on creep compliance. Solve the following problem : **6**

   A tensile test piece of rubber having dimensions 2×5×25 (mm) was subjected to a tensile force of 150 N and gave following data. After 300 sec. the force was removed to give instantaneous recovery in strain. Calculate instantaneous compliance and compliance at 200 sec.

Time (s)	=	0	10	50	100	200	300
Length (mm)	=	50	75	100	114	130	140

   c) In what was Zener model is better than Maxwell as well as Voigt model. **5**

OR

4. a) How to measure dynamic and storage modulus for polymer ? What happens to stress when sinusoidal strain is given for pure elastic, pure viscous and viscoelastic body ? **5**

   b) A straight rod of polymer is 10 mm in diameter and 2 m long; behaves in a linear viscoelastic manner with a tensile creep. Compliance is given as

   $J_{(t)} = (2 - e^{-0.1t})\ GPa^{-1}$ (t is in hours) **5**

   The rod is suspended vertically and a mass of 8 kgs is hung . Find the change in length after 2 hrs and 100 hrs.

   c) Explain following terms :

   i) Relaxation time

   ii) Instantaneous modulus and

   iii) Residual modulus.

   Also solve following problem :

   From a plot of stress v/s time; if a t = 0, $\tau_0 = 60$ MPa and at $t_\infty; \tau_\infty = 0.25 MPa$, find Instantaneous and residual modulus. The stress was applied till an elongation of 500%. **6**

5. a) Prove that $E_{\dot{\gamma}}/E_{\tau} = \eta$; where $E_{\dot{\gamma}}$ is activation energy of flow at constant rate of shear and E_{τ} is activation energy at constant shear stress. **10**

   b) Write a note on factors affecting activation energy of flow . **6**

OR

6. a) Write a note on effect of temperature on melt viscosity of polymers. **8**

   b) Write a note on effect of molecular weight and MWD on polymer melt rheology. **8**

SECTION – II

7. a) Derive an expression for apparent viscosity in terms of geometrical parameters for a cone and plate viscometer. **6**

   b) A cone and plate viscometer has a plate of diameter 15 cm and cone of angle 2°. It is used to determine the rheological behaviour of PP melt at 230°C, frequency and apparent viscosity data are given below. Determine the rheological behaviour of the melt if it obeys power law. **10**

Ω (rpm)	10	20	30	40	50	60	70	80
η (N–S/m^2)	0.121	0.139	0.153	0.159	0.172	0.175	0.183	0.185

OR

8. a) Derive an expression relating shear rate and angular velocity for a concentric cylinder viscometer when the gap between the cylinders is very small. **8**

   b) Explain how a melt flow indexes can be used to generate a rheogram. **4**

   c) Write a note on Bagley's correction. **4**

9. a) Derive an expression for pressure drop to shear for a conicylindrical shaped disc. **8**

   b) Derive an expression for the maxima of Ryan and Johnson stability parameters for a power law fluid. **8**

   c) Write an equation for pressure drop due to shear in a wedge shaped die. **2**

OR

10. a) Write a short note on planar and uniaxial extensional flow. **8**

b) Derive an equation for shear rate at walls for power law fluids in case of flow through circular channel. **8**

c) Give expression for residence time for power law fluids in a rectangular cross section. **2**

11. a) A polymer follows power law of the form ; $\tau = 1{,}50{,}000\ \dot{\gamma}_a^{0.5}$ where τ =shear stress (N/m^2) and $\dot{\gamma}$ = shear rate (Sec^{-1}). Polymer flows through a slit die having dimensions w = 75 mm, L = 100 mm and H = 1 mm. If the mass flow rate is 10 g/s and melt density as 0.78 g/cc, calculate the pressure drop through the die. **8**

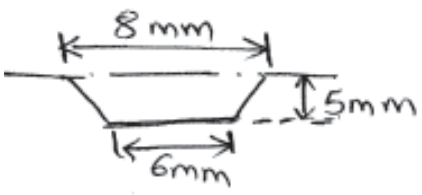
b) Derive an expression for flow length of power law fluid when injected at constant pressure in a rectangular section assuming there is freeze off as the melt flows. **8**

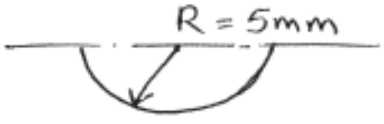
OR

12. a) Analyse the melt flow in the bubble in case of blown film extrusion. **8**

b) Polymer follows power law of the form :

$\tau = 1{,}80{,}000\ \dot{\gamma}^{0.4}$ where τ = shear stress (N/m^2) and $\dot{\gamma}$ =shear rate (Sec^{-1}). Two runners of 50 mm length with cross sections given below.





If mass flow rate = 20 g/s and melt density as 0.78 g/cm^2, compare the pressure drop in both the runners. **8**

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T.E. (Computer Engg.) (Semester – I) Examination, 2011
DATABASE MANAGEMENT SYSTEMS
(Common to IT)
(2008 Pattern) (New)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Assume suitable data, **if necessary**.*

*4) Section **I** : Q **1** or Q **2**, Q **3** or Q **4**, Q **5** or Q **6**.*

*5) Section **II** : Q **7** or Q **8**, Q **9** or Q **10**, Q **11** or Q **12**.*

SECTION – I

1. a) Compare Relational data model, Hierarchical Data Model and Network Data Model. **6**

   b) Design an E-R diagram with EER features which will model all the entities and relationships among them for the Airline Reservation System Database. **6**

   c) Explain Multi-user DBMS Architectures in details. **5**

OR

2. a) Design an E-R diagram with EER features which will model all the entities and relationships among them for the Hospital Management System Database. **9**

   b) Explain Overall Structure of DBMS. **8**

3. a) List difference between embedded SQL and Dynamic SQL. **6**

b) Explain the different operations of Relational Algebra. **5**

Consider the following Relations. It defines the schema of the database application for a bank. It manages the branches and customers of the bank. Customers take loans (borrow money) or open accounts (deposit money) at one or more branches. **6**

Branch (B_No, B_name, B_city, asset), Customer (C_No,C_Name, C_city street)Loan(Loan_no, B_name, amount), Account (Acc_No, B_name, Balance) Borrower (C_No, Loan_No), Depositor (C_No, Acc_No)

Answer the following queries in each of the query languages that you know :

1) Find the names and address of customers who have a loan.
2) Find loan data, ordered by decreasing amounts, then increasing loan numbers.
3) Find the pairs of names of different customers who live at the same address but have accounts at different branches.

OR

4. a) Explain Assertion and Triggers with suitable example. **6**

b) Explain Stored procedure and stored function.

Consider the following Relations. It defines the schema of the database application for a library. **5**

Book (Book_ISBN [pk], Title, Publisher_Name [fk]) **6**

BOOK_AUTHORS (Book_ISBN [pk, fk], Author_Name [pk])

PUBLISHER(Name [pk], Address, Phone)

BOOK_COPIES (Book_ISBN [pk, fk], Branch_ID [pk, fk], Num_Copies)

BOOK_LOANS (Book_ISBN [pk,fk], Branch_ID [pk, fk], Card_Num [pk, fk], Date_Out, Date_Due)

LIBRARY_BANCH (Branch_ID[pk], Branch_Name, Address)

BORROWER (Card_Num [pk], Name, Address, Phone)

Answer the following queries in each of the SQL query languages that you know :

1) List the ISBN and title of all books written by “John Smith”.
2) List the ISBN and title of all books written by “John Smith” as the only author.
3) List the Card number and name of all borrowers who checked out two or more books on 10/16/2003.
4) List the branch ID and name of all library branches that have at least one copy of all the books.

5. a) Explain why 4 NF is more desirable than BCNF. Rewrite the definition of 4NF and BCNF using the notions of domain constraints and general constraints. **8**

   b) Write a short note on view. Define Multivalued dependency. List all the non trival Multivalued dependency satisfied by the relation given below : **8**

A	B	C
a1	b1	c1
a1	b1	c2
a2	b1	c1
a2	b1	c3

OR

6. a) Specify Armstrong's axioms. Use Amstrong's axioms to prove the soundness of the pseudo transitivity rule. **8**

   b) What is decomposition ? Suppose that we decompose the schema R = (A, B, C, D, E) into (A, B, C) and (A, D, E). Show that this decomposition is lossless decomposition if the following set F of functional dependencies holds : **8**

   $A \rightarrow BC$ $CD \rightarrow E$ $B \rightarrow D$ $E \rightarrow A$

SECTION – II

7. a) Discuss the techniques for allowing hash file to expand and shrink dynamically. What are the advantages and disadvantages of each ? **9**

   b) What are the advantages and disadvantages of hash indices relative to B-tree indices ? How might the type of index available influence the choice of a query processing strategy ? **8**

OR

8. a) Explain insertion operation on B+ tree with suitable example. **9**

   b) Construct a B + tree for following set of the key values. **8**

   (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)

   Assume the order of tree is 4

9. a) Define the sarializability. Give test for conflict serializability. Check whether following schedule is conflict serializable. **9**

T1	**T2**
Read(A)	
Write (A)	
	Read(A)
	Write(A)
Read(B)	
Write(B)	
	Read(B)
	Write(B)

9. b) How does the granularity of data items affect the performance of concurrency control ? What factors affect the selection of granularity size of data items ? **8**

OR

10. a) Show that the two phase locking protocol ensures conflict serializability. **9**

b) What is concurrency Control ? Explain time stamp based protocol. Compare the differed and immediate versions of the log based recovery scheme. **8**

11. a) What is the difference between Persistent and Transient objects ? How is persistence handled in the typical object oriented database system ? **8**

b) What are the various issues that decide the time cost communication between client and server ? **8**

OR

12. a) Write a short note on : **12**

i) Data Warehouse Manager

ii) Pointer Swizzling Techniques.

b) Specify the steps in accessing the data object in Conventional DBMS and OODBMS. **4**

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T.E. (Computer Engineering) (Semester – I) Examination, 2011
MICROPROCESSORS AND MICROCONTROLLERS (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) In Section **I** attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No.**4**, Q. No.**5** or Q. No. **6**.*

*2) In Section **II**, attempt Q. No. **7** or Q. No. **8** Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12**.*

*3) Answers to the **two** Sections should be written in **two separate** books.*

*4) **Neat** diagrams must draw **wherever** necessary.*

*5) Figures to the **right** indicate **full** marks.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) With the help of neat block diagram, explain the architecture of Pentium Processor. **8**

   b) State and explain the conditions that Instructions in Pentium can be paired and be executed in parallel. **6**

   c) List RISC features of Pentium. **4**

OR

2. a) Which features makes Pentium, a superscalar processor ? Explain in detail. **6**

   b) Describe the floating Point Unit in Pentium. **6**

   c) What is the function of each of the following pins ? **6**

      i) $\overline{\text{BOFF}}$ ii) $\overline{\text{APCHK}}$ iii) $\overline{\text{KEN}}$

3. a) Describe different addressing modes in Pentium along with suitable examples. **8**

   b) Draw and explain timing diagram of non-pipelined write cycle with one wait state. **8**

OR

4. a) What is BIST ? Explain in detail. **6**

   b) Describe the following instructions : **6**

      i) RDTSC ii) WBINVD iii) LIDT iv) APRL

   c) Explain different data types supported by Pentium. **4**

5. a) What is TLB ? Describe its use in Pentium in detail. **8**

   b) Draw and explain CALL GATE mechanism in detail. **8**

OR

6. a) Explain the process of linear to physical address translation in Pentium. Draw the required data structures. **8**

   b) What are the rules of accessing following segments other than its own for any program **8**

      i) Data segment

      ii) Conforming Code Segment

      iii) Non-conforming code segment without using call gates

      iv) Non-conforming code segment with call gate ?

SECTION – II

7. a) What is Task switching ? Explain the steps required for task switching. **8**

   b) Explain I/O permission bit map in pentium. **6**

   c) Explain the steps required to switch from Real mode to virtual mode. **4**

OR

8. a) What is IDT ? Explain the various mechanisms to handle interrupts in Pentium. **8**

   b) What is Task ? Explain Task State Segment in detail. **8**

   c) What is Virtual Mode ? **2**

9. a) What are different addressing modes in 8051 ? Explain with suitable example. **8**

   b) Write assembly language program for 8051 microcontroller to copy five numbers from internal data memory (starting at address 50 H) to external data memory (starting at address 5000 H). **8**

OR

10. a) Describe the Internal and External memory organization for program and data memory in 8051. **8**

    b) Explain features of 8051 Microcontroller. **4**

    c) Explain MOVC and MOVX instruction of 8051 Microcontroller. **4**

11. a) Describe Timer operations in 8051 along with different modes. **8**

    b) Describe Power saving modes in 8051 microcontroller. **8**

OR

12. a) Describe serial port of 8051 microcontroller with the help of SCON. **8**

    b) Draw and explain architecture of 8096 microcontroller. **8**

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T.E. (Computer) (Semester – I) Examination, 2011
DIGITAL SIGNAL PROCESSING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume suitable data, **if necessary**.*
*5) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section-**I** and Q. **7** or Q. **8** Q. **9**, or Q. **10**, and Q. **11** or Q. **12** from Section-**II**.*

SECTION – I

1. A) Sketch and define two standard DT signals $\delta(n)$ and $u(n)$. Using convolution show that $u(n) = \sum_{K=0}^{\infty} \delta(n-K)$. **8**

   B) With example explain following properties of DT system
   i) Stability ii) Linearity. **8**

OR

2. A) Obtain a linear convolution of DT signals

$$x(n) = \{1, 0, \underset{\uparrow}{-2}, 1\}$$

$$h(n) = \{\underset{\uparrow}{-1}, 2, -1, 1\}$$

   by using convolution formula. **8**

   B) State the following terms w.r.t. sampling process :
   i) Aliasing ii) Sampling rate
   iii) Quantization iv) Coding. **8**

P.T.O.

3. A) Define a Fourier Transform (FT). State any 4 properties of FT. What is the significance of magnitude response ? **8**

   B) State the relationship between FT and DFT. Obtain 5 point DFT for $x(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$. **8**

OR

4. A) State any 4 properties of DFT. How frequency response of N pt DFT is obtained and represented ? **8**

   B) Compute 4 point circular convolution using DFT and IDFT for $x(n) = h(n) = \{1, 1, 1, 1\}$. **8**

5. A) Draw a basic butterfly structure for DIT and DIF FFT algorithm. Obtain the computational complexity and compare it with direct computation of N pt DFT. **10**

   B) Using ZT properties, obtain ZT of a sequence -

   $x(n) = 2^n u(n - 2)$. Sketch the ROC. **8**

OR

6. A) Derive the relationship between ZT and DFT. Explain the significance of ROC and state the properties of ROC. **10**

   B) Obtain IZT using PFE method where $X(z) = \dfrac{z^3}{(z+1)(z-1)^2}$. **8**

SECTION – II

7. A) Define and obtain a system function H(z) from an N^{th} order general difference equation. Express it for

   i) all zero system ii) all pole system iii) pole zero system. **10**

   B) Determine an impulse response of a system described as

   $y(n) = x(n) + 0.6\, y(n - 1) - 0.08\, y(n - 2)$. **8**

OR

8. A) What is pole zero plot ? How frequency response of a system is obtained from pole zero plot ? Explain the simple geometric method for the same. **10**

   B) Obtain system function H(z) for

   $$y(n) + \frac{1}{2} y(n-1) = x(n) - x(n-1)$$

   Determine the poles and zeros and draw a pole zero plot. **8**

9. A) Compare between FIR and IIR filters. State the ideal frequency response characteristics of DT filter. **8**

   B) Explain the impulse invariance method used for the design of IIR filter. Write the design steps. **8**

   OR

10. A) Describe the Gibbs phenomenon observed in FIR filter design. State the desirable features of windows. **8**

   B) Design a first order HPF with following specifications :

   $$H(s) = \frac{s}{s+1}, \; F_s = 10 \text{ KHz}, \; F_c = 2 \text{ KHz}$$

   Use frequency prewarping. **8**

11. A) Draw the functional block diagram of ADSP 21XX DSP processor. Explain the use of DAG and MAC unit. **8**

   B) Obtain Direct Form I and Direct Form II IIR filter structure for

   $$H(z) = \frac{3z^5 + 5z^4 - 8z^3 + 4}{2z^5 + 3z^4 + 6z^2}.$$ **8**

   OR

12. A) Explain the application of DSP in speech processing. **8**

   B) Obtain and realize linear phase FIR filter structure for a DT system

   $$H(z) = (1 + \frac{1}{2} z^{-1} + z^{-2}) \, (1 + \frac{1}{4} z^{-1} + z^{-2}).$$ **8**

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T.E. Computer (Semester – I) Examination, 2011
THEORY OF COMPUTATION
(2008 Pattern) (New)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **any three** quetions from **each** Section.*
*2) Answers to these Sections should be written in **separate** books.*
*3) **Neat** diagram must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Design Finite Automata to accept following formal language specification. Justify your design. **8**

$$L = \left\{ (a.b)^n \mid n >= 1 \right\}$$

b) Describe the following : **8**

1) Formal languages 2) Kleene Closure
3) Finite Automata with output 4) NFA with Null moves.

OR

2. a) Convert following NFA to equivalent DFA. **8**

NFA = ({P, Q, R, S}, {0, 1}δ, p, {S})

Where δ is

	0	1
P	P, Q	P
Q	R	R
R	S	-
S	S	S

b) Give Mealy Machine for the following processes
"For input from (0+1)*, if inputs ends in 101, output X; if input ends in 110, output Y, otherwise output Z". **8**

P.T.O.

3. a) For following Regular Expressions, draw an FA recognizing the corresponding languages. **8**

   1) (111 + 100)*0 2) 0 + 10* + 01*0.

   b) Obtain the regular expressions for the following sets : **4**

   1) L1 = $\{b^2, b^5, b^8, b^{11}, b^{14}...\}$ 2) L2 = $\{a^{2n+1} | n > 0\}$

   c) Obtain in plain English language represented by following regular expression. **4**

   a) 0*(10*10*)*1(0*10*1)*0* b) 0*(0*10*1)*0*

OR

4. a) Using pumping lemma prove that $L = \{a^m b^n | m > n\}$ is not regular. **6**

   b) Represent following formal Languages using regular expressions. **6**

   1) All string's of a's and b's without any combination of double letters.
   2) All string's of 0's and 1's with even number of 0's.
   3) All string's of a's and b's containing at least two a's

   c) Check the equivalence of the regular expressions. **4**

   1) (a*bbb)*a* AND a*(bbb a*)*
   2) ((a + bb)*aa)* AND $\in$ +(a+bb)*.aa

5. a) Consider the grammar G = (V = { E, F}, T = {a, b, –}, E, P)
   Where P consist of Rules :
   $E \rightarrow F -E$, $F \rightarrow a$, $E \rightarrow E - F$, $F \rightarrow b$, $E \rightarrow F$

   1) Show that G is a ambiguous
   2) Remove the ambiguity, if possible of G **6**

   b) Convert the following grammar to Greibach Normal form **6**

   G = ($\{A_1, A_2, A_3\}$, {a, b}, P, A_1) where P consist of following Rules

   $A_1 \rightarrow A_2, A_3$

   $A_2, \rightarrow A_3 A_1 | b$

   $A_{3,} \rightarrow A_1 A_2 | a$

c) Justify whether following grammars are in CNF or not. **6**

1. $S \rightarrow AS \mid a$
$A \rightarrow SA \mid b$

2. $S \rightarrow AS \mid AAS$
$A \rightarrow SA \mid aa$

OR

6. a) Write a note on applications of CFG. **6**

b) Find the CNF equivalent to the following Grammar. **6**

$S \rightarrow aB/bA$

$A \rightarrow a/aS/bAA$

$B \rightarrow b/bS/aBB$

c) What do you mean by ambiguous grammar, Let G be a grammar **6**

$S \rightarrow aB/bA$
$A \rightarrow a/aS/bAA$
$B \rightarrow b/bS/aBB$

For the srting “aaabbabbba” find the leftmost and Right Most Derivation. Draw derivation trees.

SECTION – II

7. a) Specify following with respect to NPDA **9**

1) Definition 2) Transition function

3) Moves for acceptance of string.

b) Construct a PDA accepting $\{a^n . b^{2n}, \mid n >= 1\}$ **7**

OR

8. a) Construct PDA equivalent to CFG of following productions : **7**

$S \rightarrow 0BB, \quad B \rightarrow 0S, \quad B \rightarrow 1S, \quad B \rightarrow 0$

b) Specify following with respect to PDA **9**

1) Definition 2) Instantaneous description

3) Moves for acceptance of string

9. a) Draw finite automata and corresponding turing machine for language L of following description. **10**

$L = \{x \leftarrow \{a, b\}^* \mid x \text{ ends with aba}\}$

b) Define Turing Machine. What do you mean by transition function, Instantaneous description and moves of turing machine ? **8**

OR

10. a) Design a Post machine to accept a language called as "EQUAL", where all words with the same numbers of a's and b's. **6**

b) What do you mean by Multidimenstional Turing machine ? **4**

c) Design a turing machine that accepts the set of all even palindromes over $\{0,1\}$. **8**

11. a) Prove the theorem – "If L is accepted by a nondeterministic TM say T, and every possible sequence of moves of T causes it to halt, then L is recursive". **8**

b) For following decision problem, determine whether it is decidable or un-decidable, prove the same. **8**

1) Given a TM T, does it ever reach a state other than its initial stat if it starts with a blank tape ?
2) Given a TM T, and a non halting state 'q' of T, does T ever enter state 'q' when it begins with a blank tape ?

OR

12. a) Prove the theorem – "If L1 and L2 are recursively enumerable languages over Σ then $L1 \cup L2$ and $L1 \cap L2$ are also recursively enumerable". **8**

b) State whether following Language L is context-sensitive or not. if yes, generate a context sensitive Grammar (CSG) for the same **8**

$L = \{a^n . b^n . c^n \mid n >= 1\}$

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T.E. (Computer) (Semester – II) (New) Examination, 2011
PRINCIPLES OF PROGRAMMING LANGUAGES
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any three** questions from **each** Section.*
*2) Answers to these Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **whenever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) Assume suitable data if **necessary**.*

SECTION – I

1. a) Explain following characteristics of a good programming language. **6**
   1) Orthogonality
   2) Uniformity
   3) Implementability.
   b) With suitable example explain Implicit and Explicit Type conversion. **6**
   c) What are different classifications of actual parameters ? **6**

OR

2. a) Explain significance of readability of a programming language. What is the impact of user defined operator overloading on the readability of a program ? **6**
   b) State and explain challenges of programming language design. **8**
   c) Differentiate between structures and non structured data type. **4**

3. a) What are design principles for procedural programming specification ? **6**
   b) What are undesirable characteristics of imperative programming ? **6**
   c) With suitable diagram demonstrate the execution steps for imperative programming. **4**

OR

4. a) Write short note on Block Oriented Structured Programming. **4**

   b) With suitable example demonstrate the use of pointer in PASCAL. **4**

   c) With suitable example, demonstrate how nested procedures and functions acts as a efficient program design construct. **8**

5. a) What are benefits of the object oriented model that have led to its increase in popularity ? **8**

   b) With suitable examples, demonstrate the role of various pre-defined exception classes in JAVA. **8**

OR

6. a) Compare Java Applications and Java Applets. Draw Typical Applet life Cycle. **6**

   b) Explain the concept of multithreading with respect to Java. **6**

   c) Compare Java Abstract class and Java interface in Java. **4**

SECTION – II

7. a) What is the base class of NET Framework ? What is importance of assemblies ? What are different languages supported by NET for development ? **8**

   b) Explain Value type and Reference type variable with respect to C#. **6**

   c) Describe following public methods of C# **4**

      1) bool Equals ( )
      2) int GetHashCode ( )

OR

8. a) Describe the following significant features supported by C# language

      1) Generics
      2) Strong Data Typing
      3) Namespaces
      4) Attributes
      5) Delegates. **10**

   b) State and explain most important highlights of C# language. **8**

9. a) State and explain key features of Logical Programming Specifications. **8**

   b) Explain in brief flowing classification of first order predicate calculus. **8**

      1) Logical Statement
      2) Connector
      3) Quantifier
      4) Precedence.

OR

10. a) What relationship between resolution and unification ? How resolution and unification algorithm works to match the proper pair in database to achieve the goal ? Explain with suitable example. **8**

    b) Write short note on application of logic programming. **4**

    c) What is the use of CUT operator with prolog ? **4**

11. a) Describe following properties of functional programming languages. **6**

      1) Lazy function evaluation
      2) Referential transparency

    b) Write a note on Lambda Calculus. **6**

    c) State and explain key features and design goals of LISP. **4**

OR

12. a) Explain the working of following LISP functions. Assume L is list of 5 characters.

      1) (caar L)
      2) (cddr L)
      3) (append '() L)
      4) (cons 'a L)
      5) (list L '())
      6) (atomp L). **6**

    b) Explain various data types and data structures supported by LISP. **6**

    c) Explain numeric predicate functions supported by LISP. **4**

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[3963] – 357

T.E. (Computer Engineering) (Semester – II) Examination, 2011
COMPUTER NETWORKS (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Figures to the **right** indicate **full** marks.*

*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*

*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain difference between message switching and packet switching with suitable examples. **8**

   b) Explain three fundamental models that help to reveal key problems for the designers of distributed systems. **6**

   c) What are reasons for using layered protocol ? **4**

OR

2. a) What is the principle difference between connection oriented and connectionless communication ? **8**

   b) Explain advantages and disadvantages of having international standards for network protocols. **6**

   c) Why does ATM use samll, fixed-length cells ? **4**

3. a) A channel has a bit rate of 4 kbps and a propagations delay of 20 m. sec. For what range of frame sizes does stop and wait give an efficiency of at least 50 percent ? **8**

   b) Imagine a sliding window protocol using so many bits for sequence numbers that wraparound never occures. What relations must hold among the four window edges and the window size ? **8**

OR

4. a) Enlist and explain data link layer design issues. **8**

   b) What is the minimum overhead in sending an IP packet using PPP ? Count only the overhead introduced by PPP it self, not the IP header overhead. **8**

5. a) In an infinite-population slotted ALOHA system, the mean number of slots a station waits between a collision and its retransmission is 4. Plot the delay versus throughput curve for the system. **8**

   b) Explain different approaches for receiver to unambiguously determine the start, end, or middle of each bit without reference to an external clock. **8**

OR

6. a) Measurements of a slotted ALOHA channel with an infinite number of users show that 10 percent of the slots are idle. **8**

      a) Wht is the channel load, G ?
      b) What is the throughput ?
      c) Is the channel underloaded or overloaded ?

   b) In a token ring the sender removes the frame. What modifications to the system would be needed to have the receiver remove the frame instead and what would the consequences be ? **8**

SECTION – II

7. a) For hierarchical routing with 4800 routers, what region and cluster sizes should be chosen to minimize the size of the routing table for a three-layer hierarchy ? **8**

   b) Describe a way to do reassembly of IP fragments at the destination. **6**

   c) Give examples of protocol parameters that might be negotiated when a connection is set up ? **4**

OR

8. a) Explain with suitable examples, how do IP addresses get mapped onto data link layer address ? **8**

   b) When the IPv6 protocol is introduced, does the ARP protocol have to be changed ? Explain the changes in brief and its nature. **6**

   c) Is fragmentation needed in concatenated virtual circuit internets, or only in datagram systems ? **4**

9. a) What is the task of transport layer ? Explain the services provided to the upper layers by the transport layer. **8**

   b) Describe the procedure of a server accepting connections through a socket. What are the various ways a server handles a connection request ? Why the use of same local protocol port number by multiple processes causses no confusion in the concurrent approach ? **8**

OR

10. a) Suppose a router receives an IP packet containing 600 data bytes and has to forward the packet to a network with maximum transmission unit of 200 bytes. Assume that IP header is 20 bytes long. Show the fragments that the router creates and specify the relevant values in each fragment header. **8**

   b) Define threshold condition in congestion. How does TCP tackle congestion problem using the internet congestion control algorithm ? **8**

11. a) When web pages are sent out, they are prefixed by MIME headers, Why ? **7**

   b) Explain FTP protocol. Can SMTP be used to retrieve mail from mail server to the client. **6**

   c) What is the difference between end to end delay and packet Jitter ? **3**

OR

12. a) What is domain name system ? Explain how a resolver looks up a remote name with suitable example. **7**

   b) How do you make an image clickable in HTML ? Give an example. **6**

   c) Compare FTP and TFTP. **3**

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[3963] – 358

T.E. (Computer Engineering) (Semester – II) Examination, 2011
FINANCE AND MANAGEMENT INFORMATION SYSTEMS (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** answer books.*

*2) From Section **I** answer Q. **1** or Q. **2,** Q.**3** or Q.**4**, Q.**5** or Q.**6** and answer Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12** from Section **II**.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Elaborate the term MIS and explain different approaches to management process. **8**

   b) Explain HR management and selection. What strategies are followed in appraisal ? **8**

OR

2. a) List down the functions of management and explain any two. **8**

   b) Explain International Management and Multinational Corporation with a suitable example. **8**

3. a) Define Financial Management. Explain its goals and principles. **6**

   b) In the context of financial statements, explain with an example the following in brief : **(4×2=8)**

      i) Balance sheet

      ii) Profit and loss account.

   c) Explain Corporate Security with share and debentures. **4**

OR

4. a) Explain Mergers, Acquisition and takeover with suitable example. **10**

   b) What is time value of money ? Explain it in detail. **8**

5. a) Explain Development process of MIS in detail. **8**

   b) What is DSS ? How DSS is helpful in decision making ? **8**

OR

6. a) What is business process reengineering ? Explain why it is required. **8**

   b) What is the importance of decision making in any industry ? Explain role of MIS in decision making. **8**

SECTION – II

7. a) Explain Organization of business in digital form. **8**

   b) Explain following : **8**

      i) CMS

      ii) ECM.

OR

8. a) Explain e-business and e-commerce in detail. **8**

   b) How Modern business technology are used in security and business ? **8**

9. a) Explain Global management with the help of following : **8**

      i) Outsourcing

      ii) Off-shoring.

   b) What is Enterprise management system ? Explain its components. Explain ERP in detail. **10**

OR

10. a) Explain in brief : **8**

i) SCM

ii) CRM.

b) Give political and economical challenges in IT industry. **4**

c) Which strategies and applications are followed in global IT platform ? **6**

11. a) Explain IT Act. Give highlights of it. **8**

b) Explain IPR Law in detail and give an example. **8**

OR

12. a) Explain IT impact on society. **6**

b) Explain right to information act in detail. Is it beneficial for the society ? Explain with latest example. **10**

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T.E. (Computer Engineering) (Semester – II) Examination, 2011
SYSTEMS PROGRAMMING AND OPERATING SYSTEMS (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Assembly language is nearer to Machine. Justify. **2**

   b) Write an algorithm for second pass of a two pass assembler. Which searching technique improves the performance of algorithm and how ? **10**

   c) How one pass assembler can handle forward references ? **4**

   OR

2. a) What are the differences between macros and functions ? **4**

   b) How to handle macro calls within macros ? **8**

   c) Conditional expansion of Macro is a useful feature. Justify. **4**

3. a) Define relocation. How the Direct linking loader handles relocation and linking ? **10**

   b) What is dynamic loading ? List the advantages of overlay structure. **6**

   OR

4. a) Draw the flow chart for pass-2 of direct linking loader. **12**

   b) What are the functions done by the loader ? **4**

P.T.O.

5. a) Library functions are different from system calls. How ? **4**

   b) What is use of fork() and exec() system calls ? Give example of each. **6**

   c) Signals can be sent in either direction and can be used to provide limited from of interprocess communication (IPC). Justify. **8**

OR

6. a) State whether the following statements are **true/false**. **4**

   1) Java run time environment is a system of multiple processes with multiple threads.
   2) The states of process and threads are same.
   3) Dekker's algorithm is used for enforcing mutual exclusion.
   4) In MIMD a set of processors simultaneously execute different instruction sequences on different data set.

   b) Explain different thread scheduling algorithms in multiprocessor systems. **14**

SECTION – II

7. a) Compare interprocess communication using shared memory and message passing. **4**

   b) What are the control problems faced in case of competing processes ? **12**

OR

8. a) What are the requirements of mutual exclusion ? **6**

   b) List the differences between semaphores and monitors. **4**

   c) Give solution to bounded-buffer producer consumer using semaphores. **6**

9. a) Bankers algorithm is used for deadlock avoidance. Explain. **6**

   b) State the conditions for dead lock. **6**

   c) How to prevent the dead lock ? **6**

OR

10. a) Given the memory portions of size 100 k, 500 k, 150 k, 300 k, 550 k in order how would each of the first fit, best fit and next fit algorithms place the processes of 215 k, 417 k, 115 k and 425 k in order ? **12**

b) What are the advantages and disadvantages of fixed and dynamic portioning ? **6**

11. a) Explain various buffering schemes. **6**

b) Consider a disk system with 100 cylinders. The requests to access the cylinders occur in the following sequence. **10**

4, 35, 10, 7, 18, 74, 2, 15, 6, 20

Assume that the head is at track 50. Calculate the average seek length for the FIFO, SSTF and C-SCAN.

OR

12. a) With the help of diagram explain file system architecture. **6**

b) What are the methods of record blocking ? **6**

c) Write short note on file management under UNIX. **4**

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T.E. Production (Semester – II) Examination, 2011
MACHINES TOOLS AND ADVANCE MANUFACTURING SYSTEMS
(2003 Course)

Time : 3 Hours Total Marks : 100

Instructions : *1) Attempt either Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of calculator is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

Unit – I

1. Referring to Fig. No. 1, design the set of plate types of cams for a single spindle automat machine. Assume suitable data of machining parameters for mild steel material. The bar stock is Φ 15 $\times$ 130 and 200 pieces are to be manufactured. Also draw the layout for turret cam. **18**

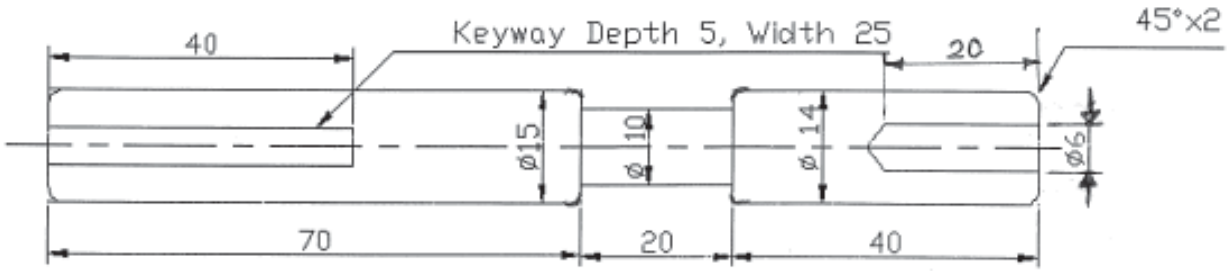

Fig.No.1.Guidebar

OR

2. A) Explain with a neat sketch, automatic cutting off and Swiss type automatic single spindle machine. **9**

   B) Compare single spindle automat with multi-spindle automat and explain the advantages of multi-spindle automate machine. **9**

P.T.O.

Unit – II

3. A) How NC/CNC machines are classified with different considerations ? Explain with a neat block diagram CNC and DNC machines. **8**

   B) What are the advantages of CNC machines over NC machines ? Explain the different systems employed on CNC machines for enhancement of productive machining. **8**

OR

4. A) Explain with a neat sketches, open loop and closed loop control systems. Explain the advantages of closed loop systems over open loop systems. **8**

   B) Explain the axis identification employed on CNC machine tools for primary, secondary and tertiary axes. How will you denote the axes for a three axis milling machine with swaging table ? **8**

Unit – III

5. A) Explain the reasons for applying surface coating on the material. Give different steps followed in a powder coating process. **8**

   B) Write a short note on : **8**
   1) Micro machining
   2) Nano machining.

OR

6. Write short notes : **16**

   1) Chemical vapour deposition

   2) Phosphating

   3) Galvanizing

   4) Ion-implantation.

SECTION – II

Unit – IV

7. A) Describe with a sketch any three types of rotary transfer mechanisms. **6**

   B) Discuss any two methods of balancing a transfer line. **6**

   C) In a six station Geneva mechanism, the driver rotates at 3 rpm. Determine the cycle time of indexing mechanism, the process time and the time spent by each cycle in indexing the table to the next working position. **6**

OR

8. A) The precedence relationships and element times for assembling a new model of product is given in the table below. The ideal cycle time is 0.53 min. **10**

Work element	1	2	3	4	5	6	7	8	9	10	11
Te (min.)	0.32	0.10	0.20	0.05	0.10	0.23	0.20	0.05	0.32	0.10	0.30
Predecessor	--	--	1,2	2	4	3	6	6	5,7	8,9	10

   I) Construct precedence diagram
   II) By using largest candidate rule assign work element to stations
   III) Compute balance delay.

   B) Explain the offline and online inspection methods employed on any machine tools. **4**

   C) Give a classification of automated material handling equipments. **4**

Unit – V

9. A) What are the different types of flexibilities in flexible manufacturing systems ? What are the measures developed to assess these flexibilities ? **8**

   B) What is computer integrated manufacturing ? Explain any one CIM system used in manufacturing. **8**

OR

10. A) Classify robots on the basis of structural configuration. Explain the applications of robots in manufacturing. **8**

    B) What is cellular manufacturing system ? Explain with an appropriate example, how it overcomes the shortcomings of functional layout. **8**

Unit – VI

11. A) Describe the factors which affects the quality and performance of CNC machines. **8**

    B) What is adaptive control ? Explain with an appropriate diagram, any one type of adaptive control used in manufacturing. **8**

OR

12. A) How control systems are classified ? Explain pre selective control system used in machine tools. **8**

    B) Write a short note on : **8**
    1) Coolant type selection
    2) Chip disposal system.

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[3963] – 360

T.E. (Computer Engg.) (Semester – II) Examination, 2011
SOFTWARE ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Assume** suitable data, **if necessary**.*

SECTION – I

1. a) Define software engineering. How software engineering is different from hardware engineering ? Justify. **8**

   b) Explain process pattern template with an example. **8**

OR

2. a) What do you mean by evolutionary process models ? Explain spiral model as an evolutionary process model. **8**

   b) Explain how extreme programming process supports agility with its framework activities ? **8**

3. a) What are requirements engineering tasks ? Explain the elicitation process using quality function deployment. **8**

   b) Explain the analysis model with its elements. **8**

OR

4. a) How use cases can be used to model the requirements ? Write an usecase for 'login' with a template and diagram. **8**

   b) What do you mean by flow modeling ? Explain data flow modeling with an example. **8**

P.T.O.

5. a) Explain the following design concepts
   i) Modularity ii) Architecture **6**
   b) What are the different types of design classes ? **6**
   c) Explain any two architectural styles with respect to program structure. **6**

OR

6. a) Explain the user interface design issues. **6**
   b) What do you mean by software architecture ? Explain the system context diagram elements with an example. **6**
   c) Explain the user interface design process. **6**

SECTION – II

7. a) Define software testing. Explain the unit testing strategy. **8**
   b) What is system testing ? Explain any two system testing strategies. **8**

OR

8. a) Explain the following :
   i) Condition testing ii) Loop testing. **8**
   b) Differentiate white box and black box testing. Explain the graph based testing method as a black box testing method. **8**
9. a) Explain the role of people, product and process in project management. **6**
   b) Differentiate and explain size and function oriented metrics. **6**
   c) Explain the FP based estimation technique. **6**

OR

10. a) Explain the concept of make buy decision using decision tree analysis. **6**
    b) What is software project estimation ? How use cases are used in estimation ? **6**
    c) How do you measure software quality in terms of maintainability and integrity ? **6**
11. a) What is a task network in project scheduling ? Explain with an example. **8**
    b) How risk projection is carried out using risk table ? **8**

OR

12. a) What is software configuration management ? Explain the change control mechanism in software configuration management. **8**
    b) Explain earned value analysis in project scheduling. **8**

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T.E. (Information Technology) (Semester – I) Examination, 2011
OPERATING SYSTEMS (New)
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answer **three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Figures to the **right** indicate **full** marks.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Assume suitable data, wherever **necessary**.*

SECTION – I

1. a) Explain the following terms : **8**
   1) System Call
   2) Multiprogramming
   3) Multiprocessing
   4) Mode Switch

   b) State different architectures of Operating systems and explain Monolithic architecture in detail. **8**

OR

2. a) Explain the following terms **8**
   1) Shell variables
   2) Bash debugger
   3) Functions in the shell
   4) Structure of AWK program

   b) Explain Modern Unix Kernel with a neat diagram. **8**

3. a) Differentiate between program and process. Explain with neat diagram contents of a UNIX process image. **10**

   b) Explain the concept of thread. Compare user-level threads and kernel-level threads. **8**

OR

4. a) Consider three processes, all arriving at time zero, with total execution time of 10, 20, 30 units, respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time during I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does CPU remain idle ? Explain in detail with Gantt Chart. **8**

   b) State different types of scheduling. Explain RR scheduling with example. **10**

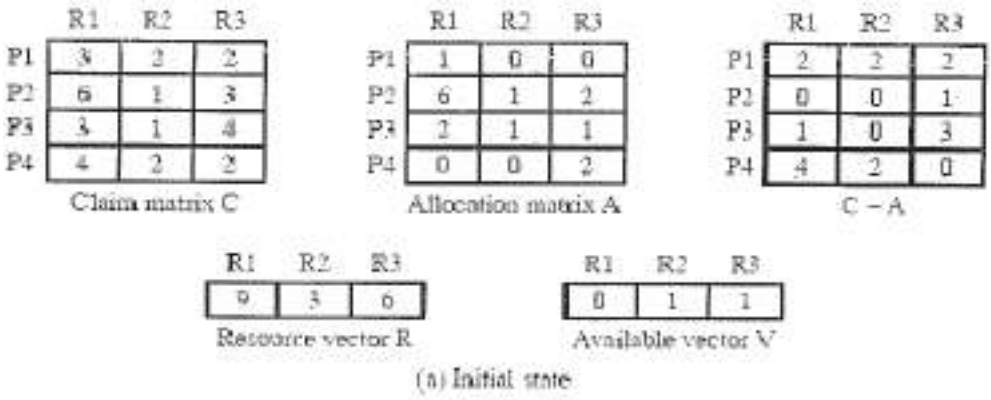
5. a) Explain with definitions the concept of general semaphores and binary semaphores. **8**

   b) What are the ways to implement Semaphores ? **8**

OR

6. a) How is deadlock prevented ? **8**

   b) Consider the following state of the system. Determine if this system is in the safe state or not. **8**



SECTION – II

7. a) A process references pages in the following order **10**

2 3 2 1 5 2 4 5 3 2 5 2

Use FIFO and LRU page replacement algorithms to find out the number of page faults for the above reference string using 3 page frames.

b) Explain the concept of Demand Paging with the help of neat diagram. **8**

OR

8. a) Explain the different memory management requirements. **8**

b) Explain different placement algorithms for dynamic partitioning. **10**

9. a) Explain File system Architecture in detail. **8**

b) Explain the concept of File Sharing. **8**

OR

10. Assume that a disk is having 200 tracks. The disk head is initially located at track 100 and that the disk request queue has random requests in it. The requested tracks, in the order received by the disk scheduler, are 55, 58, 39, 18, 90, 160, 150, 38, 184. Find the average seek length for following disk scheduling algorithms with diagrams. **16**

1) SCAN 2) C-SCAN 3) SSTF 4) FIFO

11. a) Describe two approaches to intrusion detection. What does an audit record contain ? **8**

b) How is security implemented in UNIX ? **8**

OR

12. a) Explain the Authentication in detail. **8**

b) How is security implemented in Windows 2000 ? **8**

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T.E. (Information Technology) (Sem. – I) Examination, 2011
COMPUTER NETWORK TECHNOLOGY
(New) (2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Your answer will be **valued** as a whole.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Compare packet switching and circuit switching. **8**
   b) Why layered protocol is used in network model ? **8**

OR

2. a) List similarities and differences between OSI reference model and the TCP/IP reference model. **8**
   b) Whether the network layer should provide a connection oriented services or connectionless service ? Explain with suitable example. **8**
3. a) Explain the significance of 'bind' socket system call. Does it apply to all sockets at server and client ? What parameters are specified by its various arguments. **10**
   b) For a given class – C network, design subnets in such a way that each subnet can have atleast 50 host. **8**

OR

4. a) Compare between BOOTP and DHCP host configuration protocol. **8**
   b) What is the purpose of ARP and RARP protocols ? What is the size of Ethernet frame carrying an ARP Packet as well as RARP packet ? **10**
5. a) Explain TCP with its header format. **8**
   b) Define Quality of Service and list the parameters typical to transport layer. **8**

OR

6. Write short notes on **16**
   1) NAT
   2) TCP flow control mechanism
   3) Performance issues of Transport layer.

P.T.O.

SECTION – II

7. a) How the resolver looks up a remote names in DNS ? **8**

   b) What is FTP ? Where and when it is used ? Why does it require 2 ports ? Explain at least 5 user commands used in FTP. **10**

OR

8. a) Differentiate between persistent and non-persistent HTTP connection. **8**

   b) List and explain the necessity of each area of network management. **10**

9. a) Write short notes on **8**

   1) SIP 2) RSVP

   b) Explain various scheduling mechanisms used in communication of multimedia applications. **8**

OR

10. a) Explain the RTSP protocol. Why this is needed ? **8**

    b) Differentiate between SIP and H.323 protocol. **8**

11. a) Explain the 802.11 architecture. **8**

    b) Write short notes on **8**

    1) Frame relay
    2) ATM switch
    3) X.25

OR

12. a) Explain Fast Ethernet in detail. **8**

    b) Describe the architecture of Broadband ISDN. **8**

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[3963] – 365

T.E. (Information Technology) (Semester – I) Examination, 2011
SOFTWARE ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** answer books.*
*2) From Section **I** answer Q. **1** or Q. **2**, Q. **3** or **Q.4**, Q. **5 or** Q. **6** and answer Q. **7** or Q. **8**, Q.**9** or Q.**10**, Q.**11** or Q. **12.***
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) **Figures** to the right indicate **full** marks.*

SECTION – I

1. a) Define software engineering. Explain the failure curve of software. **6**
   b) State and explain the practitioner's myths. **4**
   c) Explain the iterative software process model in detail. **8**

   OR

2. a) Explain the umbrella activities software process in detail. **10**
   b) Explain the Spiral Software Processing model in detail. **8**

3. a) Explain the requirement elicitation and requirement elaboration tasks in brief. **10**
   b) Draw and explain the traceability table for requirement management. **6**

   OR

4. a) Explain the class based elements of analysis model in detail. **8**
   b) Draw a label 0, level 1 and level 2 DFD for a library book returning system for a college student. **(1+2+5=8)**

5. a) In the context of software design explain the following in brief : **(4×2=8)**
      i) Modularity.
      ii) Functional independence.
   b) Explain the layered architecture style in detail. **8**

   OR

P.T.O.

6. a) In the context of software design explain the following in brief : **(4×2=8)**
   i) Information hiding.
   ii) Refactoring.
   b) What are the steps involved in User interface design ? How is the interface evaluation done ? **8**

SECTION – II

7. a) What are the objectives of unit testing ? How is unit testing carried out ? **8**
   b) What is black box testing ? Illustrate its importance with an example. **10**

OR

8. a) What is regression testing ? How is that carried out ? **10**
   b) What is unit testing and integration testing in object oriented context ? **8**

9. a) What question need be answered in order to develop a project plan using W^5HH principles ? **8**
   b) What is the objective of software measurement ? Explain the LOC based software estimation one in brief. **8**

OR

10. a) What is OO metric ? **8**
    b) Explain the COCOMOII estimation model. **8**

11. a) What is a risk ? What are the types of software risks ? Write two examples of each. **6**
    b) What is RMMM ? Write a note on it. **10**

OR

12. a) What is project scheduling ? What are the basic principles of project scheduling ? **8**
    b) Define SCM. What are the contents of SCM repository ? **8**

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T.E. (Information Technology) (Semester – II) Examination, 2011
SYSTEM SOFTWARE PROGRAMMING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *questions from Section* ***II*** *.*

ii) Answers to the ***two*** *Sections should be written in* ***separate*** *answer books.*

iii) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

iv) Figures to the ***right*** *indicate* ***full*** *marks.*

v) ***Use*** *of Electronic pocket calculator is* ***allowed****.*

SECTION – I

1. a) Define the following terms **4**

i) Compiler ii) Loader

iii) Interpreter iv) Macroprocessor

b) Assume the instruction opcodes for assembly mnemonic as given below :

Instruction opcode	Mnemonic	Length
00	STDP	1
01	ADD	1
02	SUB	1
03	MULT	1
04	MOVER	1
05	MOVEM	1
06	BC	1

P.T.O.

Generate Literal table, symbol table, intermediate code (using variant I) and target code, for the assembly language code given below :

```
                START   200
                MOVER   AREG, = 'S'
                MOVEM   AREG, A
LOOP            MOVER   AREG, A
                MOVER   CREG, B
                ADD     CREG, = '1'
                BC      ANY, NEXT
                LTORG
NEXT            SUB     AREG, = '1'
                BC LT,  BACK
LAST            STOP
                ORIGIN  LOOP + 2
                MULT    CREG, B
A               DS      1
BACK            EQU     LOOP
B               DS      1
                END
```

12

OR

2. a) Say true or false and justify your answer : **8**
   i) Single pass assembler can handle forward references.
   ii) Error, "symbol used but not defined" can be detected during pass I of two pass assembler.
   iii) Assembler directives get translated into object code.
   iv) The literals used in assembly language get memory allocated only after END.

   b) Draw the flowchart of activities of pass I of two pass assembler. **8**

3. a) In an assembly language program certain action is required at ten different places. Under what conditions would you code this as i) Macro ii) Subroutine ? Justify your answer. **4**

   b) Explain with example following macro facilities :
   i) Expansion time Loops
   ii) Change of flow during macro expansion. **8**

   c) Explain with example, different types of parameters that are used in macro processor. **6**

OR

4. Show macro name table, macro definition table and final expanded code for the assembly language code given below : **18**

```
        MACRO
        XYZ          & A
        ST          1, & A
        MEND
        MACRO
        MPLS         & Z
        MACRO
        &Z           & W
        AR          4, & W
        XYZ          ALL
        MEND
        ST        & Z, ALL
        MEND
PROG    START
        USING        *, 15
        MPLS        HELLO
        ST             2,3
        HELLO       YALE
YALE    EQU             5
ALL     DC           F‘3’
        END
```

5. a) Compute FIRST and FOLLOW for the grammar given below : **6**

   $E \rightarrow TE'$
   $E' \rightarrow +TE' / \varepsilon$
   $T \rightarrow FT'$
   $T' \rightarrow *FT' / \varepsilon$
   $F \rightarrow (E) / id$

   b) Distinguish between top down and bottom up parsers. **6**

   c) Explain with example the term ambiguous grammar. **4**

OR

6. a) Give regular expression / definition for white space, identifiers and simple integer constants. Explain how they are used in recognizing the corresponding tokens support your answer with transition diagram. **6**

   b) For the ‘C’ code given below, give the different tables that would be generated as output of lexical analysis.

```
main ()
 {
   int  i,  sum,  n;
   float  avg;
   n  =  10;  sum  =  ϕ ;
   for  (i = 1;  i < = 10;  i + +)
            sum = sum + i ;
   avg = sum / (float) n ;
 }
```

10

SECTION – II

7. a) Explain the processing of all phases of compiler with respect to the assignment statement given below. Clearly mention input and output of each phase.
p = i * r / 30
where i is integer variable while p and r are float type variables. **12**

b) Explain any two machine dependent code optimization techniques used in compilers. **4**

OR

8. a) Write a short note on activation record. **4**

b) Discuss code generation issues. **8**

c) Write three address code for following statement and give its triple and quadruple representation. **4**
A = – B * (C + D)

9. a) Write **true** or **false** :
i) In absolute loader scheme allocation is done by loader.
ii) In absolute loader scheme linking is done by programmer.
iii) In BSS loader scheme relocation is done by loader.
iv) In BSS loader scheme linking is done by programmer. **4**

b) Explain compile and go loader scheme. **8**

c) Explain with flow chart design of absolute loader. **6**

OR

10. a) Give the flow chart for pass I of direct linking loader. **12**

b) Explain following terms
i) Overlays
ii) Dynamic Linking. **6**

11. a) What are various types of editors ? With the help of block diagram, explain typical Editor Structure. **10**

b) Give importance of user Interface in any software application. Give structure of user interface. **6**

OR

12. a) Give different sections of files that are given as input to Lex and Yacc. Also explain how Lex and Yace communicate with each other. **12**

b) Write a short note on Debug Monitor. **4**

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T.E. (Information Technology) (Semester – II) Examination, 2011
PROGRAMMING PARADIGMS (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) What is data object ? What is life time of data object ? Explain programmer and system defined data object. **10**

   b) Explain the concept of pointer with respect to **6**

      i) Specification

      ii) Implementation

      iii) Operations performed.

OR

1. a) Define the term “Binding”. With suitable example in particular language explain which bindings are done at **8**

      i) Language implementation time

      ii) Translation time

      iii) Execution time.

   b) Differentiate between structured and non structured data types. **4**

   c) Explain the concept of coercion with example. **4**

2. a) Explain with layout activation records for subprograms. **8**

   b) Differentiate between subroutines and co-routine. **4**

   c) Explain the concepts of exception and exception handler. **4**

OR

P.T.O.

2. a) Consider the definition of procedure swap as below : **10**

```
Procedure swap (x, y : integer)
Var z : integer
Begin
z : = x;
x : = y;
Return z;
End f;
Begin
y = f();
End swap;
```

Describe the effect of the procedure call swap (I, A[i]) under each of the following parameter passing methods :

i) Call-By-Value ii) Call-by-reference

iii) Call-by-value result iv) Macro expansion

b) What are co-routines ? Discuss their implementation. **6**

3. a) Explain following variables supported by Java with example. **8**

i) Instance variable ii) Static variable

iii) Local variable iv) Parameter variable.

b) Differentiate between concept of overriding and overloading with example. **5**

c) Differentiate between concept of static variable and instance variable with example. **5**

OR

3. a) Compare Java application versus Java applets. Can applets communicate with each other ? **6**

b) Explain the concept of inheritance with respect to Java and C++ in detail. **10**

c) Differentiate between abstract class and interface in Java. **2**

SECTION – II

4. a) What is the difference between a window and a frame in Java ? **4**

b) Explain any 3 types of listeners in Java. **6**

c) Differentiate between Java swing and Java AWT. **6**

OR

4. a) Explain the following concepts in Java **8**

i) Panel ii) Frame

iii) Canvas iv) Container

b) What is meant by controls and explain different types of controls ? **8**

5. a) What is declarative programming paradigm ? How it is different than imperative paradigm ? **6**

b) Enlist the applications of logic programming. **4**

c) Why prolog or LISP are used for AI applications ? **2**

d) What is cuts in prolog ? How does it used in program ? **4**

OR

5. a) Explain rules, facts and queries in Prolog with example. **6**

b) Differentiate between unification and backtracking. **6**

c) Explain recursive structure in PROLOG with example. **4**

6. a) What are the applications of functional languages ? **4**

b) What is meant by parallel programming ? What are the design principles for parallel programming. **8**

c) What is the concept of node in Data Flow Programming ? **2**

d) Enlist benefits and limitations of Java sockets. **4**

OR

6. a) What is the difference between TCP and UDP ? **4**

b) How we can handle synchronisation mechanism in parallel programming ? **6**

c) Explain various types of data types and data structures supported by LISP. **8**

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T.E. (Information Technology) (Semester – II) Examination, 2011
DESIGN AND ANALYSIS OF ALGORITHMS
(New) (2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. : 1) Answer **three** questions from **each** Section.
2) Answer to the **two** Sections should be written in **separate** answer-books.
3) Neat diagrams must be drawn **whenever** necessary.
4) Figures to the **right** indicate **full** marks.
5) Assume suitable data, **if** necessary.

SECTION – I

1. a) Suppose you have algorithms with the running time listed below (Assume these are exact running time). How much slower do each of these algorithms get when you (a) Double the input size (b) increase the input size by one ? **8**

   i) $100n^2$ ii) n log n

   iii) 2^n iv) n^2

   b) A binary tree is a rooted tree in which each node has at most two children. Show by induction that any binary tree the number of nodes with two children is exactly one less than number of leaves. **10**

OR

2. a) Suppose you have algorithms with the running time listed below (Assume these are exact running time). How much slower do each of these algorithms get when you (a) Double the input size (b) increase the input size by one ? **8**

   i) n^2 ii) n^3

   iii) 2^n iv) n logn

   b) What is the purpose of proof techniques to apply on the algorithms ? Explain the method of proof by contradiction in detail and how do we apply the proof by contradiction "to prove that there are infinitely many prime numbers". **10**

P.T.O.

3. a) Analyze Prim's algorithm of minimum spanning tree using greedy approach. Find the cost of Minimal Spanning Tree of the given graph by using Prim's Algorithm. **6**

b) Compare the sorting methods Merge sort and quick sort implemented using divide and conquer, devise data sets which compare the average and worst case complexities for these two algorithms. **10**

OR

4. a) Write an algorithm for finding out the maximum and minimum number in an array using divide and conquer. Devise data sets which compare the average and worst case complexities for these two algorithms. Analyze an Kruskal's algorithm of minimum spanning tree using greedy approach. **10**

b) Find the cost of Minimal Spanning Tree of the given graph by using Kruskal's Algorithm. **6**

What is dynamic programming approach to solve the problem ?

5. Consider the following instance of Knap sack problem : n = 6,
(p1, p2, p3, p4, p5, p6) = (w1, w2, w3, w4, w5, w6) = (100, 50, 20, 10, 7, 3) and
M = 165.
Solve the problem using Dynamic programming approach. **16**

OR

6. What is dynamic programming approach to solve the problem ?
N = 3 and {a1, a2, a3) = {do, if, while} Let p (1:3) = (0.5, 0.1, 0.05)
q(0:3) = (0.15, 0.1, 0.05, 0.05)
Compute and construct OBST for above values using Dynamic approach. **16**

SECTION – II

7. a) Explain how to find Hamiltonian Cycle by using Backtracking in given graph. **8**

b) Analyze sum of subset algorithm on data : **10**
M = 35 and
i) W = {5, 7, 10, 12, 15, 18, 20}
ii) W = {20, 18, 15, 12, 10, 7, 5}
iii) W = {15, 7, 20, 5, 18, 10, 12}
Are there any discernible differences in the computing time ?

OR

8. a) Analyze the 8-queen problem using backtracking strategy of problem solving. **8**
b) Construct Planar graph for following map. Explain how to find m-coloring of this planar graph by using m-coloring Backtracking algorithm. **10**

9. a) Describe the following with respect to Branch and Bound. **16**
   i) The methods
   ii) Least cost search (LC Search)
   iii) Control abstraction for LC search
   iv) Bounding

   And take an example of travelling salesman problem using branch and bound.

OR

10. a) Differentiate Backtracking and Branch and Bound Method. Illustrate with example of 4-Queen's Problem. **8**

   b) What is a state space tree and with respect to state space tree explain the following terms : **8**
   i) solution states
   ii) state space
   iii) answer states
   iv) static trees
   v) dynamic trees
   vi) live node
   vii) bounding function.

11. a) Write Non-Deterministic Algorithm for sorting of elements of an array. What is its Complexity ? **8**

   b) Prove that Clique Decision Problem is NP-Hard. **8**

OR

12. a) Write Non-Deterministic Algorithm for searching an item in an array. What is its Complexity ? **8**

   b) What do you mean by P, NP, NP-Hard and NP-Complete Problems ? Give an example of each category. **8**

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T.E. Biotechnology Examination, 2011
GENETICS ENGINEERING
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B *: i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Answer to the **two** Sections should be written in **separate** answer books.*
*iii) Neat diagrams should be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*

SECTION – I

1. What do you understand by PCR ? What are the components of a PCR reaction ? Using appropriate diagram, describe steps involved in typical PCR reaction. **18**

OR

2. Give an account of **9**

   a) Flow cytometry

   b) Microarray

3. Write notes on **any two** : **8**

   a) Phagemids

   b) Multiple cloning site

   c) Selection markers

   d) Insertion expression vector.

4. What are the steps involved in forming a Genomic DNA library ? **16**

OR

5. What are various methods of synthesizing C-DNA library ? **16**

P.T.O.

SECTION – II

6. How can PCR be employed in cloning of DNA fragment ? Describe various approaches taken. **18**

OR

7. What are the steps involved in a cloning experiment ? Discuss them with the help of a flow chart. **18**

8. Explain in detail about live vaccines. What kinds of modifications are used to produce a vaccine ? **16**

OR

9. Give a detailed account of chemical transformation method. **16**

10. Discuss the use of recombinant DNA technology with the example of production of factor VIII. How does it help in treating heamophilia ? **16**

OR

11. What is the spatiality of BT cotton ? Describe the technology behind it. **16**

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T.E. Biotechnology Examination, 2011
FERMENTATION TECHNOLOGY – I
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer to **two** Sections should be written in **separate** answer books.*
*ii) Draw neat diagrams **wherever** necessary.*
*iii) Maximum marks for **each** question is given in parentheses.*

SECTION – I (Maximum Marks **50**)

1. Describe the widely used upstream and downstream processes involved in microbial fermentation. **(18)**

OR

2. Define the strategies that could be adopted for screening microorganisms which can utilize sucrose as carbon source at 55°C for the production of a desired product alcohol ? Describe the downstream process for purification of alcohol from fermentation broth. **(18)**

3. What are the different parameters to be considered during microbial culture optimization for achieving maximum yield of a desired product ? **(16)**

OR

4. With suitable example illustrate how carbon to nitrogen ratio effects microbial growth and production of metabolites. **(16)**

5. What are organic acids ? What is there commercial significance ? Describe the fermentative production of citric acid. **(16)**

OR

6. Explain the differences in the commercial production of wine and beer ? **(16)**

P.T.O.

SECTION – II (Maximum Marks **50**)

7. What is immobilization ? Describe the process of whole cell immobilization and its advantages in microbial production. **(18)**

OR

8. With suitable examples, describe how microbial enzymes can reduce the time and cost of production of antibiotics. **(18)**

9. Explain the different modes of operation of a stirred tank bioreactor highlighting their advantages and disadvantages. **(16)**

OR

10. Briefly describe the major types of bioreactors used in animal cell technology. **(16)**

11. What are the different aspects to be considered during process scale-up ? Describe. **(16)**

OR

12. What are the different aspects to be considered for process economics ? Describe. **(16)**

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T.E. Biotechnology Examination, 2011
HEAT TRANSFER
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answer to the **two** Sections should be written in **separate** answer books.*
*3) Assume suitable data, **if necessary**.*
*4) **Neat** diagrams should be drawn **whenever** necessary.*
*5) Use of scientific calculator is **allowed**.*
*6) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain the basic laws involved in conduction and convection. **6**

   b) What is Buckingham π-theorem ? How dimensional analysis helps in data reduction ? Explain with example. **10**

   OR

2. a) Discuss the mechanisms of conduction and convection. **4**

   b) Explain the role of heat transfer in biotechnology with example. **6**

   c) Explain the physical significance of Reynolds number and Prandtl number. **6**

3. a) One of the largest surfaces of 1m × 1m × 0.05 m copper plate (K = 385 W/m K) is held at 100°C while the second largest surface is maintained at 0°C. Calculate the rate at which energy flows through the plate and the thermal resistance of the plate. **6**

   b) Consider a large homogeneous flat plate of thickness 2b in which heat is generated uniformly at q. Find the maximum temperature assuming steady state conduction. **12**

   OR

P.T.O.

4. a) The thermal conductivity of pure aluminum is 214.6 W/m K and 228.5 W/m K at 200°C and 300°C respectively. One surface of a large slab of aluminum of thickness 40 cm is exposed to 300°C while the other surface is maintained at 200°C. Assuming that the thermal conductivity of aluminum varies linearly in this temperature range, determine the rate of conduction heat transfer per unit area through the slab. Also determine the values of k_0 and β_k for aluminum. $[k(T) = k_0 (1 + \beta_k T)]$. **10**

   b) Derive the expression for steady state conduction in a multilayered spherical shell. **8**

5. a) What is meant by thermal boundary layer ? **4**

   b) What are extended surfaces ? Explain with relevant examples. **4**

   c) Write short note on

      i) Film wise and drop wise condensation

      ii) Types of boiling. **8**

OR

6. a) Derive the differential equation for steady state heat convection in cylindrical coordinates for a steady flow with constant properties and negligible viscous dissipation. **12**

   b) What are types of convection ? Explain with example. **4**

SECTION – II

7. a) Explain how the heat transfer takes place by radiation with suitable example. **6**

   b) Define following terms : **6**

      i) Monochromatic radiating power

      ii) Total radiating power

      iii) Emissivity

      iv) Monochromatic emissivity

      v) Gray body

      vi) Black body.

   c) Explain Planck's law and Kirchhoff's law. **4**

OR

8. a) Explain : **8**

      i) Shape factor ii) Reciprocal relation

      iii) Specular reflection iv) Wien's law.

   b) Derive the expression for heat exchange by radiation between two finite black surfaces. **8**

9. What is LMTD ? Derive the expression for LMTD in parallel and counter-current flow. **18**

OR

10. a) Explain : **8**

      i) Fouling factor ii) Effectiveness.

   b) Water at the rate of 68 kg/min is heated from 35 to 75°C by oil having a specific heat of 1.9 kJ/kg°C. The fluids are used in a counter flow double pipe heat exchanger, and the oil enters the exchanger at 110°C and leaves at 75°C. The overall HTC is 320 W/m^2°C. Calculate the heat exchange area. **10**

11. a) What is boiling point elevation ? Explain Duhring's rule. **6**

    b) It is desired to concentrate 5000 kg/h of a solution of NaOH from 10% to 25% solids in a single effect evaporator. Steam is available at 110°C and the vapor space is maintained at 410 mm of Hg. The boiling point of water corresponding to the vapor space pressure is 84°C. The solution has a boiling point elevation of 10°C. The enthalpies of the feed and thick liquor are 90 and 80 kcal/kg respectively and the enthalpy of the vapor is 650 kcal/kg. The feed enters at its boiling point corresponding to the vapor space pressure. $\lambda s = 534$ kcal / kg

    i) Calculate the steam consumption per hour

    ii) If the available heat transfer area is 35 m^2, estimate the heat transfer coefficient. **10**

OR

12. a) What are the types of evaporators ? Explain any one application of each of them. **6**

    b) What is the objective of evaporation ? Explain what happens to concentration, density, viscosity and boiling point during evaporation. **8**

    c) Define capacity and economy of an evaporator. Explain its significance. **2**

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T.E. Biotechnology Examination, 2011
COMPUTATIONAL TECHNIQUES AND BIOSTATISTICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Figures to the **right** indicate **full** marks.*
*2) **Use** of pocket electronic calculator is **allowed.***
*3) Draw a **neat** sketch **wherever** necessary.*
*4) Assume suitable data **if** necessary.*
*5) Answer **any three** questions from Section **I** and **any three** questions from Section **II.***
*6) Answer to the **two** Sections should be written in **separate** answer books.*

SECTION – I

1. a) Find the constants "m" and "c" by least squares method using following data : **8**

Data : P = mW + c :

P	12	15	21	25
W	50	70	100	120

b) Fit a second degree parabola to the following data : **8**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

OR

2. a) An experiment gave the following values, if "v" and "t" are connected by the relation $v = at^b$, find the best possible values of "a" and "b". **8**

v (ft^3 / min)	350	400	500	600
t (min)	61	26	7	26

b) Predict the mean radiation dose at an altitude of 3000 ft by fitting an exponential curve to the given data. **8**

Altitude (x)	50	450	780	1200	4400	4800	5300
Dose of radiation (y)	28	30	32	36	51	58	69

3. a) Given the values in the data, evaluate f (9) using Lagrange's formula. **10**

x	5	7	11	13	17
f (x)	150	392	1452	2366	5202

b) Evaluate $\Delta\left(e^{x}\log 2x\right)$. **6**

OR

4. a) Express $y = 2x^3 - 3x^2 + 3x - 10$ in a factorial notation and hence show that $\Delta^3 y = 12$. **6**

b) From the following table, estimate the number of students who obtained marks between 40 and 45. **10**

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students	31	42	51	35	31

5. a) The velocity v (Km/min) of a moped which starts from rest is given at fixed intervals of time t (min). Estimate the distance covered in 20 min by Simpson's $1/3^{rd}$ rule. **9**

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

b) Evaluate $\int \frac{dx}{1+x^2}$ in the limits (0, 6) by using Weddle's rule and compare the result with the actual value. **9**

OR

6. a) A solid of revolution is formed by rotating about x-axis, the area between x-axis, the lines x = 0 and x = 1 and a curve through the points with the following coordinates. Estimate the volume of the solid formed using Simpson's rule. **9**

x	0	0.25	0.50	0.75	1.00
y	1	0.9896	0.9589	0.9089	0.8415

b) Evaluate $\int \frac{dx}{1+x^2}$ in the limits (0, 6) by using trapezoidal rule. **9**

SECTION – II

7. a) Using Newton's iterative method, find the real root of $x \log_{10}^{x} = 1.2$ correct to five decimal places. **8**

b) Find the root of the equation $xe^x = \cos x$ using Regula falsi method correct to four decimal places. **8**

OR

8. a) Find a root of the equation $x^3 - 4x - 9 = 0$ using bisection method in four stages. **8**

b) Deduct Newton Raphson's iterative formula to find a root of $\sqrt[k]{N}$ and evaluate $\sqrt[3]{24}$ correct to two decimal places. **8**

9. a) Define Frequency polygon. Explain in detail the methods of drawing a frequency polygon. **8**

b) Write short notes on sub divided bar diagrams by taking an example. **8**

OR

10. a) Write short notes on : **8**
    i) Quota sampling
    ii) Convenience sampling.

b) What are Ratio charts ? Explain the method of constructing ratio charts. List out the uses of ratio charts. **8**

11. a) In experiments on Pea breeding, the following frequencies of seeds were obtained. Theory predicts that the frequencies should be in proportions 9 : 3 : 3 : 1. Examine the correspondence between theory and experiment by using Chi square test. The value of Chi square at 0.005 significance level is given as 7.815 for degrees of freedom v = 3. **10**

Round and yellow	**Wrinkled and yellow**	**Round and green**	**Wrinkled and green**	**Total**
315	101	108	32	556

b) Calculate the mean and standard deviation for the following data : **8**

Size of item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

OR

12. a) The following is the frequency distribution of a random sample of weekly earnings of 509 employees. Calculate the average weekly earnings by using : **10**
    i) Direct method
    ii) Step deviation method

Weekly earnings	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
No. of employees	3	6	10	15	24	42	75	90	79	55	36	26	19	13	9	7

b) What do you mean by Chi square test ? Describe the working procedure to test significance and goodness of fit for Chi square test. **8**

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T.E. (Biotechnology) Examination, 2011
REACTION ENGINEERING
(2008 Pattern)

Time : 3 Hours | Max. Marks : 100

Notes: *1) Figures to the **right** indicate **full** marks.*

*2) **Use** of Programmable calculator is **not** allowed.*

*3) Draw a **neat** sketch **wherever** necessary.*

*4) Make necessary assumptions **wherever required.***

*5) Answer **any three** questions from Section – **I** and **any three** questions from Section – **II**.*

SECTION – I

1. a) Explain the temperature dependency of rate constant from Arrhenius law. **8**

   b) Milk is pasteurized if it is heated to 63 C for 30 min but if it is heated to 74 C it only needs 15 sec for same process. Determine the activation energy of sterilization process. **8**

OR

2. a) Differentiate between elementary and non-elementary reactions with suitable examples. **4**

   b) AT 1100 K n-nonane thermally cracks 20 times as rapidly as at 1000 K. Calculate the activation energy for this reaction. **6**

   c) Give the classification of chemical reactions. **6**

3. For the reaction stoichiometry $2A \rightarrow R$ carried out at 25 C. The reaction temperature was increased to 100 C and following data was obtained. Determine the rate expression which satisfies the data. **18**

P.T.O.

t, min	1	2	3	4	5	6	7	8	9	10	15	20
P, atm	1.14	1.04	0.982	0.940	0.905	0.870	0.850	0.832	0.815	0.8	0.75	0.728

OR

4. The liquid phase decomposition of A is studied in experimental reactor. Determine the holding time required to obtain 75% conversion (C_{A0} = 0.8 mol/lit) in
   i) Mixed flow reactor
   ii) Plug flow reactor. **18**

Data :

C_A in feed, mol/lit.	**C_A in exit stream, mol/lit.**	**Holding time, sec**
2.00	0.65	300
2.00	0.92	240
2.00	1.00	250
1.00	0.56	110
1.00	0.37	360
0.48	0.42	24
0.48	0.28	200
0.48	0.20	500

5. For pulse input experiments following results were obtained. Calculate the conversion of reactant A in the real reactor. **16**

   A $\rightarrow$ Product, $-r_A = 0.10\ C_A$

   Data:

t, min	0	1	2	3	4	5	6	7	8	9	10	12	14
C_{pulse}, gm/cu.m.	0	1	5	8	10	8	6	4	3	2.2	1.5	0.6	0

OR

6. Write short notes on : **16**
   i) Dispersion Model.
   ii) Segregated flow model.

SECTION – II

7. Spherical solid particles containing B are roasted isothermally in an oven with gas of constant composition. Solids are converted to non-flaking product according to shrinking core model. Determine the rate controlling mechanism for the transformation of solid. **18**

Data 1 :

d_p, mm	X_B	t, min
1	0.3	2
1	0.3	5

Data 2 :

d_p, mm	X_B	t, min
1	1	4
1.5	1	6

OR

8. a) Obtain the relationship of time with radius and conversion and with conversion for spherical particles of unchanging size assuming shrinking core model. **12**
   b) Write short notes on progressive conversion model. **6**

9. a) Derive the expression for Thiele modulus for pore diffusion resistance combined with surface kinetics for single cylinderical pore. **12**
   b) Explain the experimental method for finding rate in recycle reactor. **4**

OR

10. a) Determine the amount of catalyst required in packed bed reactor for 75% conversion of 1000 mol/min if C_{A0} = 8 mol/m^3 of feed. **10**

    b) Write short note on Trickle bed reactor. **6**

11. Carbohydrate A decomposes in presence of enzyme E. Carbohydrate B affects the decomposition. Runs were conducted and data is obtained. **16**

    i) Find a rate equation for the decomposition.

    ii) Determine the role of B in decomposition.

    iii) Suggest a mechanism for the decomposition.

C_{A0} mol/m^3	C_A, mol/m^3	C_{B0}, mol/m^3	C_{E0}, mol/m^3	ν, cm^3/min
200	50	0	12.5	80
900	300	0	5	24
1200	800	0	5	48
700	33.3	33.3	33.3	24
200	80	33.3	10	80
900	500	33.3	20	120

OR

12. Write short notes on : **16**

    i) Substrate limiting microbial fermentation

    ii) Non-competitive Inhibition

    iii) Product limiting microbial fermentation

    iv) Michaelis-Menten kinetics.

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T.E. Biotechnology Examination, 2011
FERMENTATION TECHNOLOGY – II
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. : *i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*ii) Answer to the **two** Sections should be written in **separate** answer books.*
*iii) **Neat** diagrams should be drawn **whenever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) Use of programmable calculator is **allowed**.*
*vi) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Describe the effect of aeration on power consumption of an agitator in a fermenter. Does the power consumption increase or decrease ? Why ? **6**

   b) Explain how the bubble characteristics affect oxygen uptake rate in a fermenter. **6**

   c) Classify fermentation broth based on their rheology giving examples of each type. **6**

OR

2. a) Discuss in detail the different factors which affect the rate of mass transfer ($k_L a$) during a fermenter operation. **9**

   b) Describe in detail the dynamic method of gassing out for determining the mass transfer coefficient in a fermenter. **9**

3. a) Describe in brief the most commonly used unit operations for processing of fermentation broths. **8**

   b) With the help of a neat sketch, explain the construction and working of an air lift bioreactor. **8**

OR

P.T.O.

4. Write short notes on the following : **16**
   a) Bubble column bioreactors
   b) Continuous counter current decanter
   c) Spray dryer
   d) Packed towers for fermentation.

5. a) Define adsorption with suitable examples. Write short notes on Freundlich and Langmuir isotherms. **8**
   b) A solution containing valuable solute is colorized by an impurity. Adsorption experiments yielded the equilibrium relationship $Y^* = 8.91 \times 10^{-5} X^{1.66}$. Initial solution of 1000 kg has a color concentration of 9.6 color units/kg solution. Calculate the percentage of origianl color removed in single stage using 32 kg of fresh adsorbent. **8**

OR

6. Decolorization of a particular oil yielded the equilibrium relation $Y = 0.004\ X^2$, where Y = gm color/gm color free oil and X = gm color/gm absorbent. If 100 kg of oil containing one part of color and the rest oil is treated with 25 kg of adsorbent, calculate the percentage color removed if 12.5 kg of the adsorbent is used initially followed by another 12.5 kg in a two stage crosscurrent adsorption operation ? **16**

SECTION – II

7. a) Write a short note on preparation of solids prior to leaching operation. Also enlist the factors affecting leaching. **9**
   b) Derive an expression for (y_{Mn}, N_{Mn}) for multistage crosscurrent leaching operation with the help of a neat sketch. **9**

OR

8. Seeds containing 20% by weight oil are to be leached in countercurrent operation. 90% of oil is recovered in a solution containing 50% by weight oil. If fresh solvent is used and 1 kg of solution is removed in underflow with every 2 kg of insolubles, determine the following for a 5 stage leaching operation. **18**
   i) $F(Y_F, N_F)$
   ii) $R_{n+1}(X_{n+1}, N_{n+1})$
   iii) $R_1(x_1, N_1)$
   iv) $E_n(y_n, N_n)$

9. a) Define membrane fouling. What are the factors effecting fouling ? Derive an expression for the total resistance offered during fouling operation. **8**

   b) Define Microfiltration. What are the membranes used for microfiltration ? Describe the transport equations used in MF. **8**

OR

10. a) Define the following with formulae : **8**
   i) Retention Coefficient
   ii) Transmission Coefficient
   iii) Decontamination factor
   iv) Concentration factor

   b) Write a short note on facilitated diffusion through a membrane giving suitable examples. **8**

11. a) Derive Mixture rule. How is it used in extraction calculations ? **8**

   b) Write short notes on : **8**
   i) Choice of solvent in extraction
   ii) Any one equipment used for liquid liquid extraction

OR

12. a) Write short notes on the use of Equilateral triangular coordinates in extraction operation. **8**

   b) Derive the material balance equations for multistage crosscurrent extraction process with neat sketch and state the necessary assumptions. **8**

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T.E. (Biotechnology) Examination, 2011
BIOSEPARATIONS – I
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

N.B. *: i) Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *questions from Section* ***II*** *.*

ii) Answers to the ***two*** *Sections should be written in* ***separate*** *answer books.*

iii) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

iv) Figures to the ***right*** *indicate* ***full*** *marks.*

v) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Define Bioseparations. What are the major challenges in Bioseparation Engineering ? Explain in detail. **9**

2. a) Write short notes on Bioproduct release. Give a brief account on the factors to be considered during bioproduct release. **9**

OR

2. a) Explain in detail range of bioproducts. **9**

b) Give detailed notes on Rheological characteristics of fermentation broths. **9**

3. a) What are the different methods of Chromatographic analysis ? Explasin each one in detail. **12**

b) A solute X of a sample mixture is not retained on the column and elutes out at 4 min after injection. Another solute in the same sample mixture Y elutes out at 12 min. The mobile phase flow rate is 20 ml/min. Calculate the values of V_m, K^1, for the solute y and time spent by Y in the mobile and stationary phases. **4**

OR

4. a) What is Thin layer Chromatography ? Describe the working procedure of TLC. Explain how the performance of TLC is analyzed based on R_f factor ? **12**

b) Define the following with suitable formulae : **4**

i) Resolution

ii) Back pressure

P.T.O.

5. a) Explain the construction and working of Disk stack centrifuge with a neat sketch. List out its applications. **8**

   b) What is Ultra filtration ? Explain in detail the modes of operation in Ultra filtration with neat sketches. **8**

OR

6. a) What is density gradient centrifugation ? Explain in detail with example. **8**

   b) The centrifugal separation of a biomass of 80 μm sized cells of density 1.04 Kg/m^3 was carried out in a tubular centrifuge having a diameter of 15 cm and rotating at 1200 rev/min and the length of the centrifuge being 40 cm. Calculate Sigma factor. **8**

SECTION – II

7. a) Define solvent extraction. What is the principle behind it ? Write short notes on partition coefficient in solvent extraction. **9**

   b) What are the criteria for the selection of solvent in solvent extraction ? Explain in detail. **9**

OR

8. a) Explain in detail the equipments used for drying biproducts. **10**

   b) Explain in short the following : **8**

      i) Falling drying rate period

      ii) Constant drying rate period

9. Explain the role of Bioseparartion techniques in Bioprocess Engineering. **16**

OR

10. Discuss the importance of economic aspects in Bioseparation. Explain in detail with a case study. **16**

11. What are the processes used for the recovery of intracelluar and extracellular products during primary recovery stage in Bioprocesses ? **16**

OR

12. Write short notes on separation of secondary metabolites with example. **16**

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T.E. Biotechnology Examination, 2011
IMMUNOLOGY AND DIAGNOSTICS
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

SECTION – I (Maximum Marks 50)

1. Describe anatomic and physiological barriers of Innate immunity. **18**

OR

2. Describe the experimental evidence showing γ - globulin fraction of serum responsible for humoral immunity. How is antibody diversity generated ? **18**

3. Enlist the primary lymphoid organs and summarize their functions in IR. **16**

OR

4. Describe the importance of antigen antibody interactions in diagnostics. Comment on the sensitivity of each assay. **16**

5. With the help of diagram describe the process of autograft acceptance and rejection. **16**

OR

6. Discuss the role of MHC and process of antigen presentation in cell mediated immunity. **16**

SECTION – II (Maximum Marks 50)

7. Describe in detail various immune effector mechanisms involved in humoral immunity. **18**

OR

8. Briefly describe Type I hypersensitivities and explain the events taking place after binding of reaginic antibodies to mast cells. **18**

P.T.O.

9. Write on : **16**

   a) Recombinant vaccine

   b) Attenuated vaccines

   c) Adjuvants

   d) Anti-sera.

OR

10. Write short notes on : **16**

   a) Monoclonal antibodies

   b) Active and passive immunization.

11. Write notes on **any two** (**8** marks **each**) : **16**

   a) Autoimmunity

   b) Immunodeficiency

   c) Immunity in cancer

   d) Cytokines and diseases.

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T.E. (Biotechnology) Examination, 2011
BIOINFORMATICS & MANAGEMENT
(2008 Pattern)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** answer books.*
*3) Assume suitable data, **if necessary**.*
*4) **Neat** diagrams should be drawn **whenever** necessary.*
*5) Figures to the **right** indicate **full** marks.*

SECTION – I

1. What are databases ? Explain protein and nucleotide databases. **18**

OR

2. Define bioinformatics and explain its scope and objective. Give an overview of applications of bioinformatics. **18**

3. a) Describe Swiss-PROT and TrEMBL primary database in detail. **8**

b) Explain the specialized genomic databases with examples. **8**

OR

4. State and explain various methods used for DNA sequencing. **16**

5. a) Write a note on : **9**
i) PROSITE ii) PRINTS and
iii) BLOCKS.

b) What are composite databases ? Explain about NRDB and OWL. **7**

OR

6. Explain the protein structure and levels of protein sequence and structural organization. **16**

P.T.O.

SECTION – II

7. a) Describe multiple sequence alignment with example. **8**

   b) Distinguish between local and global alignment. **8**

OR

8. Explain about FASTA and its variants. How does FASTA works ? **16**

9. a) What is the distance methods used in determining phylogenetic relationship ? Explain. **8**

   b) Write a short note on homolog, ortholog and paralog. **8**

OR

10. What is phylogeny ? Explain the method for construction of phylogenetic tree. Explain different types of trees. **16**

11. a) Discuss the impact of Industrial revolution on the organizations. **9**

    b) What is management ? State various functions of manager. **9**

OR

12. a) What are various disciplines in management ? How do they co-relate and function together in an organization ? **9**

    b) What do you understand by "Technology Transfer" ? What factors need to be taken into consideration while introducing new technology ? **9**

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T.E. (Production) (Semester – II) Examination, 2011
DIE AND MOULD DESIGN (Common with Prod. S/W)
(2003 Course)

Time: 4 Hours Max. Marks: 100

N.B. *: i) Answers to the **two** Sections should be written in **separate** book.*
*ii) **Neat** diagrams must be drawn **wherever** necessary.*
*iii) Figures to the **right** indicate **full** marks.*
*iv) **Use** of electronics pocket calculator is **allowed**.*
*v) Assume suitable data, **if necessary**.*

SECTION – I

1. Design a progressive die for the component shown in Figure 1

Given : Stock thickness= 1.2 mm, Shear strength of material = 195 MPa.

i) Draw best strip layout and find material utilization **4**

ii) Find out press tonnage **4**

iii) Design and draw pilot and show its mounting **4**

iv) Draw assembly drawing **6**

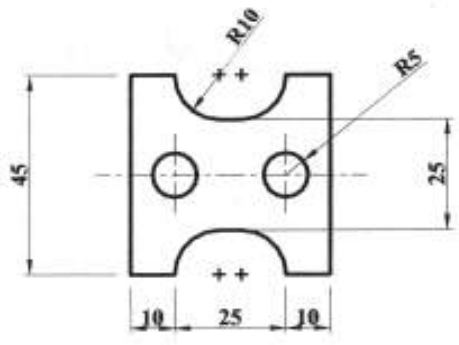


Fig: 1
Material: Al, 1.2mm thick

OR

2. a) List the name of different types of stoppers and draw a neat sketch of it that used in design of progressive die of component shown in Fig. 1. **8**

   b) Explain the methods of mounting of the punch and design and draw the punch plate for component shown in fig.1. **6**

   c) What is meant by clearance, calculate it for the same problem. What is an effect of excessive and insufficient clearance in press working ? **4**

3. Design a drawing die for the shell shown in fig. 2 **16**

   Given: blank thickness = 1.2 mm

   UTS = 260 N/mm^2.

   Determine :

   1) Blank Size
   2) Number of draws
   3) Dimension of die and punch
   4) Force required and sketches for each draw

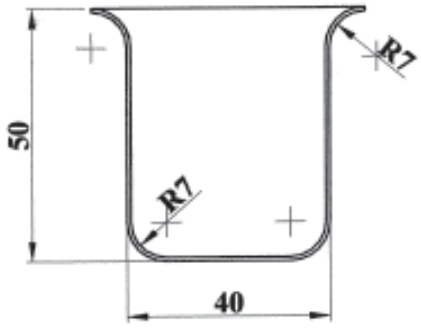


Fig: 2

OR

4. a) Explain spring back and its prevention. **4**

   b) Calculate the develop length for bend component in fig.3. **4**

c) Draw and design a bending die for the component shown in fig. 3. **8**

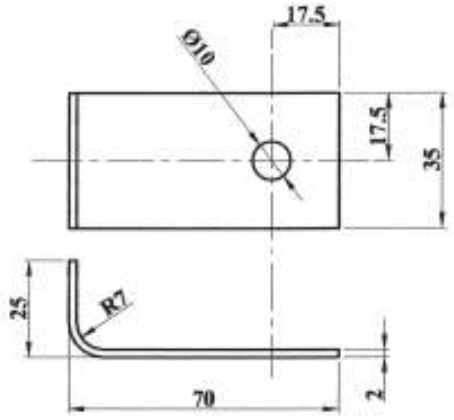


Fig: 3

5. Design close die for forging a component shown in fig.4. **16**

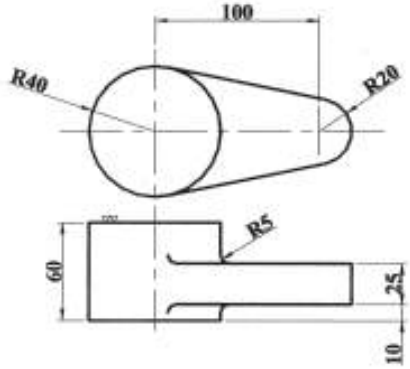


Fig:-4

OR

6. Apply rules of upsetting and design upset forging die for component shown in fig.5. **16**

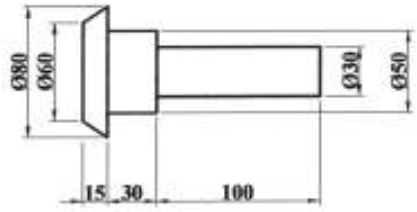


Fig:-5

SECTION – II

7. a) Explain with neat sketch ejection system in die-casting. **8**

   b) Explain gooseneck hot chamber die casting with neat diagram. **8**

OR

8. a) Explain with neat sketch cold chamber die-casting. **8**

   b) Explain various types defect in die casting with remedy. **8**

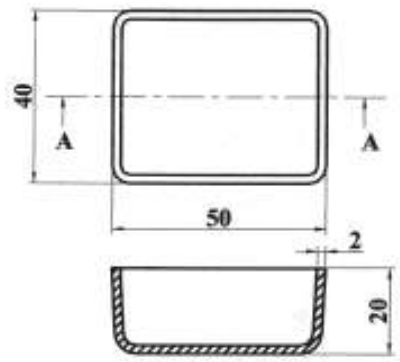
9. Explain with neat sketch : **16**
   i) Blow moulding ii) Transfer moulding
   iii) Injection moulding for thermosetting plastics.

OR

10. a) Explain cavity and core insert with neat sketch and also explain its method of fitting to bolster. **10**

    b) Explain basic terminology in injection moulding. **6**

11. Design a single-impression injection mould for the component shown in fig. 6. **18**



Sec A-A

Fig: 6

OR

12. a) Explain different methods of mould cooling in injection moulding. **10**

    b) What rectangular edge gate and 50 mm long runner dimensions are required for moulding PVC box shown in fig. 6 ? **8**
    Given ; PVC constant (n) = 0.9; PVC density = 1.39 gm/cm^3.

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T.E. (Production) (Semester – II) Examination, 2011
DATABASE AND INFORMATION TECHNOLOGY FOR PRODUCTION ENGINEERING
(Common with Prod. S/W) (2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any one** question from **each** Unit.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of electronic pocket calculator **is allowed.***
*6) Assume suitable data, **if necessary**.*

UNIT – I

1. a) What are the advantages and limitations of database processing ? **5**

   b) Explain the entity-relationship model with a suitable example. **5**

   c) Explain the various components of DBMS with a neat sketch. **6**

OR

2. a) What is a data constraint ? Explain column level and table level constraints with an example. **7**

   b) Explain the following in brief : **9**
      i) Data types used in SQL
      ii) Relational database management system
      iii) Procedural and Non procedural languages.

UNIT – II

3. a) Explain with an example the primary key and foreign key concepts in databases. **6**

   b) Create a table ‘emp’ with the following columns by assuming suitable data type and size with correct syntax in SQL. Emp_id, Ename, City, State, Salary, Age. **4**

P.T.O.

c) Give an expression in SQL to solve each of the following queries : **6**

i) Find the names of all employees whose name starts with 'M'.

ii) List all the employees name and salary whose age is less than 60 years.

iii) Select the employees whose salary is between Rs. 20,000 and Rs. 50,000.

OR

4. a) Explain the use of compound conditions AND, OR, joining in SQL programming with an example. **6**

b) Explain the following with reference to SQL programming : **10**

i) Principles of NULL value

ii) Grouping data from tables

iii) SQL operators (any four).

UNIT – III

5. a) Distinguish between an Algorithm and a Program . What are the characteristics of an Algorithm ? **8**

b) Draw a flow chart and psedo C-code for calculating the sum of following series : **10**

$$f(x) = 1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \frac{1}{8!} + \frac{1}{10!} + ----$$

OR

6. a) What is a Computer Network ? What are the characteristics of Local Area Networks ? Explain in brief types of transmission media ? **10**

b) Write a loop that will calculate the sum of squares of all odd numbers between 1 and 15. Write the loop in two different ways :

i) Using a 'for' statement

ii) Using a do-while statement. **8**

SECTION – II

UNIT – IV

7. a) Describe the output generated by the following C-program. **6**

```
# include <stdio.h>
    int funct 1 (int n);
        main ( )
        {
            int n = 10;
            printf ("%d", funct 1 (n));
        }
    int funct 1 (int n)
    {
        if(n > 0)
            return (n + funct 1 (n–2)); }
```

b) Explain the meaning of each of the following function prototypes : **4**

i) int f(float a);

ii) double f(double a, int b);

iii) void f(long a, short b, unsigned c);

iv) char f(void);

c) Find a real root of $f(x) = x^3 – 5x + 1 = 0$ by bisection method correct to five decimal places. Compute five iterations. **8**

OR

8. a) Draw a flow chart and psedo C-program to find the root of an equation using Newton-Raphson method. **10**

b) Solve the following system of linear algebraic equations upto four decimal places using Gauss-Seidal method. Perform four iterations. **8**

$9x + 4y + z = –17$

$x – 2y – 6z = 14$

$x + 6y = 4$

UNIT – V

9. a) If 0.333 is the approximate value of 1/3, find absolute, relative and percentage errors. **5**

   b) Define absolute error, round off error and relative error with an example for each. **4**

   c) Draw the flowchart to solve the problems of Newtons Interpolation Method. **7**

OR

10. a) The function y = f(x) is given at the points (7, 3), (8, 1), (9, 1) and (10, 9). Find the value of y for x = 9.5 using Lagrange's interpolation formula. **8**

    b) For the data given below, find the equation to the best fitting exponential curve of the form $y = a.e^{b.x}$. **8**

x	1	5	7	9	12
y	10	15	12	15	21

UNIT – VI

11. a) Define electronic commerce. List the consumer's benefits of electronic commerce. **6**

    b) What is electronic fund transfer ? How does it work ? **6**

    c) Explain the difference between conventional and artificial intelligent computing. **4**

OR

12. a) What are intelligent agents ? What are the characteristics of intelligent agents ? **6**

    b) Explain in brief the applications of IT in the following areas : **10**

    i) Materials requirement planning

    ii) Project management.

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T.E. (Production) S/W (Semester – I) Examination, 2011
MANUFACTURING ENGINEERING TECHNOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Black figures to the **right** indicate **full** marks.*

*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*5) Assume suitable data, if **necessary**.*

*6) **All** questions are **compulsory**.*

SECTION – I

1. a) Explain the methodology and implementation of 'Five S' in large scale manufacturing company. **9**

   b) What is TQM ? Describe internal and external customer and supplier link conception TQM. **9**

OR

2. Differentiate between (**any three)** : **18**

   a) Quality of design and quality of conformance.

   b) Quality policy and quality objective.

   c) Inspection and quality control.

   d) Cost of quality and value of quality.

P.T.O.

3. Explain the following : **16**
   a) 'Poka Yoke'
   b) Belts in six-sigma
   c) Zero defect
   d) Control charts.

OR

4. Explain following quality management tools. **16**
   a) Ishikawa diagram
   b) Six Sigma
   c) Pareto analysis.
   d) Pie-chart and Check sheet.

5. a) Explain with neat sketch the Sigma comparator. **7**
   b) Explain the process of manufacturing of slip gauges. **5**
   c) Mention any four metrological properties of measuring instruments. **4**

OR

6. a) Differentiate between : **9**
      i) Line and end standards
      ii) Gauges and comparators
      iii) Accuracy and precision.
   b) Explain with neat sketch the electrical comparator. **7**

SECTION – II

7. a) For 20° pressure angle gear having 40 teeth and 4 mm Module, calculate diameter of plug which fits in tooth space with its center on pitch circle and distance over the plug in opposite tooth space. **4**
   b) Explain the base tangent method. **8**
   c) Write short note on Parkinson gear tester. **6**

OR

8. Write short notes on : **18**
   a) Thread errors and their effects
   b) Talysurf
   c) Three wire method.

9. Write short note on : **16**
   a) Tool makers microscope
   b) Optical flat
   c) Profile projector.

OR

10. Write short note on : **16**
   a) Taylor's principle
   b) Auto Collimeter
   c) Angle dekor.

11. a) Define flatness. Explain with neat sketch flatness testing methods. **8**
   b) Explain the principles of alignment tests. Discuss any three alignment tests on lathe machine. **8**

OR

12. Write short notes on : **16**
   a) Surface plate
   b) CMM
   c) Straight wedge method
   d) CNC performance test.

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T.E. Electrical (Sem. – I) Examination, 2011
ELECTRICAL MACHINES – II (2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) **Black** figures to the **right** indicate full marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION –I

1. a) Sketch the torque-slip characteristics of a 3 phase Induction motor indicating there in the starting torque, maximum torque and the operating region. How do starting and maximum torque vary with the rotor resistance ? **8**

b) A 3-phase, 50 Hz, 4-pole induction motor has a slip of 4.1. Calculate

a) speed of the motor b) frequency of rotor emf.

If the motor has a resistance of 1Ω and standstill reactance of 4Ω, calculate the power factor i) at standstill and ii) at a speed of 1400 r.p.m. **8**

OR

2. a) Derive an expression for torque of a 3-phase induction motor and obtain the condition for maximum torque. **8**

b) A 6 pole, 3-phase, 50 Hz induction motor develops a maximum torque of 30Nm at 960 r.p.m. Determine the torque exerted by the motor at 5% slip.The rotor resistance per phase is 0.6Ω. **8**

3. a) Starting from the first principles develop the equivalent circuit of a 3-phase induction motor. Draw and explain the phasor diagram. **8**

b) Explain the procedure of drawing the circle diagram of an induction motor. What information can be drawn from circle diagram ? **8**

OR

P.T.O

4. a) In a 3-phase induction motor show that
Pg : Prc: Pmd = 1: S: (1-S)
Where the symbols have their usual meanings. **8**

b) Explain the procedure of no-load and blocked rotor tests on a 3-phase induction motor. How are the parameters of equivalent circuit determined from test results ? **8**

5. a) Describe the construction of a double cage induction motor. Explain its working and point out its advantages compared with a single cage motor. **10**

b) Describe with construction diagram the working of the following starters.
i) Direct on-line starter ii)Auto transformer starter. **8**

OR

6. a) A cage induction motor when started by means of a star-delta starter takes 180% of full load line current and developed 35% of full load torque at starting. Calculate the starting torque and current in terms of full load values, if an autotransformer with 75% tapping were employed. **10**

b) Derive the relationship between the torques developed by outer and inner cages of a double cage induction motor. **8**

SECTION – II

7. a) Explain the phenomenon of crawling and cogging in a 3-phase induction motor. **8**
b) Write a short note on testing of a 3-phase induction motor as per BIS. **8**

OR

8. a) Discuss briefly the various methods of speed control of 3-phase induction motor. **8**

b) Explain the principle of induction generator. What are its limitations ? **8**

9. a) Explain the working principle of
i) Split phase, ii) Capacitor start single phase induction motor
with the help of neat sketches. **8**

b) Describe the working principle and construction of shaded pole induction motor. **8**

OR

10. a) Using double-revolving field theory, explain why a single phase induction motor is not self starting. **8**

    b) Discuss the procedure for determining the parameters of equivalent circuit of a single phase induction motor. **8**

11. a) Explain why a universal motor can operate from d.c. as well as a.c. supply. What are the differences in construction between a.c. and d.c. series motor? **10**

    b) Draw and explain the phasor diagram of A.C. series motor. **8**

OR

12. a) Write a short note on ratings and applications of compensated series motor. **10**

    b) Write a short note on plain series motor. **8**

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T.E. (Electrical) (Semester – I) Examination, 2011
DESIGN OF ELECTRICAL MACHINES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any three** questions from **each** Section.*
*2) Answers to the two Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Write a note on insulating materials used in the manufacture of electrical machines. **9**

   b) Draw heating curve and cooling curve and explain the following terms,

   i) Heating time constant ii) Cooling time constant. **9**

   OR

2. a) What is transformer grade steel and dynamo grade steel ? Discuss in detail, various properties of electrical sheet steels used in electrical machines. **9**

   b) Explain in detail, various modes of heat generation. **9**

3. a) Derive the output equation of three phase core type transformer. **7**

   b) Determine the main dimensions of the core, the number of turns and the cross section of the conductor for a 300 KVA, 11000/ 433 Volts, 50 Hz, single phase core type distribution transformer. The net conductor area in the window is 0.7 times the net cross section of iron in the core. Assume a square cross section for the core, a flux density of 1.2 Wb/m^2 and a current density of 1.5 Amp/mm^2 and window space factor of 0.2. Take height to width ratio as 3. **9**

   OR

P.T.O.

4. a) Discuss various steps followed for the design of low voltage and high voltage winding of a distribution transformer. **10**

   b) Write a note on specifications of power transformers as per IS 2026. **6**

5. a) Explain the procedure to estimate the no load current of 3-phase transformer. **10**

   b) A 300 KVA, 6600/400 Volts, 50 Hz, 3-phase, delta/star connected, core type transformer has the following data.

   Width of low voltage winding = 25 mm

   Width of high voltage winding = 16 mm

   Height of coils = 0.5 m

   Length of mean turn = 0.9 m

   HV winding turns = 830

   Width of duct between high

   voltage and low voltage winding = 15 mm

   Calculate the leakage reactance of transformer referred to high voltage side. **6**

OR

6. a) Explain various methods of cooling of transformer. **10**

   b) A 630 KVA, 11000 V/400 V, 50 Hz, 3-phase, delta star connected, core type transformer has 670 turns on high voltage side. Calculate the instantaneous radial force under short circuit conditions.

   i) Height of winding = 0.8 meter

   ii) Length of mean turn = 1.5 m

   iii) Leakage impedance = 6%

   iv) Doubling effect multiplier = 1.8. **6**

SECTION – II

7. a) Derive the output equation of three phase induction motor. **8**

   b) What are the desired values of $\frac{L}{\tau}$, peripheral speed and width of ventilating ducts for three phase induction motor ? **8**

OR

8. a) What is overload capacity ? Comment on selection of values of overload capacity of 3-phase induction motor. What is its impact, if the specific electrical loading value is higher ? **8**

   b) How do you calculate the following for a 3-phase induction motor ?

      i) Area of stator slots

      ii) Length of mean turn and

      iii) Stator teeth. **8**

9. a) Which factors should be considered for estimating the length of air gap of 3-phase induction motor ? Why the air gap should be as small as possible ? **9**

   b) A 3-phase, 2 pole, 50 Hz, squirrel cage induction motor has a rotor diameter of 0.20 m and core length 0.12 m. The peak density in the air gap is 0.55 Wb/m^2. The rotor has 33 bars, each of resistance 125 micro-Ohms and a leakage inductance 2 micro-Henry, the slip is 6%.

      Calculate

      i) the peak value of current in each bar

      ii) rotor I^2R loss

      iii) rotor output and

      iv) torque exerted. Neglect the resistance of end rings. **9**

OR

10. a) Discuss various methods to reduce the harmonic torque in induction motor. **10**

    b) Comment on shape and sizes of rotor bars used for squirrel cage induction motor. **8**

11. a) The magnetic circuit of a 440 volts, 6 (six) poles, 3-phase, star connected, 50 Hz induction motor has the following particulars :

    Core length 0.15 m, stator teeth length 30 mm, tooth width at $\frac{1}{3}$ height from narrow end 7 mm; rotor teeth length 15 mm; rotor tooth width at $\frac{1}{3}$ height from narrow end 10.5 mm; stator bore diameter 0.4 m; effective air gap length 0.9 mm; stator and rotor core depth 6.5 mm; mean 60° lengths of magnetic circuit per pole pair in core : Stator 0.25 m, rotor 0.16 m. The stator has 72 slots with 8 conductors per slot. The rotor has 49 slots. The stacking factor is 0.9. Estimate the magnetizing current using the following magnetization curve.

B Wb/m^2	0.5	0.7	1.0	1.2	1.4	1.6
at A/m	95	110	200	300	600	2500

10

    b) What are the different types of leakage reactances in induction motor ? **6**

OR

12. Write short notes on :

    a) Effect of ventilating ducts on calculation of magnetizing current. **6**

    b) MMF calculations in magnetic circuit of 3-phase induction motor. **10**

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T.E. Electrical (Semester – I) Examination, 2011
CONTROL SYSTEM – I
(2003 Course)

Time : 4 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in separate books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Differentiate open loop and close loop control system. with suitable examples. **4**

   b) Differentiate Linear and non Linear control system. **4**

   c) Find out transfer function of given R-L-C series circuit shown in fig.1. **8**

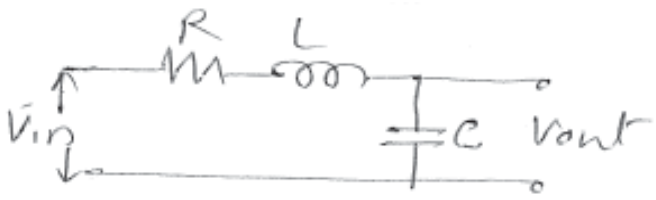

Fig. 1

OR

2. a) Find the transfer function of the system. shown in fig. (2) by using signal flow graph method. **10**

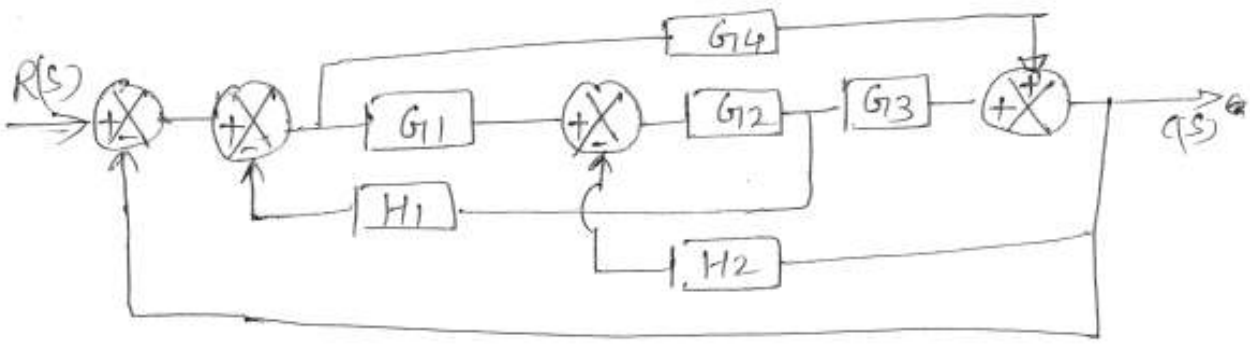

Fig. 2

b) Find force voltage equation and draw the electrical circuit. **6**

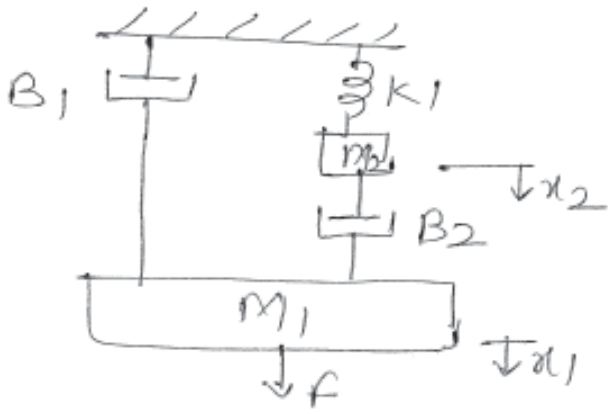

Fig. 3

3. a) Explain the following terms :
   i) stable system.
   ii) critical stable system.
   iii) unstable system. **4**

   b) Distinguish between absolute stability and relative stability. State different methods by which stability can be decided. **4**

c) Characteristic equation of control system is $S^4 + 5S^3 + 5S^2 + 4S + K = 0$. Find the value of K by using Routh Harwitz criterion. **8**

OR

4. a) The system given in fig. 4 with unity feedback control system with a minor feedback loop. Determine the derivative constant "a" which increases the damping ratio to 0.7. What is the steady state response to unit step input with the setting of "a". **8**

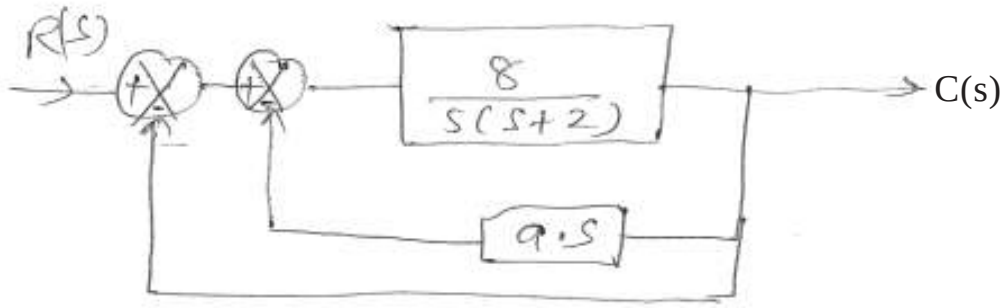

Fig. 4

b) For a unity feedback system having open loop transfer function

$G(S) = \dfrac{K(S+2)}{S(S^3+7S^2+12S)}$ find error coefficient and steady state error when input is $\dfrac{R}{2}t^2$. **8**

5. a) Differentiate root locus and inverse root locus. **6**

b) Open loop transfer function of an unity feedback control system is $G(S) = \dfrac{K(S+1)}{S(S-3)}$. Draw the root locus, also find the value of K at break away point. **12**

OR

6. a) Write the procedure how to find break away point in root locus technique. **6**

b) The feedback control system has $G(S)H(S) = \dfrac{K(S+9)}{S(S^2+8S+17)}$ sketch the root locus and find centroid, critical value of K, stability of system. **12**

SECTION – II

7. a) Explain how to find gain margin and phase margin from bode plot. **4**

   b) Sketch the bode plots for the function. $G(S)=\frac{250}{S(S+0.5)(S+5)}$ also find G.M and P.M, also find new system gain if phase margin 20°. **12**

OR

8. a) Explain what will be the correction in bode magnitude plot if damping ratio is less than 0.5. **4**

   b) Draw bode plot and comment on stability

   $G(S)=\frac{50(S+2)}{S(S+0.5)(S^2+4S+25)}$. **12**

9. a) Explain what is principle of arguments. **4**

   b) Sketch Nyquist plot for the function $G(S)H(S)=\frac{10}{S(1-S)}$ and comment on stability. **12**

OR

10. a) Explain how to plot complex function of a complex variable. **4**

    b) A feedback control system. has $G(S)H(S)=\frac{(1+4S)}{S^2(1+40S)}$. Sketch Nyquist plot and determine stability of system. **12**

11. a) Explain what do you understand by phase lag network. **9**

    b) Explain the steps of phase lead design using root locus. **9**

OR

12. a) Explain the steps of phase lag design using root locus. **9**

    b) Explain the phase lead design using Bode diagram. **9**

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T.E. (Electrical Engineering) (Semester – I) Examination, 2011
MANAGEMENT TECHNIQUES
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any one** question from each Unit.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

Unit – I

1. What are the different forms of business organizations ? Discuss the following types of business organizations in brief : **16**

   a) Partnership

   b) Joint stock enterprises

   c) Co-operatives.

OR

2. a) Distinguish the following : **8**

      i) Management

      ii) Administration

      iii) Organization.

   b) 'All managers by whatever name called manage'. Discuss, bringing out the universality of management functions. **8**

P.T.O.

Unit – II

3. a) Distinguish between the following : **10**
   i) Invited bids and Speculative bids
   ii) Principal and Promoter.

   b) Define plant layout. Describe the objectives of good plant layout. **8**

OR

4. a) Explain the importance of plant location. Describe the various factors to be considered in selecting the actual site in a particular locality. **10**

   b) What is materials management ? Explain its objectives and importance. **8**

Unit – III

5. Discuss in detail the main provisions of following acts : **16**
   i) Workmen Compensation Act
   ii) Minimum Wages Act.

OR

6. a) What is performance appraisal ? Explain its significance. **8**

   b) Define 'Motivation'. Explain the classification of hierarchy of needs as given by Maslow. **8**

SECTION – II

Unit – IV

7. a) Define 'Financial Management'. Explain the scope and objectives of financial management. **8**

   b) What are the functions of finance ? Explain in brief any two financial institutions. **10**

OR

8. a) What are the various elements of primary cost ? Explain it by suitable examples. **6**

   b) Distinguish between the following : **6**

      i) Prime cost and Factory cost

      ii) Marketing and Selling.

   c) Define market segmentation ? What are the advantages of market segmentation ? **6**

Unit – V

9. a) Describe the seven sources of manufacturing wastes as identified in the JIT system. **8**

   b) Define Total Quality Management. State and explain the guiding principles of Total Quality Management. **8**

OR

10. a) Why is an ISO-9000 certification important to a firm ? Explain the methodology of ISO-9000 certification. **10**

    b) Explain the role of Kanban cards in JIT manufacturing. **6**

Unit – VI

11. a) What is 'self development' ? Explain in brief different methods of self development. **8**

    b) Explain the following :

       i) Stress management

       ii) Business and Professional ethics. **8**

OR

12. Define 'Communication'. Explain the process of communication with a neat line diagram. What are the advantages and disadvantages of Verbal and Nonverbal communication ? **16**

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T.E. (Electrical) (Semester – II) Examination, 2011
MICROCONTROLLER AND ITS APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*4) Assume suitable data, if **necessary**.*

SECTION – 1

1. a) What makes 8051 an 8-bit micro-controller ? Enlist the features of 8051. Also compare microprocessor and microcontroller. **6**

   b) What are the functions of the following 8051 pins ? **6**

      i) ALE

      ii) $\overline{EA}$

      iii) $\overline{PSEN}$

      iv) RST

      v) TXD

      vi) XTAL 2

   c) Explain the 16-bit addressing registers and their functions in 8051. **4**

OR

2. a) Which ports of 8051 are bit addressable ? What are the addresses of bit addressable locations ? What is the advantage of bit addressability for 8051 ports ? **6**

   b) What do you mean by the term quasi-bi-directional port ? Why is port 0 of 8051 true bidirectional ? **5**

   c) Write a program to output 55H and AAH alternatingly on port 1. **5**

P.T.O.

3. a) Indicate the size of timer for each of the following modes. **4**
   a) mode 0 b) mode 1 c) mode 2

   b) Explain the advantages and limitations of register indirect addressing mode. **6**

   c) What are the steps to generate a time delay using the timer mode 1 ? **6**

OR

4. a) What will happen if both INT0 and INT1 in the IP are set to high at the same time ? **4**

   b) Explain the function of GATE bit in the TMOD register. **4**

   c) What are the various SFRs you need while programming a serial port ? Write a short program to initialize the serial port of 8051 in mode 1. **8**

5. a) Explain the rotate group of instructions with suitable examples. Also state the flags affected. **5**

   b) Write three different instructions to clear the contents of register A. **5**

   c) Write a program to subtract the contents of R1 from R0, put the result in R7. **4**

   d) How RETI and RET instructions differ ? **4**

OR

6. a) Write a sequence of instructions that sets the AC flag. **5**

   b) Explain why the main program cannot be allowed to get a subroutine except by CALLing it. **5**

   c) Explain the following instructions :
      i) SUBB A, # data
      ii) SJMP
      iii) MOVC A, @ A + DPTR
      iv) DA A. **4**

   d) Explain the difference between MOVX and MOV instruction. **4**

SECTION – 2

7. A) Explain steps to receive data serially in 8051 and importance of Rl flag. **8**

   B) Write a short note on emulator, simulator, assembler and compiler used for 8051. **8**

OR

8. A) Explain salient features of members of MCS-51 family. **8**

   B) Explain steps to transfer data serially in 8051 and importance of Tl flag. **8**

9. Write a short note on (Assembly program is not expected). **18**

   A) Level measurement using 8051

   B) Flow measurement using 8051

   C) Pressure measurement using 8051.

OR

10. A) Draw and explain 8051 based stepper motor control interface diagram for three motors interfaced with Port 0 and port 1. Write a program to rotate the all motors in same direction. **10**

    B) Explain 8051 based DC motor speed control method. **8**

11. A) Explain the architecture of 8096. **8**

    B) Write a short note on PWM generation in 8096. **8**

OR

12. A) Draw the block diagram of 8096. **8**

    B) Explain the ADC block in 8096. **8**

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T.E. (Electrical) (Sem. – II) Examination, 2011
ELECTRICAL MACHINES – III
(2003 Course)

Time : 3 Hours | Max. Marks : 100

Instructions: *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Derive expression of induced emf of a three phase alternator. **6**

   b) Compare non -salient pole synchronous machine with salient-pole synchronous machine. **6**

   c) A 4-pole, 3 phase, 50 Hz, star connected alternator has 60 slots with 2 conductors per slot and having armature winding of the two-layer type. Coils are short-pitched in such a way that if one coil side lies in slot number 1, the other lies in slot number 13. Determine the useful flux per pole required to generate a line voltage of 6000 volts. **6**

OR

2. a) Explain synchronous impedance method to find regulation of a three phase alternator. **6**

   b) Draw and explain phasor diagram of a cylindrical rotor 3 phase alternator. Also calculate the induced emf from it. Consider lagging power factor load. **6**

P.T.O.

c) A 550 V, 55 KVA, single-phase alternator has an effective resistance of 0.2Ω. A field current of 10 A produces an armature current of 200 A on short circuit and an emf of 450 volts on open circuit.

Calculate the synchronous reactance and voltage regulation at full load with power factor 0.8 lagging. **6**

3. a) Explain with a neat diagram, the slip test to determine d-axis and q-axis reactances of a synchronous machine. **8**

b) What are the conditions to be satisfied for parallel operation of alternator with infinite bus bar ? Explain in each case, what happens if the condition is not satisfied. **8**

OR

4. a) List the various methods of synchronizing of 3 phase ac generators. Explain one dark and two equally bright lamp method with neat circuit diagram. **8**

b) Two station generators A and B operate in parallel. Station capacity of A is 50 MW and that of B is 25 MW. Full load speed regulation of station A is 3% and full load speed regulation of Station B is 3.5%. Calculate the load sharing if the connected load is 50 MW, No-load frequency is 50 Hz. **8**

5. a) Explain the operation of synchronous motor under

i) constant load, varying excitation.

ii) constant excitation, varying load. **8**

b) A 6600 V, 3-phase, star connected synchronous motor draws a full load current of 80 A at 0.8 p.f. leading. The armature resistance is $2.2\ \Omega$ and synchronous reactance 22Ω per phase. If the stray losses of the machine are 3200 W,

determine :

a) the e.m.f. induced,

b) the output power

c) the efficiency. **8**

OR

6. a) Compare three phase induction motor to three phase synchronous motor w.r.t.
   i) Construction ii) Starting
   iii) Working p.f. iv) Cost
   v) Applications. **8**

   b) Explain an experimental method of determining V-curves and inverted V-curves for the synchronous motor. **6**

   c) What is the purpose of damper winding in a synchronous machine ? **2**

SECTION – II

7. a) Explain how starting torque is developed by a single phase hysteresis motor. Derive expressions for hysteresis and eddy current torques developed by the motor. **8**

   b) Explain the construction and working principle of single phase reluctance motor. What are the applications of reluctance motor ? **8**

OR

8. a) With the help of a circuit diagram and schematics briefly explain the working of a brushless d.c. motor. **6**

   b) List the advantages of a brushless d.c. motor. **4**

   c) Explain edge and end effects of a linear induction motor. List some applications of this motor. **6**

9. a) What are the causes of producing harmonics in a 3-phase Induction Motor ? What are the effects of space harmonics on performance of a 3-phase Induction Motor ? **8**

   b) How slot or tooth harmonics are generated in the waveform of an alternator ? What problems are experienced due to these harmonics ? **8**

OR

10. a) Explain clearly the methods to reduce harmonic effects in synchronous machines. **8**

    b) Explain clearly the methods of reducing harmonic torques and vibrations in 3-phase induction motor. **8**

11. a) Using the concept of generalized machine theory obtain the parameters of the equivalent circuit of a 3-phase induction motor. Hence draw the equivalent circuit of the motor. **10**

    b) Obtain identical transformations for currents and voltages from a rotating balanced 3-phase (a, b, c) winding to a rotating balanced 2-phase (α, β) winding. **8**

OR

12. a) Derive expressions for a 3 phase salient pole synchronous machine.
    i) armature to field mutual inductances.
    ii) armature self inductances. **10**

    b) Draw and explain the primitive model of 3-phase induction motor. Also write current and voltage equations. **8**

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T.E. (E & TC/Electronics/Indl. Elex.) (Semester – I) Examination, 2011
DIGITAL DESIGN AND COMPUTER ORGANISATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in separate books.*
*2) Neat diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
4) Assume suitable data, if necessary.
*5) In Section I : Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6.** In section **II** : Attempt Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12**.*

SECTION – I

1. a) Analyze gated D latch as an asynchronous circuit constructed with NAND gates. **8**

   b) What is the difference between Mealy and Moore sequential circuits ? Discuss their advantages and disadvantages. **6**

   c) Enlist various encoding techniques used to represent state machine. **2**

   OR

2. a) What are the static and dynamic hazards ? Explain how static hazards are eliminated. **8**

   b) What is a serial adder ? Explain its working with the help of a state diagram. **6**

   c) Explain how the ASM chart differ from a conventional flow chart. **2**

3. a) Describe case statement in detail. Write a VHDL code for 4:1 multiplexer using case statement. **8**

   b) Explain the difference between signal and variable. **6**

   c) Explain Entity and Architecture. **2**

   OR

P.T.O.

4. a) What are the different types of VHDL modelling ? Explain any one with example. **6**

   b) What is the difference between concurrent and sequential statements of VHDL ? Explain with the help of suitable example. **6**

   c) What is the use of library clause and use clause ? Give example. **4**

5. a) Using Booth's algorithm multiply the following :

   Multiplicand = + 15

   Multiplier = – 6. **6**

   b) Explain IEEE single precision and double precision floating point number format. **6**

   c) List the rules for floating point multiplication and division. **6**

OR

6. a) Perform the following division using restoring and non-restoring division algorithm :

   Dividend = 1100

   Divisor = 0011. **12**

   b) Briefly explain the operation of look ahead carry generator. **6**

SECTION – II

7. a) Describe following addressing modes along with suitable examples :

   i) Register mode

   ii) Immediate mode

   iii) Autoincrement mode

   iv) Autodecrement mode. **8**

   b) Draw and explain the multiple bus organisation of the CPU. Explain its advantages. **8**

OR

8. a) What are queues ? Give difference between stacks and queues. **6**

   b) What are condition codes ? Explain the use of them. **6**

   c) What do you mean by branching ? **4**

9. a) What are the different methods of handling multiple I/O devices by CPU ? **8**

   b) Explain interface between keyboard and processor. Also explain the communication between them. **8**

OR

10. a) Explain the following :
      i) Programmed I/O
      ii) Interrupt Driven I/O. **8**

    b) Draw and explain the timing diagram for synchronous input data transfer. **8**

11. a) Explain the concept of virtual memory. How virtual address is translated to physical address ? **8**

    b) What are the differences between SRAM and DRAM ? Explain need of refreshing in case of DRAM. **6**

    c) Write a short note on memory management requirements. **4**

OR

12. a) Write short notes on :
      i) RAID
      ii) CD-ROM
      iii) Characteristics of memory. **12**

    b) Compare associative and set-associative mapped cache. **6**

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T.E. (E & TC./Electronics, Indl. Elex) (Sem. – I) Examination, 2011
ANALOG INTEGRATED CIRCUITS – DESIGN AND APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from Section – **I** and **3** questions from Section – **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Explain the concept of virtual ground and virtual short. **4**
   b) Draw the circuit diagram of differential amplifier with constant current bias and explain how does it improve CMRR. **8**
   c) Draw and explain the working of Wilson current source. **6**

OR

2. a) Explain the significance of following parameters of Op-amp.
      i) Slew rate
      ii) Input offset voltage (v_{io})
      iii) CMRR
      iv) PSRR
      v) Full power bandwidth. **10**
   b) What is need of level shifting circuit in Op-amp ? Explain the level shifting circuits used in Op-amp. **8**

P.T.O.

3. a) What are the limitations of difference amplifier in precision differential measurement ? Draw the circuit diagram of instrumentation amplifier using three Op-amps and derive the expression for gain. **10**

   b) Draw and explain the integrator circuit using Op-amp with run, set and hold mode. **6**

OR

4. a) What are the problems associated with the ideal differentiator ? Design a practical differentiator for input signal with f_{max} = 500 Hz. Use Op-amp IC with power supply voltages of ± 15V. **8**

   b) Draw and explain the voltage to current converter with grounded load. **8**

5. a) What are the advantages of Schmitt Trigger over open loop comparators ? Design inverting Schmitt trigger circuit with different values of UTP = 3.5 V and LTP = – 1.5V. Use Op-amp IC 741 with power supply voltage of ± 15V. **8**

   b) What is difference between precision rectifier and conventional rectifier ? Draw the circuit diagram of full wave precision rectifier and explain its operation. **8**

OR

6. a) Explain with neat diagram, how Op-amp can be used for window detector. **6**

   b) Draw and explain the sample and hold amplifier using Op-amp. **6**

   c) Write the short note on 'peak detector using Op-amp'. **4**

SECTION – II

7. a) Draw and explain the use of IC 555 as PWM. **6**

   b) Design a triangular waveform generator using Op-amp for following specifications.

   Amplitude of square wave = $\pm V_{sat}$

   Amplitude of triangular wave = ± 3V

   Frequency of output waveform = 1 KHz

   Power supply voltages = ± 15V

   Use Schmitt trigger and integrator combination using Op-amp. **10**

OR

8. a) Design a square wave generator for output frequency of 1 KHz with 50% duty cycle. Use Op-amp IC with power supply voltages of $\pm 15V$. **6**

   b) Design an astable multivibrator using IC 555 for output frequency of 50 KHz with 75% duty cycle. **6**

   c) Write short note on 'Sawtooth wave generator'. **4**

9. a) State advantages and disadvantages of achieve filters over passive filters. **6**

   b) Draw and explain the first order Sallen-key low pass filter with its frequency response. Design a second order Butterworth LPF having upper cut-off frequency 2 KHz. Also determine its frequency response. **10**

OR

10. a) Explain in short the following approximation of active filters

   i) Butterworth approximation

   ii) Chebyshew approximation

   iii) Bessel approximation

   iv) Elliptic approximation. **8**

   b) Design a wide band pass filter having $f_L = 550$ Hz and $f_H = 3.5$ KHz with pass band given of 4. Draw the frequency response of filter and also calculate the Q value of filter. **8**

11. a) Draw the basic block diagram of PLL and explain the function of each block. **4**

   b) Draw the circuit diagram of temperature compensated Antilog amplifier using Op-amp and explain its working. **8**

   c) Draw and explain the use of PLL as FSK Demodulator. **6**

OR

12. a) Design a PLL circuit using PLL IC 565 for free running frequency of 9 KHz. Calculate the lock range and capture range. Use power supply voltages of $\pm 6V$. **8**

   b) Draw and explain the basic log amplifier using Op-amp and transistor. **6**

   c) Write short note on 'Analog multipliers. **4**

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T.E. (E&TC / Electronics Indl. Elex.) (Semester – I) Examination, 2011
DIGITAL COMMUNICATION
(2003 Course)

Time : 3 Hours Max. Marks :100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II.***
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Rule, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – II

1. a) State sampling theorem. Explain aliasing and aperture effect in detail with spectral diagrams. **10**

   b) Consider the random process X(t) defined by X(t) = A cos ωt, where w is constant and A is a random variable uniformly distributed over (0, 1). Find the auto correlation and auto covariance of X(t). **8**

OR

2. a) A signal

   m(t) = cos 200 πt + 2 cos 320 πt is ideally sampled at Fs = 300 Hz. Draw the spectrum of m(t) & sampled signal on a graph. If the sampled signal is passed through an LPF with cutoff of 250 Hz, what frequency components will appear in the output ? **10**

   b) The random process X(t) = X, where X is a random variable uniformly distributed in (–1, 1). Find mean and auto correlation function for the process and PSD. **8**

P.T.O.

3. a) For speech signal which type of quantization is preferred and why ? Explain the technique and its types used for the same. **8**

   b) A PCM system of video signal with fs = 10 MHz requires SNR of 50 dB for signal power = 1. Calculate signalling rate. Repeat the above for signal power = 0.1 and compare the result. **8**

OR

4. a) Explain PCM encoder and decoder in detail. **10**

   b) Compare DM, ADM, PCM, LPC, DPCM w.r.t. following :

      i) Bit Rate

      ii) Bandwidth

      iii) Hardware complexity

      iv) Sampling Rate

      v) Noise equation

      vi) SNR. **6**

5. a) Consider a binary sequence with 10111001. For this sequence draw the waveform for the following formats

      i) Unipolar NRZ

      ii) Bipolar RZ

      iii) AMI

      iv) Split phase (Manchester). **8**

   b) Explain Bit and Frame Synchronizer. **8**

OR

6. a) Derive the equation of PSD of AMI signal . State its advantage over other data formats. **8**

   b) With the help of an example explain the need of scrambling. **8**

SECTION – II

7. a) With the help of block diagram of Transmitter and receiver explain 16-point QAM system. Give mathematical equations and Bandwidth requirement. **10**

   b) Give the difference between offset QPSK and non-offset QPSK. **4**

   c) For the given bitstream draw the waveform at the O/P of DSPSK encoder, bit stream : 00100110011110. **4**

OR

8 a) With the help of graphical representation, explain phase continuity in MSK. What is minimum in MSK ? **8**

   b) Compare BPSK and BFSK with the help of equations and signal space representation. **6**

   c) Write a short note on GMSK. **4**

9. a) Derive the expression of probability of error Pe for BPSK and BFSK signal detected using optimum receiver. **8**

   b) Explain integrate and dump receiver with neat circuit diagram and equations. **8**

OR

10. a) It is required to transmit 2.08 Mbps with an error probability of $P^e \leq 10^{-6}$.

    The channel noise power spectrum is $\eta/2 = 10^{-11}$ W/Hz. Determine the signal power required at the receiver input using polar signalling
    Q (5.2) = 0.000001. **8**

   b) State the properties of matched filter. Explain impulse response in detail. **8**

11. a) Design a three stage feedback shift register with proper taps to generate N =7 PN sequence. Draw the generator block and if the initial state from left to right is 101, find the output sequence. State the properties of this sequence. **10**

   b) Compare fast FHSS and slow FHSS system. **6**

OR

12. a) Explain the significance of jamming margin in DSSS system. A BPSK - DSSS system using coherent detection is used to transmit data at 250 bps and system has to work with one error in 20,000 bits. Determine minimum chipping rate if the jammed signal is 300 times stronger than the received signal. Assume Q (3.9) = 0.00005. **10**

b) Explain different multiple Access techniques. **6**

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T.E. (Electronics & Telecommunication)/Electronics/Indl. Elex.
(Semester – I) Examination, 2011
MECHATRONICS
(2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*
*7) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section I and solve Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II**.*

SECTION – I

1. a) Define the term Mechatronics. Draw and explain the block diagram of mechatronics system in detail. **8**

   b) What do you understand by the term dynamic characteristics ? Explain the following terms :

   i) Speed of response

   ii) Measuring Lag

   iii) Fidelity. **8**

OR

2. a) Explain mechatronics system design approach with reference to robotics. **8**

   b) 'Mechatronics is synergistic integration of mechanical engineering with electronics and intelligent control algorithms in design and manufacture of process products'. Justify the statement. **8**

P.T.O.

3. a) With detailed diagram explain fiber optic temperature measurement system. **8**

   b) A strain gauge has a gauge factor of 4. It is attached to a metal bar that sketches from 10 cm to 10.2 cm. What will be the percentage change in resistance. If unstrained value of resistance is 240 ohm. What is the value of resistance after strain ? **8**

OR

4. a) List the different types of proximity sensors. Explain any one in detail. **8**

   b) Explain transit time ultrasonic flowmeter in detail. **8**

5. a) Design a signal conditioning circuit using RTD and instrumentation amplifier using three op-amps. The temperature is varied from 0-100°C and the expected output is 0-10 volts. Draw the complete circuit diagram. **10**

   b) Define the term PLC. Explain the block diagram of PLC in detail. **8**

OR

6. a) Why ADC is required in signal conditioning circuits ? What are the different types of ADC ? Explain any one in detail. **8**

   b) It is required to design data acquisition system for measurement of temperature, pressure and flow. Draw the microcontroller based interfacing diagram in detail. Explain the different sensors used and algorithm required to implement the system. **10**

SECTION – II

7. a) What is the role of recorders in mechatronics system ? Draw and explain block diagram of magnetic tape recording system in detail. **10**

   b) What are the basic types of data communication ? Describe in detail I^2C communication. **8**

OR

8. a) What do you mean by HART ? What are the different modes of HART protocol ? Explain any one in detail. List the applications of HART. **10**

   b) Why bus standards are required ? Write a short note on IEEE 488 bus. **8**

9. a) Explain in detail electropneumatic converter. **8**

   b) Define the term actuator. Explain in detail electrohydraulic actuator. **8**

OR

10. a) Write a short note on selection criteria of control valves. **8**

    b) Explain in detail different types of cables. **8**

11. a) Define the term strain gauge. Explain in detail how strain gauge is used in weighing machine. **8**

    b) Discuss Rotary optical encoder as mechatronics design approach. **8**

OR

12. a) Discuss skip control of CD player as a mechatronics case study. **8**

    b) Design a Robotic walking machine that will execute different motions. **8**

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T.E. (E&TC) /Electronics Indl. Elex. (Semester – II) Examination, 2011
POWER ELECTRONICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer* ***any three*** *questions from* ***each*** *Section.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

4) Black figures to the ***right*** *indicate* ***full*** *marks.*

5) ***All*** *questions carry* ***equa****l marks.*

SECTION – I

1. a) What are the requirements of triggering circuits ? Explain any one type. **6**

   b) Explain with circuit diagram, working of IGBT with its characteristics and specifications. **6**

   c) What is GTO ? Explain. **4**

OR

2. a) What is the necessity of paralleling of power devices ? Explain. **4**

   b) What is the need of protection circuits ? Explain with circuit diagram working of Snubber circuits. **6**

   c) What is 2-transistor analogy ? Explain with Latch up. **6**

P.T.O.

3. a) What are AC to DC converters ? Explain with circuit diagram working of 1 phase LCC base Half controlled converter with RL Load. Deduce the equation for Output Load Voltage. **10**

   b) A 1 phase half controlled converter is operating from 120 V, 50 Hz, AC supply. The load resistance is 10Ω. If the av o/ p voltage is 25% of the maximum possible average o/p voltage, determine :

   i) firing angle (α) ii) Rms av o/p current. **6**

OR

4. a) What are phase controlled converters ? Explain with circuit diagram and waveforms, working of 1 phase fully controlled converter with highly inductive load. Assume $\alpha = 90°$.
   Comment on Rectification and Inverstion modes. **12**

   b) What is the effect of free wheeling diode in FCC ? Justify it improves p.f. **4**

5. a) What is the need of 3 phase converters ? Explain with circuit diagram and waveforms, working of 3 phase full controlled converters with RL Load. **10**

   b) 3 phase full controlled converter is operating on an inductive load. Find the following :

   i) AV o/p voltage ii) Supply p.f. iii) Displacement p.f.

   Assume 3ϕ, 415 V/ 50 Hz supply and $\alpha = 30°$. **6**

OR

6. a) Why phase controlled converters are not preferred over chopper for power controller applications ? State its merits and demerits. **10**

   b) What is the effect of reactive power on phase controlled converter o/p ? Suggest the remedies for improving the active power to the load. **6**

SECTION – II

7. a) What is DC to AC converter ? Explain with circuit diagram and waveforms, working of 3 phase MOSFET based voltage source inverter operating in 120° mode of conduction with purely resistive load (star connected). **10**

   b) What are harmonic reduction techniques in inverters ? Explain any one type. **6**

OR

8. a) What are resonant converters ? Explain with circuit dia and waveforms, working of ZCS with suitable load. **10**

   b) Compare Linear, Switched mode and Resonant converters. **6**

9. a) What are DC to DC converters ? Explain with circuit diagram working of 1 quadrant step-up chopper. **8**

   b) 1 quadrant chopper is having a supply voltage 200 V DC and operating at frequency 1KHz. Find out :

      i) DC voltage ii) Av. load voltage

      iii) Rms load voltage if on-time of chopper is 500 μ sec. **8**

OR

10 a) What is chopper ? Explain with circuit diagram and waveform working of 2 quadrant chopper (step-down). **12**

   b) Why RLE (–) load is necessary for inversion operation of converters ? Justify. **4**

11. a) What is UPS ? How it is different from AC regulator ? Explain with block diagram, working of 1 ϕ off-line UPS with suitable load. State its specification. **10**

   b) Compare ON-line, off-line and line interactive type UPS systems. **5**

   c) Why ON-line UPS are costlier than off-line ? Justify. **3**

OR

12. Write short notes on **any three** :

   i) ZVS

   ii) Reversible drives

   iii) Protection Circuits

   iv) Static and Dynamic equalizing circuits

   v) SMPS

   vi) HVDC. **18**

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T.E. (E&TC / Electronics Indl. Elex.) (Semester – II) Examination, 2011
DIGITAL SIGNAL PROCESSING
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II.***
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of electronic pocket calculator is **allowed.***
*5) Assume **suitable** data, if **necessary.***

SECTION – I

1. a) Given the causal system y (n) = y (n – 1) + x (n) + x (n – 1). Find the response to x (n) = y (n). Also see whether system is stable. **8**

   b) With $x(n) = x_1(n) * x_2(n)$ and $x_1(n) = \left(\frac{1}{3}\right)^n u(n)$ and $x_2(n) = \left(\frac{1}{5}\right)^n u(n)$ find x (z) using convolution property of z - transform. Also find x (n) taking inverse z - transform of x (z). **8**

OR

2. a) Determine whether following systems are (i) Causal (ii) Linear (iii) Stable (iv) Time invariant. **8**

   1) $y(n) = \sum_{k=-\infty}^{n} x(k+3)$ 2) $y(n) = x(-n-2)$

   b) Find all possible x (n) corresponding to $x(z) = \frac{z}{3z^2 - 4z + 1}$. **8**

3. a) State and prove the following properties of DFT :
   i) Circular frequency shift
   ii) Circular convolution. **9**

P.T.O.

b) Find output y (n) of a filter whose impulse response is $h(n) = \{1, 1, 1\}$ and input signal $x(n) = \{3, -1, 0, 1, 3, 2, 0, 1, 2, 1\}$ using overlap-save and overlap-add method. **9**

OR

4. a) Determine 8 point DFT of the sequence $x(n) = \{1, 2, 1, 2\}$. **6**

b) Find response of FIR filter with $h(n) = \{1, 2, 4\}$ to the input sequence $x(n) = \{1, 2,\}$ using circular convolution. **4**

c) Compute IDFT of given sequence using DIT FFT algorithm.
$X(k) = \{5, 0, 1 - j, 0, 1, 0, 1 + j, 0\}$. **8**

5. a) A low pass filter has the desired frequency response as given below :

$$H_d\left(e^{j\omega}\right) = e^{-j2\omega} \quad 0 \le \omega \le \pi/3$$
$$= 0 \quad \frac{\pi}{3} \le \omega \le \pi$$

Determine filter coefficients h (n) for M = 7 using Bartlet window. **8**

b) Realize the system function H (z) in direct form - II and cascade form

$$H(z) = \frac{1 - z^{-3}}{\left(1 + z^{-1}\right)\left(1 - z^{-1} - z^{-2}\right)}.$$ **8**

OR

6. a) Write short notes on :

i) Gibbs phenomenon

ii) FIR Differentiator. **8**

b) Using rectangular window design a lowpass filter with passband gain units, cut off frequency 1 KHz and working at sampling frequency 5 KHz. The length of response is 7. **8**

SECTION – II

7. a) Differentiate between IIR filter design techniques : **8**
   i) Impulse Invariance Technique.
   ii) Bilinear Transformation.

   b) Design a Butterworth IIR filter using Bilinear transformation. Given :

$$0.82 \le \left| H\left(e^{j\omega}\right)\right| \le 1 \quad 0 \le \omega \le 0.3\,\pi$$
$$\left| H\left(e^{j\omega}\right)\right| \le 0.2 \qquad 0.6\,\pi \le \omega \le \pi$$

   10

OR

8. a) From $H_a(s) = \dfrac{2}{(s+1)(s+4)}$ determine H (z) using impulse invariance technique for T = 1 sec. **6**

   b) Determine the order of the filter for following specifications : $\alpha_p = 0.5$ dB $t_p = 0.10$ Hz $\alpha_s = 15$ dB $f_s = 0.15$ Hz . Use Chebyshev approximation. **6**

   c) The transfer function of discrete causal system is given as :

$$H(z) = \frac{1 + z^{-1}}{1 - z^{-1} + \frac{1}{2} z^{-2}}$$

   i) Find difference equation.
   ii) Draw direct form - II realization. **6**

9. a) Define decimation and interpolation. **4**

   b) Design a multirate LPF for specifications :
   Pass band 0 – 25 Hz
   Stop band 28 – 60 Hz.
   Pass band deviation $\delta_p = 0.01$ dB.
   Stop band deviation $\delta_s = 60$ dB.
   Sampling frequency 2000 Hz. **12**

OR

10. a) With the help of neat diagram explain the sub-band coding of audio signals. **4**

    b) Design a 3 stage decimator that down samples an audio signal by a factor of 96 with specifications : $F_s = 96$ KHz. Highest frequency of interest in data = 450 Hz. $\delta_p = 0.01$ $\delta_s = 0.001$. **12**

11. a) What is effect of coefficient quantization of FIR and IIR filters ? **8**

    b) Explain in brief the following functional units of DSP processor.
    i) Barrel shifter ii) DAGS iii) MAC. **8**

OR

12. a) Draw the block diagram of over-sampling analog to digital converter. Explain application of over-sampling A/D and D/A converters. **8**

    b) What is dynamic range scaling ? **4**

    c) Compare DSP processor with conventional microprocessors. **4**

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T.E. (Electronics & Telecommunication/Electronics Indl.Elex.) (Semester – II)

Examination, 2011

ELECTROMAGNETIC WAVES AND RADIATING SYSTEMS

(2003 Course)

Time: 3 Hours Max. Marks: 100

N.B. *: i) Answer **three** questions from Section **I** and **three** questions from Section **II**.*

*ii) Answers to the **two** Sections should be written in **separate** answer books.*

*iii) **Neat** diagrams must be written **wherever** necessary.*

*iv) Figures to the **right** indicate **full** marks.*

*v) Your answers will be valued as a **whole**.*

*vi) **Use** of non programmable calculators is **allowed**.*

*vii) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Write the electric field equation everywhere and sketch the field lines due to the following charge distributions. **6**

i) Uniformly distributed line charge

ii) Uniformly distributed surface charge

iii) Two uniformly distributed surface charges placed apart by a distance d parallel.

b) Write the magnetic field equation and draw the field lines due to the following current distributions **6**

i) Infinite current filament

ii) Sheet current.

c) State Divergence and Stokes's theorems and their applications to EM fields. **6**

OR

2. a) Are static electric and magnetic fields interdependent ? Explain.

b) Write Maxwell equations in differential form for static fields.

c) Write Maxwell equations in integral form for static fields.

d) Explain the physical significance of each Maxwell equation.

e) Discuss the boundary conditions for static electric fields at the interface between two perfect dielectric media.

f) Discuss the boundary conditions for static magnetic fields at the interface between two perfect magnetic media. **18**

3. Write Maxwell's equations for time varying electromagnetic fields in charge free region. Is it true that the divergence of the genuine EM field is zero and curl is non zero ? Check whether the following fields are genuine EM fields, i.e., they satisfy Maxwell's equations. Assume the fields exist in charge free regions.

a) $\overline{A} = 40\sin(\omega t + 10x)\hat{a}_z$

b) $\overline{B} = \frac{10}{\rho}\cos(\omega t - 2\rho)\hat{a}_\phi$

c) $\overline{C} = \left(3\rho^2 \cot\phi \hat{a}_\rho + \frac{\cos\phi}{\rho} \hat{a}_\phi \right) \sin \omega t$

d) $\overline{D} = \frac{1}{r} \sin\theta \sin(\omega t - 5r) \hat{a}_\theta$ **16**

OR

4. a) In a charge free region for which σ=0, $\varepsilon = \varepsilon_0 \varepsilon_r$, and $\mu = \mu_0$

$\overline{H} = 5\cos(10^{11} t - 4y) \hat{a}_z A/m$

Find (i) $\overline{J}_d$ and $\overline{D}$ and (ii) ε_r **10**

b) What is the retarded vector magnetic potential and explain its significance in electromagnetic analysis ? **6**

5. Discuss the wave propagation in the following media by giving expressions for $\overline{E}, \overline{H}$ propagation constant, attenuation constant, phase constant, intrinsic impedance, velocity of propagation. **16**

a) Free space

b) Lossless dielectric

c) Lossy dielectric

d) Perfect conductor.

OR

6. a) In a transmission media with a lossless dielectric $(\varepsilon = 4.5\,\varepsilon_0, \mu = \mu_0)$ **10**

$\overline{E} = \frac{40}{\rho}\sin(\omega t - 2z)a_\rho$ V/m, find

i) ω and $\overline{H}$

ii) The Poynting vector

iii) The total time-average power crossing the surface z = 1 m, 2 mm$<\rho<$3 mm, $0<\phi<2\pi$

b) The electric field in free space is given by $\overline{E} = 50\cos(10^8 t + \beta x)\hat{a}_y$ V/m. **6**

i) Find the direction of propagation

ii) Calculate β and the time it takes to travel a distance of $\lambda/2$

iii) Sketch the wave at t = 0, T/4, and T/2.

SECTION – II

7. a) Discuss the equivalent network model of a transmission line, its primary constants and also find the secondary constants in terms of primary constants. **6**

b) Show that a transmission line of infinite length is equivalent to the line of finite length terminated with its characteristic impedance. **10**

OR

8. A generator of 1 V, 10 MHz supplies power to a 100 m line open wire line terminated in 200 Ω resistance. The line parameters are R = 40 Ω/m, L = 0.2 μH/m, G=400 μS/m, C= 0.5 nF/m. Find

   a) Characteristic Impedance, Propagation constant

   b) Reflection Coefficient, VSWR

   c) Input Impedance

   d) Sending end current, receiving end current, receiving end voltage

   e) Input power, Output power, efficiency of the line. **16**

9. a) Explain the steps involved in finding the radiation fields due to an antenna by giving the mathematical relationship. **6**

   b) Define the terms antenna pattern, Radiation intensity, Directive gain, directivity, half power beam width, band width. **6**

   c) Evaluate the directivity of an antenna with normalized radiation intensity given **6**

$$U(\theta,\phi)=\begin{cases}\sin\theta, & 0\le\theta\le\dfrac{\pi}{2},0\le\phi\le2\pi\\ 0, & \text{otherwise}\end{cases}$$

OR

10. a) Near field electric field intensity of Hertzian dipole is given by

$$E_{rs} = \frac{\eta I_0 dl}{2\pi} \cos\theta \left[\frac{1}{r^2} - \frac{j}{\beta r^3} \right] e^{-j\beta r}$$

$$E_{\theta s} = \frac{\eta I_0 dl}{4\pi} \sin\theta \left[\frac{j\beta}{r} + \frac{1}{r^2} - \frac{j}{\beta r^3} \right] e^{-j\beta r}$$

$$E_{\phi s} = 0$$

Find (i) Magnetic field intensity $\overline{H}$ (ii) approximate the fields for far fields and find the Poynting vector, (iii) far field Power radiated (iv) radiation resistance. **12**

b) A Hertzian dipole of length $\lambda/100$ is located at the origin and fed with a current of 0.25 $\sin 10^8$ t A. Determine the magnetic field at r = $\lambda/5$, $\theta = 30°$. Represent your answer in instantaneous form. **6**

11. a) Consider an antenna consisting of two Hertzian dipoles placed in free space along the z-axis but oriented parallel to x-axis. Assume that the distance between them is d and the center is origin. The dipole located at (0, 0, d/2) carries a current $I_{1s} = I_0$ (α and the one at (0, 0,–d/2) carries current $I_{2s} = I_0$ (0 where α is the phase differene between the two currents. Find the total field at a point P, find the array factor. Far fields of Q 10 may be used. **6**

b) Extend results of 11(a) to the general case of an N-element array and find the array factor. What should be the phase difference α for broadside and end fire array. **10**

OR

12. a) Sketch the radiation pattern of 6 element linear array for end-fire case, by finding the direction of side lobes, nulls. Assume the distance between the elements to be $\lambda/2$. What would be the radiation pattern for broad side array ? Sketch it. **10**

b) What are the advantages of array of antennas and explain the application of arrays ? **6**

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T.E. Civil (Semester – II) Examination, 2011
PROJECT MANAGEMENT AND COMPUTER APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II.***

*2) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I.** Answer Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section **II.***

SECTION – I

1. a) Explain the importance of project management in construction sector. Give suitable examples. **4**

   b) Explain the term 'Life Cycle' of a project. State in brief the role of construction project manager in each phase of the Life Cycle. **6**

   c) Draw the network for the following data : **8**

      i) A is the starting activity.

      ii) B and C are parallel activities and they succeed A.

      iii) B controls activities D and E.

      iv) F and G succeed C.

      v) D controls I, G controls J.

      vi) E and F together control start of activity H.

      vii) I, H and J are the terminal activities.

      OR

2. a) For a small cycle of operation in a major construction project, following activities along with their durations were observed.

Activity (i - j)	**Duration (Weeks)**
1-2	3
1-4	17
2-3	6
2-4	8
3-4	8
3-5	4
5-6	6
4-6	6
6-7	2

i) Draw AOA network and calculate the event times and total project duration. Highlight the critical path. **6**

ii) Calculate all the activity times, Total Float and Free Float. Tabulate all the results. **8**

b) State the formulae used for calculating : **4**

Total Float, Free Float, Independent Float and Interfering Float.

3. a) The data given below is pertaining to activities in a scientific research project with probabilistic time estimates :

Activity	Activity times (weeks)		
i - j	Optimistic	Most Likely	Pessimistic
1-2	3	5	7
1-3	1	2	3
3-4	8	12	17
2-5	6	8	12
4-5	0	0	0
4-6	6	9	12
4-7	3	6	8
5-8	5	7	9
8-9	3	6	8
6-9	1	2	3
9-10	2	4	6
7-10	8	15	20

i) Draw the network

Calculate the total expected project duration, highlight the critical path and find the slack for each event. **8**

ii) What is the probability that the project will be completed in the expected project duration ? **4**

iii) What is project updating ? Under what circumstances is it necessary to update a project network ? **4**

OR

4. a) For a small construction project, the time and cost data are as given below. Determine the optimum project duration and the corresponding minimum cost. Use step by step network compression method. Indirect cost is Rs. 3,000 /- per week. **12**

Activity	Normal		Crash	
	Duration (weeks)	**Cost (Rs.)**	**Duration (weeks)**	**Cost (Rs.)**
1-2	3	12,000	2	16,000
1-3	6	18,000	3	24,000
2-4	2	20,000	1	23,000
3-4	4	16,000	2	21,000
4-5	5	30,000	4	35,000

b) Explain with a graphical representation, the time-cost relationship in a construction project. **4**

5. a) Define a contract. List out important points included in a Tender notice. **4**

b) What are the objectives of material management ? **4**

c) Explain the role of price variation clause in a construction contract. **4**

d) Explain : i) Order quantity

ii) Lead Time. **4**

OR

6. a) What is meant by Breach of Contract ? **4**

b) List out advantages of arbitration. **4**

c) For the following given data, carry out A-B-C analysis. **8**

Plot the ABC curve graphically

Sr. No.	Item	Cost (Rs.)
1	Cement	99,250
2	Binding wire	3,750
3	Rubble	45,000
4	River Sand	97,000
5	Steel Reinforcement	1,00,000
6	Timber	97,500
7	Crushed sand	85,000
8	Lime	4,000
9	Fasteners and Fixtures	5,500
10	Blasting Material	40,000

SECTION – II

7. a) State the importance of a site layout. List out various factors usually considered in a site layout. **6**

b) Draw a neat site layout for the demolition of a High Rise Structure. **6**

c) State the various causes of construction accidents. **4**

OR

8. a) Draw a neat site layout for the erection of a windmill. **6**

   b) Explain various injury indices considered in construction safety. **4**

   c) Recommend appropriate protective equipment for workers during the following construction operations : **6**

      i) Blasting of Rock

      ii) Welding

      iii) Fixing of glass panels.

9. a) Draw a flowchart and write the algorithm for Newton Raphson Method. **8**

   b) Following are the values of f (x) for various values of x. **10**

x	1	2	7	8
f (x)	4	5	6	4

Find the values of f (10) and the value of x for which f (x) is maximum or minimum.

OR

10. a) Using Gauss Quadrature three point formula, find the value of the integral $I = \int_0^{\pi} e^x \cos x \, dx$. **8**

   b) What are the applications of Simpson's $\frac{3}{8}^{th}$ rule ? **10**

Draw a flow chart for Simpson's $\frac{3}{8}^{th}$ rule, to find the area under the curve.

11. a) State the importance of project documentation in construction project management. State the applications of : **8**

    a) Material Indent Register

    b) Drawing Register

    Show a typical format of any one of the above.

    b) Explain the role of Information Technology in construction project management. **8**

OR

12. a) Explain the application of Data Base Management to materials management. **8**

    b) What is Quality control ? State its importance in construction projects. Discuss quality control norms for any two construction materials. **8**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
MICROCONTROLLER TECHNIQUES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **any 3** questions from **each** Section.*
*2) Question Nos. **5** is **compulsory**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Describe the organization of Internal RAM of MCS-51 with respect to the following points

   i) Diagram **2**

   ii) Bit addressable memory **2**

   iii) Scratch pad area **2**

   iv) Indirectly addressable area. **2**

   b) What are the functions of the following pins of 8051 ? **8**

   i) $\overline{\text{PSEN}}$ ii) XTAL2

   iii) $\overline{\text{WR}}$ / P3.7 iv) $\overline{\text{T0}}$ / P3.4

   v) $\overline{\text{EA}}$ vi) ALE

   vii) RST viii) RXD/P3.0.

OR

2. a) Explain the following instructions of 8051 **8**

   i) SJMP label

   ii) ANL A, #0C7h

   iii) LCALL function

   iv) SETB P1.6.

   b) With the help of neat diagrams, explain the interfacing of external program and data memory to 8051. **8**

3. a) Write a program to generate a square wave of 1 KHz with a 50% duty cycle at P1.2. Make use of internal timers of 8051 and explain the SFRs used for the same. Show calculations if any in detail. Assume crystal frequency as 2 MHz. **10**

   b) Calculate the time required to execute the following delay subroutine if f_{osc} = 6 MHz. **8**

```
        MOV R6,#64H
LOOP :  MOV R7,#0F0H
LOOP1:  DJNZ R7, LOOP1
        DJNZ R6, LOOP
        RET
```

   Show all the calculations in detail.

OR

4. a) Write a program in 8051 to transmit 10 numbers stored in the internal data memory of 8051 at a baud rate of 4800. Show calculations in detail. Also explain the SFRs configured. Assume crystal frequency as 11.0592 MHz. **10**

   b) Compare the power down and idle mode of 8051. **8**

5. Write short notes **(any two)** : **16**

   a) Interfacing of a 3 X 3 matrix keyboard to 8051

   b) LCD interfacing to 8051

   c) ADC interfacing to 8051.

SECTION – II

6. a) With a neat diagram, explain the interfacing of RTC to 8051. **8**

   b) With a neat diagram, explain the interfacing of Serial ADC to 8051. **8**

OR

7. A stepper motor is interfaced to 8051. It is controlled with 3 switches, Run/Stop, CW/CCW (Clock wise/Counter Clock wise) and Home. The step angle is 1.8° and has a speed of 600 rpm. Draw a neat diagram for the system and write the essential software for the same. **16**

8. a) Discuss the architectural features of PIC 16F877. **8**

   b) Explain the following instructions of PIC. **8**

      i) CLRF f

      ii) CLRWDT

      iii) DECFSZ f,d

      iv) ADDLW k

OR

9. a) Explain with a neat diagram the working of Timer 1 of PIC 16F877 as a timer counter. **8**

   b) Explain the STATUS register of PIC 16F877. Also explain the bits of the status register. **8**

10. a) Explain the following SFRs of PIC 16F877 associated with the ADC module : **10**

i) ADCON0 REGISTER (ADDRESS: 1Fh)

R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	U-0	R/W-0
ADCS1	ADCS0	CHS2	CHS1	CHS0	GO/$\overline{\text{DONE}}$	–	ADON
bit 7							bit 0

ii) ADCON1 REGISTER (ADDRESS 9Fh)

U-0	U-0	R/W-0	U-0	R/W-0	R/W-0	R/W-0	R/W-0
ADFM	–	–	–	PCFG3	PCFG2	PCFG1	PCFG0
bit 7							bit 0

b) Explain the capture mode of CCP module with a neat diagram. Also explain the SFR configured for the same. **8**

OR

11. a) Explain the I^2C operation of the MSSP module in PIC. Also draw waveforms for the same. **10**

b) With a neat block diagram explain the PWM operation of the CCP module. How is the duty cycle calculated ? **8**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
SIGNALS AND SYSTEMS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Find the Convolution of the following sequence

$x(n) = 2\delta(n+1) - \delta(n) + \delta(n-1) + 3\delta(n-2)$

$h(n) = 3\delta(n-1) + 4\delta(n-2) + 2\delta(n-3)$. **8**

b) Determine the impulse response h(n) for the system described by the second order difference equation.

$y(n) - 0.1y(n-1) - 0.3\,y(n-2) = x(n) + x(n-1)$. **8**

OR

2. a) What is the input signal x(n) that will generate the output sequence ?

$y(n) = \{1, 6, 7, \underset{\uparrow}{10}, 5, 7, 1, 1\}$ for a system with impulse response

$h(n) = \{1, 2, 1, 1\}$. **8**

b) Define the terms : **8**

1) Natural Response.
2) Forced Response.
3) Impulse Response.
4) Convolution integral.

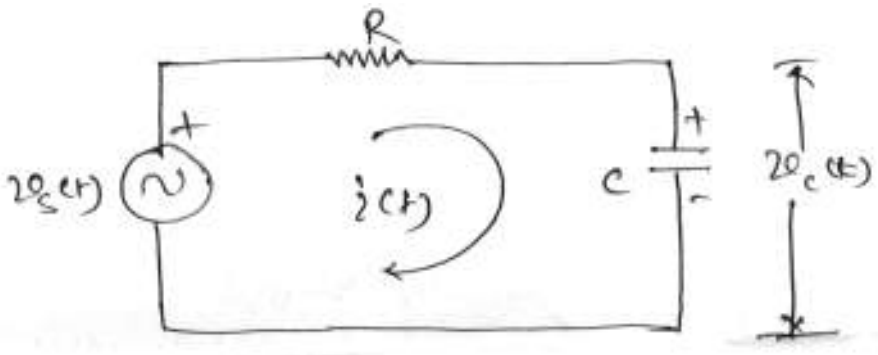
P.T.O.

3. a) Find the initial and final values for the following transforms : **8**

1) $X(s) = \dfrac{s+5}{s^2+3s+2}$

2) $X(s) = \dfrac{s^2+5s+7}{s^2+3s+2}$

b) Find the system function H(s) and the impulse response h(t) of the RC circuit shown in the fig. **8**



OR

4. a) Find the z-transform of : **8**

1) $x(n) = -a^n\, u(-n-1)$

2) $x(n) = a^{-n}\, u(-n-1)$

b) Using the power series expansion technique, find the inverse z-transform of the following X(z) **8**

1) $X(z) = \dfrac{z}{2z^2-3z+1}; |z| < \dfrac{1}{2}$

2) $X(z) = \dfrac{z}{2z^2-3z+1}; |z| > 1$

5. a) Prove the time convolution theorem

$x_1(t) * x_2(t) \leftrightarrow X_1(\omega)X_2(\omega)$. **10**

b) Show that the following signals are orthogonal over an interval [0, 1].
f(t) = 1

$x(t) = \sqrt{3}(1-2t)$. **8**

OR

6. a) Consider a continuous time LTI system described by the equation,

$$\frac{dy(t)}{dt} + 2y(t) = x(t)$$

using Fourier transform, find the output y(t) to each of the following input signals,

1) $x(t) = e^{-t}\, u(t)$
2) $x(t) = u(t)$. **10**

b) Find the frequency response of the following casual system

$$y(n) = \frac{1}{2}x(n) + x(n-1) + \frac{1}{2}x(n-2).$$ **8**

SECTION – II

7. a) Find the auto correlation of the following signal

$$x(n) = e^{-3n};\ 0 \le n \le 5$$

And hence find the energy. **8**

b) Write short notes on : **8**
1) Applications of Correlation.
2) Properties of Correlation.

OR

8. a) Find the cross correlation of the sequences **8**
1) $x_1(n) = \{1, 1, -2, 1\}$ $x_2(n) = \{2, -1, -1, 2\}$
2) $x_1(n) = \{-6, \underset{\uparrow}{-4}, 2, 1\}$ $x_2(n) = \{-1, \underset{\uparrow}{-1}, 2, 2\}$.

b) What is correlation ? Explain in detail the difference between correlation and convolution. **8**

9. a) What are random variables ? Explain the types with examples. **8**

   b) The probability distribution function of a random variable is given by,

   $f_x(x) = e^{-3x}$; $x \geq 0$. Find the probability that x will be in the range 1 to 4. **8**

OR

10. a) Give the relation between probability and probability distribution function. Explain the properties of PDF. **8**

   b) The distribution function for a random variable X is

$$F(x) = \begin{cases} 0 & ; \ x < 0 \\ 1 - e^{-2x} & ; \ x \geq 0 \end{cases}$$

   1) Find the probability that $X > 0.6$
   2) Find the probability that $X \leq 0.25$
   3) Find the probability that $0.4 < X \leq 0.8$. **8**

11. a) Write short note on : **10**

   1) Complex Exponential Modulation.

   2) Sinusoidal Amplitude Modulation.

   b) Explain the difference between narrow band frequency modulation and wide band frequency modulation. **8**

OR

12. a) Explain in detail difference between amplitude modulation and frequency modulation. **8**

   b) Explain in detail synchronous demodulation and asynchronous demodulation. **10**

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T.E. (Instrumentation and Control) (Semester – I) Examination, 2011
CONTROL SYSTEM COMPONENTS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive torque equation of the D.C. motor. **8**

   b) A dc shunt motor runs at 900 rpm from a 400 V supply with armature current as 25 A. Find the speed at which it will run from 230 V supply with armature current of 15 A. Armature resistance is 0.8 Ω. Assume flux per pole at 230 V to have decreased to 75% of its value at 400 V. **10**

   OR

2. a) Explain the following characteristics of DC series motors. **10**
      i) Torque and armature current
      ii) Speed and armature current
      iii) Speed and torque

      Also explain the characteristics of DC motor

   b) A 4 pole D.C. motor has lap connected armature winding with 576 conductors and it draws an armature current of 25 A. If flux per pole is 0.012 weber, calculate gross torque developed by motor. **8**

3. a) Explain the following terms related to stepper motor
      i) Maximum pull in rate
      ii) Holding torque
      iii) Detent torque
      iv) Maximum pull out rate. **8**

   b) Draw and explain the characteristics of dc shunt and dc series generators. **8**

   OR

P.T.O.

4. a) List various types of generators. Give application of each type of generator. **8**

   b) What are various types of stepper motor ? Explain with neat sketch working of any one type. **8**

5. a) Explain working of relay and compare solid state relay with electro mechanical relay. **8**

   b) Explain construction and working principle with applications of
      i) Reed relay ii) Pressure switch. **8**

OR

6. a) Write selection criteria for relays. **6**

   b) State a practical application for each of the following :
      i) Limit switch
      ii) Proximity switch
      iii) Temperature switch
      iv) Rotary switch
      v) Level switch. **10**

SECTION – II

7. a) What are interlocks ? Explain various interlocks in the lift application with wiring diagram. **10**

   b) List various types of motor protection circuits and explain any two in detail. **8**

OR

8. a) Explain over load protection circuit in mixer grinder. Draw electrical diagram. **8**

   b) Explain breaking of motor. Draw an electrical wiring diagram using standard symbols for reversing direction of rotation of electric motor. **10**

9. a) Explain pneumatic power supply with neat sketch. **8**

   b) Draw a pneumatic circuit for 2 clips to be riveted together on a semi automatic press. Draw step displacement diagram. **8**

OR

10. a) Explain Air filter Regulator (FRL) unit with neat sketch. **8**

    b) Draw and explain 3/2 valve and 4/3 valve. **8**

11. a) State various components required in hydraulic supply. Explain any two components in detail. **8**

    b) Explain meter in and meter out control circuit. **8**

OR

12. a) Compare hydraulic and pneumatic system. Explain properties of hydraulic oil. **8**

    b) Draw hydraulic circuit for sequential operation of two cylinders. Assume suitable data if required. **8**

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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
PROCESS PLANT OPERATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – 1

1. Explain unit operations and unit processes related to any process industry with flow sheet symbols in detail. **16**

OR

2. Explain the terms compressors, blowers, single stage and multistage pump in detail. **16**

3. What are different types of reactors ? Explain the term rate of reaction and factors affecting it in detail. **16**

OR

4. Explain the endothermic and exothermic chemical reactions. Derive the integrated performance equation of ideal batch reactor. **16**

5. Derive material and energy balance equation for boiler and evaporator. **18**

OR

6. Write notes on :

   a) Types of dryers

   b) Reflux ratio

   c) Cooling towers. **18**

P.T.O.

SECTION – 2

7. What is size reduction and explain its equipments ? Explain different types of separators. **16**

OR

8. Compare sedimentation, hindered settling and free settling and hydrocyclone. **16**

9. What is corrosion and its protection techniques in detail. **16**

OR

10. Explain hardness and its testing methods. **16**

11. Draw the flow sheet diagram of manufacturing of urea and explain it. **18**

OR

12. Draw the flow sheet diagram of manufacturing of paper from pulp and explain it. **18**

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T.E. (Instrumentation and Control) (Semester – II) Examination, 2011
PROCESS LOOP COMPONENTS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) **Assume** suitable data, **if necessary**.*

SECTION – I

1. a) Define and explain the following using a typical temperature loop
   i) Process
   ii) Controlled variable
   iii) Manipulated variable
   iv) Load variable
   v) Disturbance. **10**

   b) A sensor outputs a voltage ranging from 0 to 20 mV. For interface to an ADC the signal needs to be in the range of 0 to 2.5 V. Develop the signal conditioning circuit. **8**

OR

2. a) Draw P and ID symbols for the following and give examples for the same
   i) Control valve
   ii) Binary electrical signal
   iii) Current to pneumatic converter
   iv) Programmable logic controller
   v) Orifice. **10**

   b) Resistances in a bridge circuit are $R_1 = R_2 = R_3 = 120\,\Omega$. $R_4 = 121\,\Omega$. If the supply voltage is 10 V. Find the offset voltage. Also design a signal conditioning circuit to get output 0 to 5 V. **8**

P.T.O.

3. a) Explain the following wrt DPT
   i) Manifold
   ii) Closed vessel level measurement. **8**

   b) Explain the calibration procedure of SMART. **8**

OR

4. a) Explain the working of direct acting current to pneumatic converter. **8**

   b) Discuss the role of process characteristics in selecting the type of controller. **8**

5. a) Explain the concept of AUTO/MAN bumpless transfer and rate before reset. **8**

   b) Write and explain the equations for position and velocity algorithm for digital controller. **8**

OR

6. a) Define the following :
   i) Tuning
   ii) Repeats per minute
   iii) Offset
   iv) Neutral zone. **12**

   b) "Time proportional controller is better than ON/OFF controller". Justify. **4**

SECTION – II

7. a) State the limitations of a relay based system. **8**

   b) Develop relay ladder diagram for two way traffic light. **8**

OR

8. a) Explain with following wrt PLC
   i) HMI
   ii) Programming technique. **8**

   b) Develop physical ladder diagram for tank level system. **8**

9. a) Explain with the following parts of a control valve.
   i) Stuffing box
   ii) Guiding
   iii) Bonnet
   iv) Diaphragm plate
   v) Valve trim. **10**

   b) Compare spring diaphragm and piston cylinder actuator. **8**

OR

10. a) How a positioner enhances the performance of control valve ? **10**

   b) What are different selection criteria for control valve ? **8**

11. a) Give hazardous area classification. **8**

   b) Explain the neat sketch the working of high/low selector and give its application. **8**

OR

12. Write short notes on **any two** :
   i) Intrinsic Safety
   ii) Square root extractor
   iii) Alarm annunciator. **16**

[3963] – 8

T.E. Civil (Semester – II) Examination, 2011
STRUCTURAL DESIGN – II
(2003 Course)

Time : 4 Hours Max. Marks : 100

***Instructions**: i) Answer Q.**1** or Q.**2**, Q.**3** or Q.**4**, in Section **I**.*
*ii) Answer Q.**5** or Q.**6**, Q.**7** or Q.**8**, in Section **II**.*
*iii) Answer to **two** Sections should be written in **separate** answer books.*
*iv) Figures to the **right** indicate **full** marks.*
*v) **Use** of I.S. 456-2000 and non-programmable calculator is **allowed**.*
*vi) **Neat** diagram must be drawn **wherever** necessary.*
*vii) Mere reproduction from I.S. code as answer will not be given **full** credit.*
*viii) Assume any other data, **if necessary**.*

SECTION – I

1. A) Answer the following : **9**

i) Why is the concrete cover to reinforcement required ?

ii) Why is over-reinforced design not preferred ?

iii) What is a balanced design ?

B) An R.C.C. beam 250 mm wide and 500 mm effective depth is reinforced with 4 No. 12 mm diameter bars in tension. Find

i) Depth of neutral axis

ii) Moment of resistance.

Also state whether the beam is under-reinforced or over-reinforced.

Use material M_{20} grade concrete and HYSD reinforcement of Fe_{415}.

Use W.S.M. **8**

P.T.O.

C) A rectangular beam 230 mm wide and 520 mm effective depth is reinforced with 4 No. 16 mm diameter bars. Find

i) Depth of neutral axis

ii) Moment of resistance.

The materials are M_{20} grade of concrete and HYSD reinforcement of grade Fe_{415}.

Use L.S.M. **8**

OR

2. A) Explain the following : **9**

i) Partial safety factor

ii) Doubly reinforced section

iii) Characteristic strength of concrete.

B) A Tee beam has the following details :

Width of Web = 350 mm

Width of flange = 1450 mm

Thickness of flange = 100 mm

Effective depth = 410 mm

Tension steel = 4 No. 20 mmϕ

Find the moment of resistance of the section.

Use materials, M_{20} grade concrete and HYSD reinforcement of grade Fe_{415}.

Method : W.S.M. **8**

C) A.R.C. beam of rectangular section 230 mm wide and 400 mm deep is reinforced with 4 No. 12 mmϕ bars provided with an effective cover of 35 mm.

Calculate the ultimate moment of resistance of the section and maximum uniformly distributed superimposed load this beam can carry over a span of 3.5 m.

Materials : M_{20} and Fe_{500}.

Method : L.S.M. **8**

3. A) A reinforced concrete beam has a support section with a width of 230 mm and effective depth 500 mm. The support section is reinforced with 3 No. 16 mm diameter bars on the tension side. 6 mm diameter-2 legged M.S. Stirrups are provided at a spacing of 130 mm c/c.

   Using M_{20} grade concrete and Fe_{415} HYSD bars, calculate the shear capacity of the beam section. **8**

   B) A two span continuous beam ABC, 10 m long, freely supported at A and C and continuous over central support B, 5 m from 'A' carries a characteristic dead load of 12 kN/m and characteristic live load of 18 kN/m.

   Calculate the design moments at central support 'B' and near midspan of AB and BC using 30% redistribution of moments. Draw bending moment envelop. **17**

OR

4. A) A reinforced concrete beam of rectangular section with a breadth of 350 mm and overall depth of 800 mm is reinforced with 4 No. 20 mm diameter on the tension side at an effective cover of 50 mm. The section is subjected to an ultimate moment of 215 kN.m.

   Estimate the ultimate torsional moment that can be allowed on the section. Use M_{30} grade concrete and Fe_{415} grade reinforcement. **8**

   B) A reinforced concrete beam of rectangular section 300 mm wide is reinforced with 4 bars of 25 mm diameter at an effective depth of 600 mm. The beam has to resist a factored shear force of 400 kN at support section. Design vertical stirrups for the section.

   Use concrete grade of M_{25} and HYSD reinforcement of Fe_{415}. **17**

SECTION – II

5. Figure shows a centre line plan of two storeyed office building whose floor-to floor height is 3.6 m. Classify the slabs.

   Design roof slabs S_2 and S_3 by LSM, Use M_{20}, Fe_{415}, Live load = 4 kN/m^2 F.F = 1.0 kN/m^2. Draw neat sketches showing the details of the reinforcement in the slab. **25**

OR

6. Design the first and second flight of dog-legged staircase as shown in figure.

   Use M_{20} / Fe $_{415}$.

   Take riser = 150 mm Tread = 300 mm

   Draw details of reinforcement. **25**

7. Design a rectangular column A in ground floor and below the plinth with isolated, footing for following data and data given in Q. 5. Draw the details of reinforcements.

   1) Water proofing load for roof slab 2 kN/m^2

   2) Height of parapet wall 1.2 m

   3) Thickness of slab 150 mm

   4) Thickness of wall 230 mm

   5) Beam size 230×500 mm

   6) M_{20} Fe $_{415}$

   7) Safe bearing capacity strata 250 kN/m^2 below 1 m of ground level. **25**

   OR

8. Design a short rectangular column with material M_{20} and Fe_{415} with effective height 3 m. Carrying ultimate load 1650 kN and ultimate moment 300 kNm about major axis (axis parallel to width 400 mm). Also design the footing for the above column without considering moment. Take safe bearing capacity of Strata as 250 kN/m^2. Draw detailing of reinforcement. Consider column size 400 mm × 600 mm and cover 60 mm. **25**

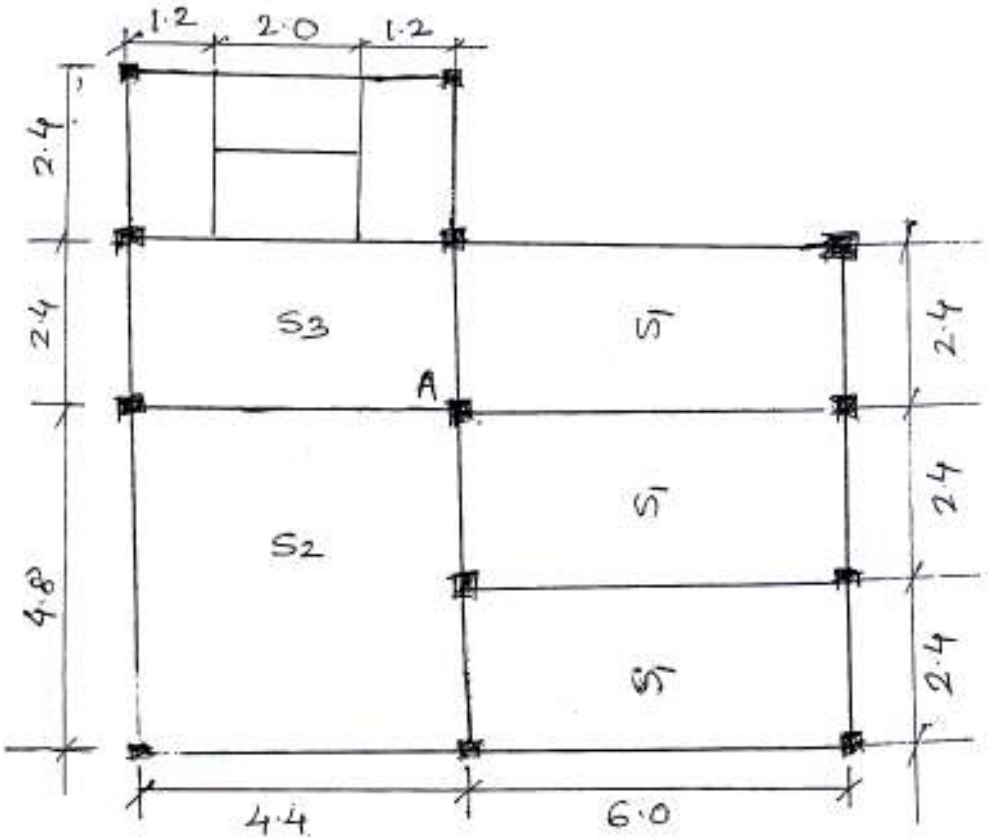
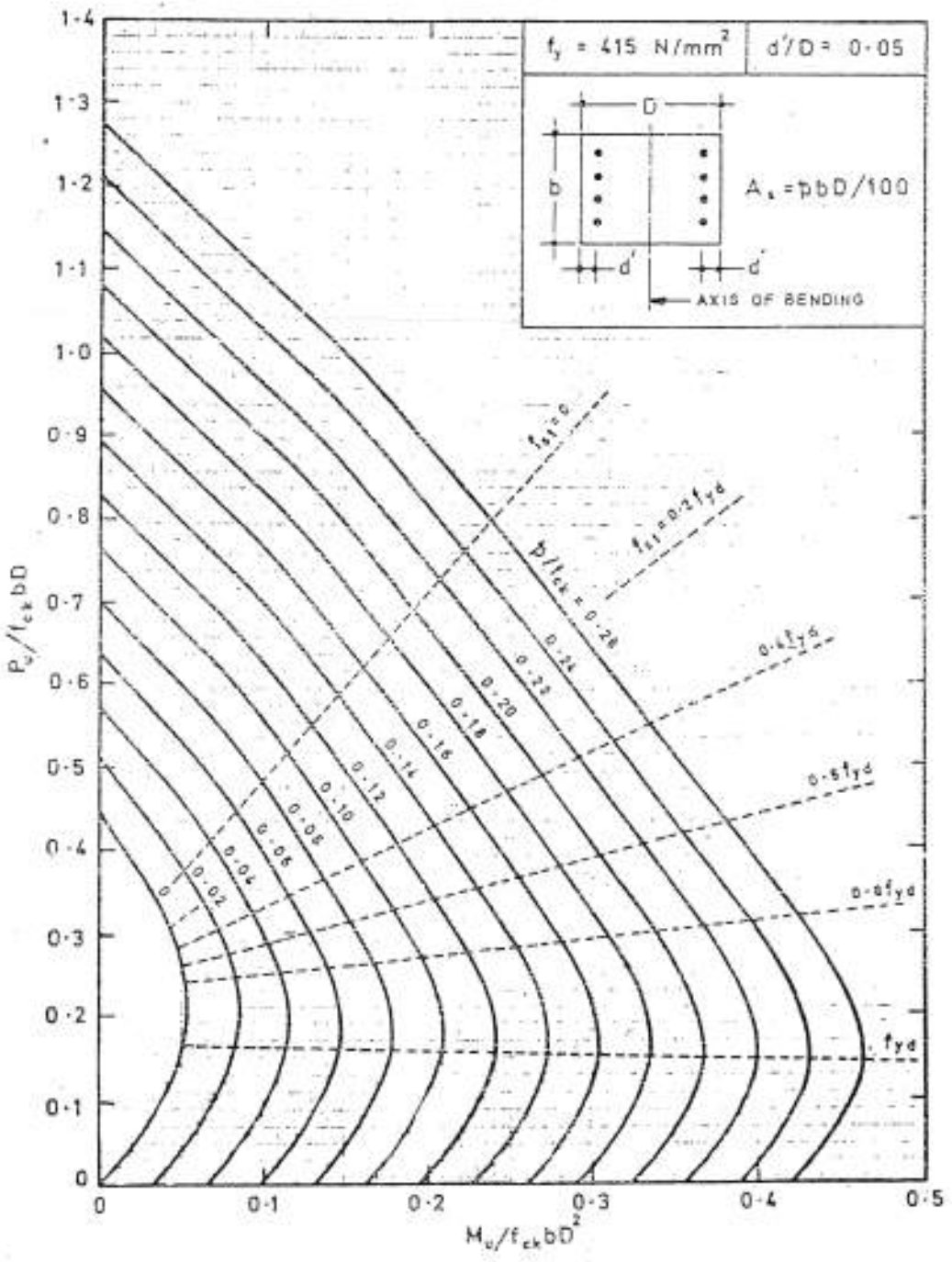
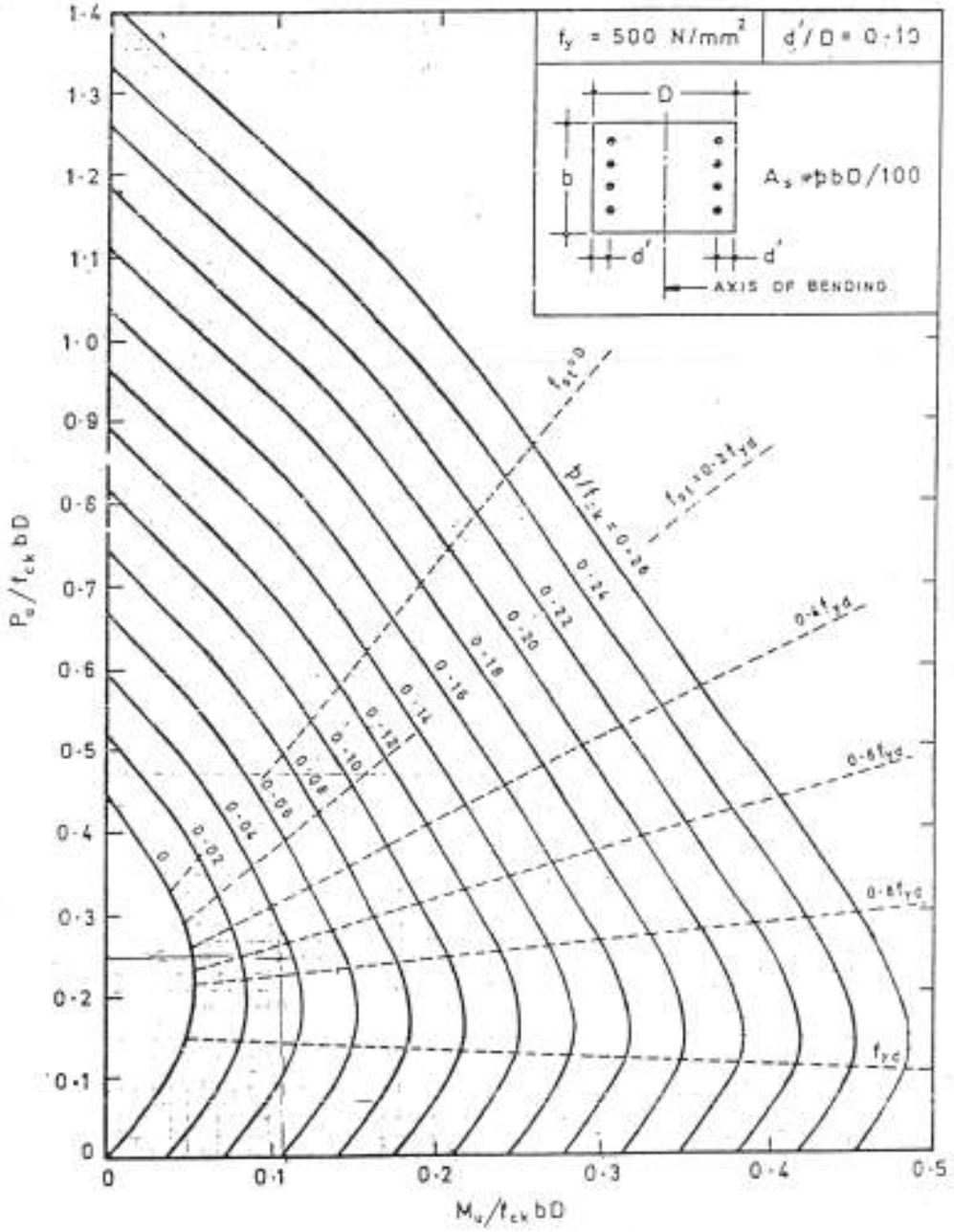


Figure.
plan of office building

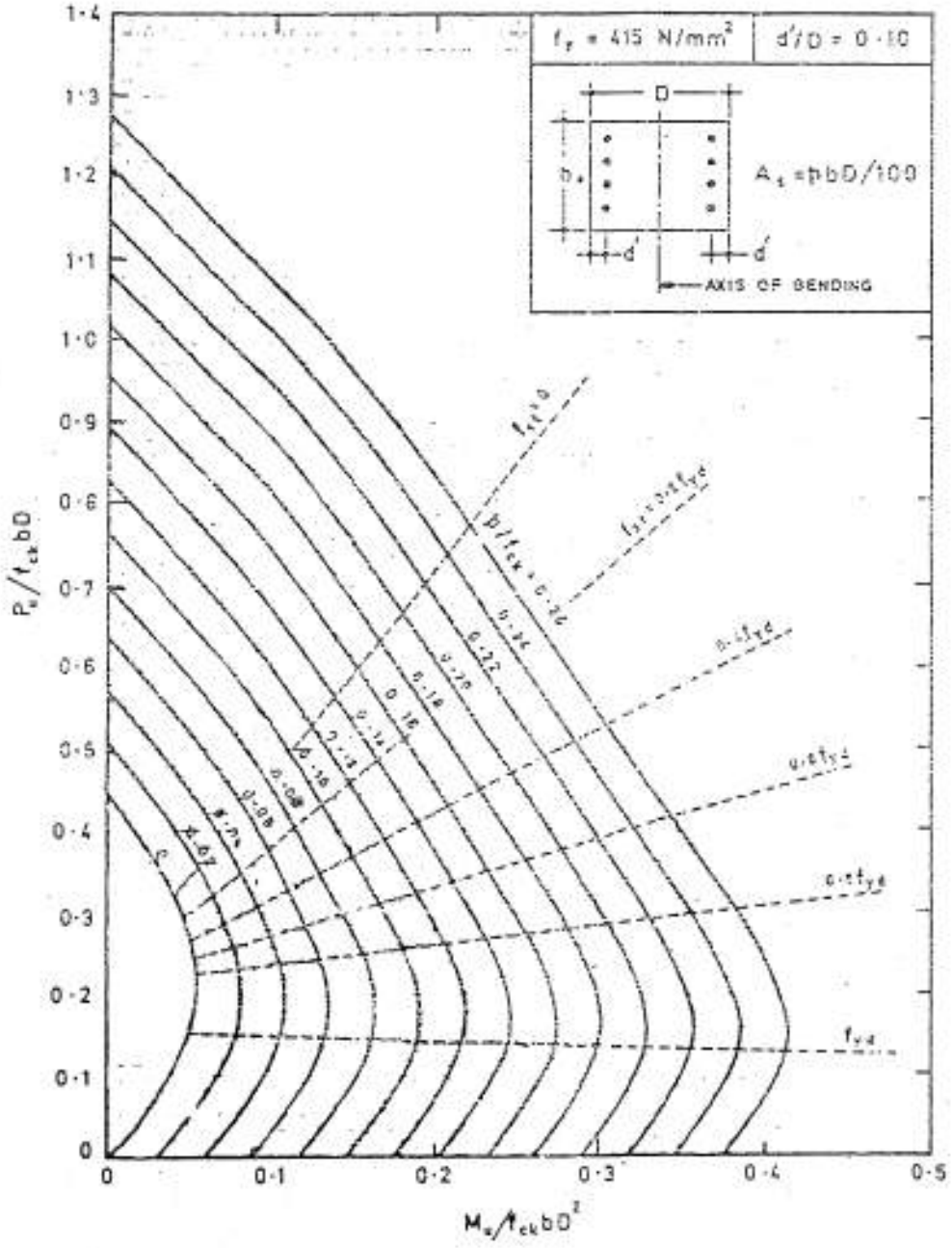
COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides



COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides



COMPRESSION WITH BENDING — Rectangular Section — Reinforcement Distributed Equally on Two Sides



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T.E. (Instrumentation & Control) (Semester – II) Examination, 2011
INDUSTRIAL MANAGEMENT
(2003 Course)

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **All** questions carry **equal** marks.*
*5) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

1. State and explain the concept of strategic planning. What are the different management techniques for developing business strategy ? **16**

OR

2. a) Prepare a Ishikawa and reverse Ishikawa diagram. Explain how it controls production process. **8**

   b) What is business process Re-engineering ? Briefly explain its techniques. **8**

3. a) Explain the following : **8**
      i) ISO-9000
      ii) ISO-14,000

   b) What is statistical process control ? Explain its application to control quality. **8**

OR

4. a) What is patent ? Explain the procedure of obtaining patent right. **8**

   b) State and explain Mergers and Take overs as a business strategy with its limitations and advantages. **8**

P.T.O.

5. What is inventory control ? Explain quantitative and qualitative (subjective) inventory control techniques. **18**

OR

6. Define production planning and control. Explain the techniques and objectives of PPC. **18**

SECTION – II

7. a) What is performance appraisal ? Explain its importance. **8**

   b) Define Motivation. Explain Maslow's theory of motivation. **8**

OR

8. a) State and explain various methods of training. How it influence efficiency and productivity ? **8**

   b) Explain various leadership skills. Why it is considered essential for business ? **8**

9. a) Define capital structure. Describe various sources of fixed and working capital. **9**

   b) Explain project costing. Explain how project report is prepared. **9**

OR

10. a) Explain how Profit and Loss Account and Balance Sheet of a company evaluate the performance. **10**

    b) Explain the following :

       i) Payback period ii) Return on Investment. **8**

11. Critically examine the salient features of Company Act-1956. **16**

OR

12. Explain the following : **16**

    a) Letter of credit

    b) Value added Tax.

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T.E. (Printing) (Semester – I) Examination, 2011
PRINTING NETWORKS AND COMPUTER GRAPHICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Classify the following DOS commands as internal and external commands. Explain with example : COPY, TYPE, ATTRIB, FORMAT, DIR, DEL, REN, SORT. **8**

   b) Compare Windows and MAC operating system. **8**

   OR

2. a) Explain UNIX Operating system. Explain the multiuser and multitasking features of UNIX Operating system. **8**

   b) What is Operating system ? Give the functions and features of Operating system. **8**

3. a) What are design issues of networking ? What are the different types of networks ? **10**

   b) Explain the OSI reference model in detail. **8**

   OR

4. a) Write short notes on : **10**
      1) Network topologies.
      2) Pop3 and IMAP.

   b) Explain IP addressing classes with examples. **8**

5. a) What is internet working ? Explain different internet working devices. **8**

   b) Explain in detail VSAT. **8**

   OR

P.T.O.

6. a) Explain video-conferencing in detail. **8**

   b) Write short notes on (**any two**) : **8**

      1) Brouters
      2) VoN
      3) VolP
      4) Leased Lines.

SECTION – II

7. a) Explain fundamentals steps involved interface image processing. **8**

   b) Write short notes on : **8**

      1) Gif.
      2) pcx.
      3) avi.
      4) bmp.

OR

8. a) Explain the terms bit, dot, pixel related to image. **8**

   b) Explain : **8**

      1) Video ram
      2) Basic graphics system.

9. a) Write short notes on (**any two**) : **10**

      1) CIP4
      2) PPF in workflow
      3) Coding of PDF

   b) Explain any workflow interface detail. **8**

OR

10. a) What is workflow ? What are features of workflow system interface prepress ? **10**

    b) Explain the integration of prepress-press-postpress. **8**

11. a) Explain the digital camera interface detail and its application in field of printing. **8**

    b) Write short notes on : **8**
    1) Scanners application in printing.
    2) Printers application in printing.

OR

12. a) Explain in detail : **8**
    1) OCR
    2) ICR

    b) Write short notes on : **8**
    1) Web camera
    2) Frame grabber card.

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T.E. (Printing) (Semester – I) Examination, 2011
REPROTECHNIQUES
(2003 Course)

Time: 3 Hours Max. Marks: 100

SECTION – I

1. What is a digital original ? Explain in detail. **18**

   OR

   Compare digital original with conventional original. **18**

2. Explain what is halftone. Why is it required ? **16**

   OR

   Explain structure of Halftone Image in detail. **16**

3. Explain the relation of screen ruling and substrate properties. **16**

   OR

   Compare AM and FM screening. **16**

SECTION – II

4. Explain types of Image setters. **18**

   OR

   Discuss in detail CTP technology. **18**

5. Explain FM screening and its advantages over AM screen. **16**

   OR

   Compare AM and FM screening. **16**

6. What is print characteristic curve ? Explain banana curve. **16**

   OR

   Explain densitometer structure and working. **16**

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T.E. (Printing) (Sem. – I) Examination, 2011
DESIGN OF PRINTING MACHINE COMPONENTS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer to the **two** Sections should be written in **separate** books.*

*2) **Neat** diagrams must be drawn **wherever** necessary.*

*3) Figures to the **right** indicate **full** marks.*

*4) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) What are important considerations in selection of material in design ? **8**

   b) Explain the B.I.S. system of designation of steels. **8**

OR

   a) What are fits and tolerance ? Explain in short the different types of fits with applications. **8**

   b) Differentiate between the hole basis and shaft basis system. **8**

2. a) Explain the term 'Factor of Safety'. Explain the factors to be considered while selecting a factor of safety. **8**

   b) Design a Knuckle joint to withstand a tensile force of 25 kN. The material has tensile strength of 300 N/mm^2. Assume factor of safety of 5, $S_{yt} = S_{yc}$ =300 N/mm^2. **8**

OR

   a) State the procedure of designing a shaft as per the following approaches:

      i) Equivalent bending moment approach.

      ii) Rigidity approach. **8**

P.T.O.

b) Design a cotter joint to transmit a load of 90 kN in tension or compression. Assume the following stresses for socket, spigot and cotter.

Allowable tensile stress = 90 MPa

Allowable crushing stress = 120 MPa

Allowable shear stress = 60 MPa. **8**

3. Write short notes on **any three** : **18**

a) Properties of material

b) Compare bolted with welded joint.

c) Universal joint and their application.

d) Geometric Tolerance.

SECTION – II

4. a) Prove that maximum efficiency of square threads is given by

$$\eta_{max} = \frac{1-\sin\theta}{1+\sin\theta}$$

where θ is pressure angle. **10**

b) What are the different types of stresses induced in power screw ? **6**

OR

a) Explain the important factors in selecting a coupling. **8**

b) Derive a relation for torque required to raise the load and lowering the load against thread friction. **8**

5. a) Explain advantages and limitations of welded joint. **8**

   b) Explain different forms of threads. **8**

OR

   a) A 50 mm diameter solid shaft is welded to a flat plate by 10 mm fillet weld. Find maximum torque that the welded joint can sustain if the maximum shear stress intensity in the weld material is not to exceed 80 MPA. **8**

   b) What are the different types of stresses included in screw thread ? **8**

6. Write short notes on **(any three)** : **18**

   a) Load stress equation for helical spring.

   b) Stresses induced in helical spring.

   c) Spring nomenclature.

   d) Classification of springs.

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T.E. (Printing) (Semester – I) Examination, 2011
TECHNOLOGY OF PRINT FINISHING AND PACKAGING
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. Explain in detail tools and equipment used in finishing operations. **18**

OR

1. Discuss print finishing workshop layout. **18**

2. Write short notes on (**any 2**) :

   1) Securing

   2) Covering methods

   3) Adhesives. **16**

OR

2. Discuss in detail pre-forwarding operations. **16**

3. Explain the processes in detail :

   1) Ruling

   2) Numbering. **16**

OR

3. Explain costing and estimation for finishing operations. **16**

SECTION – II

4. Explain raw materials for paper packaging in detail. **16**

OR

4. Explain manufacturing process of a paper corrugated carton. **16**

P.T.O.

5. Discuss various tests on paper and packages. **18**

OR

5. Explain any two printing processes involved in packaging. **18**

6. Explain considerations in costing and estimations for packaging. **16**

OR

6. Explain ecological factors regarding recycling of paper packages. **16**

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T.E. Printing (Semester – II) Examination, 2011
PRINTING TELECTRONICS AND OPTOELECTRONICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. A) Explain basic problems of long distance transmission. **8**

   B) Explain role of oproelectronics in printing technology. **8**

   OR

2. A) Draw and explain block diagram of communication system. **8**

   B) Explain necessity of modulation ? Explain pulse amplitude modulation. **8**

3. A) Explain data encryption and decryption. **10**

   B) Explain frequency modulation with suitable diagram (waveforms). **8**

   OR

4. A) Explain time division multiplexing (TDM) and frequency division multiplexing (FDM). **10**

   B) Explain different types of quantization. **8**

5. A) Explain companding using suitable diagram. **8**

   B) Write short notes on : **8**

   1) Videotext
   2) Teletext

   OR

6. A) What are different channel interferences ? Explain noise interface. **8**

   B) Explain data transfer through e-mail. **8**

P.T.O.

SECTION – II

7. A) Explain any four types of optocouplers with the help of suitable diagrams. **8**

   B) Explain different features of photodiode. **8**

OR

8. A) Explain working of LASER diode. **8**

   B) Explain working of phototransistor. **8**

9. A) Draw and explain block diagram of basic fiber optic communication system. **10**

   B) Explain application of optical communication for paper or note counting. **8**

OR

10. A) Describe different losses in fiber optic cable with suitable diagrams. **10**

    B) Explain single mode and multimode step index fiber optic cable. **8**

11. A) Explain sheet thickness measurement application. **8**

    B) Explain Wi-Fi technology. **8**

OR

12. A) Explain any one application of optoelectronics in field of printing in detail. **8**

    B) Explain RFID technology. **8**

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T.E. (Printing) (Semester – II) Examination, 2011
SURFACE PREPARATION – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1)* ***All*** *questions are c****ompulsory****.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

4) Black figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – 1

1. A) Explain any four factors affecting the planning of the e job. **8**

   B) Explain the factors affecting the imposition of the job. **8**

OR

1. A) Explain the Sheet work method with appropriate diagrams. **8**

   B) Explain the Half sheet work method with appropriate diagrams. **8**

2. A) Explain the manufacturing process of Water Deep etch plate in brief. **8**

   B) Explain the manufacturing process of Positive working PS plate in brief. **8**

OR

2. A) Explain the manufacturing process of Gum Deep etch plate in brief. **8**

   B) Explain the manufacturing process of Negative working PS plate in brief. **8**

3. A) Explain the method of preparing the Direct Electrophotostatic plate in brief with suitable diagram. **9**

   B) Explain the method of preparing the Reflection type of Diffusion transfer plate in brief with suitable diagram. **9**

OR

3. A) Explain the method of preparing the Indirect Electrophotostatic plate in brief with suitable diagram. **9**

   B) Explain the method of preparing the Projection type of Diffusion transfer plate in brief with suitable diagram. **9**

P.T.O.

SECTION – 2

4. A) Explain the various applications of Ctp technology in detail with appropriate examples. **8**

   B) Explain the Thermal Ctp technology in detail. **8**

OR

4. A) Differentiate between conventional and Ctp technology. **8**

   B) Explain the Silver Halide Ctp technology in brief. **8**

5. A) Differentiate between direct and indirect method of preparing in screen. **8**

   B) Explain the Indirect method of preparing the screen with suitable diagrams. **8**

OR

5. A) Explain various factors affecting the quality of the screen. **8**

   B) Explain the Direct Indirect method of preparing the screen with suitable diagrams. **8**

6. A) Find out number of plates required to print the following job and also give the printing plan for the same : Annual Report

   Text pages - B/W - 64

   Cover pages - four colour - 04

   Size of the book - demy $\frac{1}{4}$

   Size of the machine - 23”×36”

   Quantity to be printed 3000 copies. **9**

   B) Give suitable causes and remedies for Dot Gain and Dot Loss on Negative working Pre Sensitized plate. **9**

OR

6. A) Explain any four elements of UGRA PCW in brief. **9**

   B) Give suitable causes and remedies for Dot Gain and Dot Loss on Positive working Pre Sensitized plate. **9**

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T.E. (Printing) (Semester – II) Examination, 2011
OFFSET MACHINES – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) **All** questions are **compulsory**.*
*2) Answers to **two** Sections should be written in **separate** books.*

SECTION – I

1. Explain the following :

   1) What is the working of a lithographic plate on offset machine ? **5**

   2) Why do plate cylinders and blanket cylinders have gaps ? **8**

   3) Explain packing requirements in offset. **3**

OR

1. Explain automatic plate loading system. **16**

2. Explain :

   1) Ink roller train in offset. **8**

   2) Stripe method and roller strip method to check roller pressures. **8**

OR

2. Explain multi-roller inking system in offset with neat figure and ink path. **16**

3. What is the role of alcohol in dampening solution ? State its advantages and disadvantages. **18**

OR

3. 1) Explain modern dampening system construction and use. **9**

   2) List down various constituents of fountain solution. **9**

P.T.O.

SECTION – II

4. Write short notes on : **16**
   1) Successive sheet feeder
   2) Pile height governor
   3) Double sheet detector
   4) Grippers in delivery system.

OR

4. What is front lay system ? State different types of mechanisms used. **16**

5. Explain pre makeready and makeready of a single colour press for a single colour job. **16**

OR

5. Explain problems related to machine : **16**
   1) Slurring
   2) Mechanical dot gain
   3) Ghosting
   4) Doubling.

6. 1) State the plan of daily press maintenance of delivery unit of single color machine. Write a check list. **9**

   2) Explain any four types of waste generated in press room. **9**

OR

6. With a help of neat diagram explain construction of blanket and its performance requirements. **18**

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T.E. Printing (Semester – II) Examination, 2011
DIGITAL COLOUR IMAGING AND COLOUR MANAGEMENT
(2003 Course)

Time : 3 Hours Marks : 100

SECTION – I

1. Answer **any two** : **18**

   A) Explain the terms wavelength. Explain various types of waves present in electromagnetic spectrum.

   B) Explain trichromancy and Opponency theory of human vision with neat diagram.

   C) Process colours cyan, magenta and yellow are used for printing instead of red, green and blue. Explain this with reflection and absorption of colour.

2. Solve **any two** : **16**

   A) Explain the term Colour Temperature and Co-related colour temperature of illuminants.

   B) Explain principle and construction of colorimeter.

   C) Explain colour matching experiment used to define human matching function.

3. Answer **any two** : **16**

   A) Explain colour space CIE Lch

   B) Device dependent workflow

   C) Need for colour management.

P.T.O.

SECTION – II

4. Solve **any two** : **18**

A) What is Colour Gamut ? Explain RGB gamut and CMYK Gamut.

B) Explain profile connection space (PCS)

C) Explain term Device link.

5. Answer **any two** : **16**

A) Explain Colorimetric rendering intent.

B) Explain three C's of colour management used for press standardization.

C) Explain term Gray balance.

6. A) Explain Electrophotography Printing Process **16**

B) Explain Drop-on demand Ink jet printing process.

C) Explain principle and construction of CCD flat bet scanner.

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T.E. (Civil) (Semester – II) Examination, 2011
ENVIRONMENTAL ENGINEERING – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Solve Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6*** *from Section* ***I*** *and Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12*** *from Section* ***II****.*

2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*

3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*

4) Figures to the ***right*** *indicate* ***full*** *marks.*

5) ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*

6) ***Assume*** *suitable data,* ***if necessary****.*

SECTION – I

1. a) Explain the sources of noise. **6**

   b) Explain in brief various techniques used to control noise pollution. **6**

   c) Convert following sound pressure levels into decibel units. **4**

   i) P = 1 microbar ii) P = 500 microbar

   iii) P = 60 microbar iv) P = 20,000 microbar.

OR

2. a) Explain on-site handling, storage and processing of solid wastes. **6**

   b) Explain thermal and mechanical volume reduction processing techniques used in municipal solid waste systems. **6**

   c) State the source categories of solid waste. **4**

3. a) Explain various primary and secondary meteorological parameters which affect dispersion of air pollutants. **6**

   b) What are the effects of particulate matter on human health and materials ? **6**

   c) What are the sources of air pollutants ? **4**

OR

P.T.O.

4. Write short note on : **16**
   i) Green house effect
   ii) Acid rain
   iii) Ozone depletion
   iv) Heat island.

5. a) Write distribution forms and effects of alkalinity. **6**

   b) Draw a flow diagram of river water treatment process for a city. Explain the purpose of any two units used for water treatment. **6**

   c) Following is the population data for a town. Water supply scheme is to be designed for this town with a design period of 30 years.

Year	1970	1980	1990	2000	2010
Population	35,000	38,000	45,000	60,000	70,000

   Estimate the future population of a town at the end of the year 2040 by geometric increase method. **6**

OR

6. a) What do you know about Rain Water Harvesting ? Draw a sketch of 'Roof Top Rain Water Harvesting system for a bungalow'. **6**

   b) How is the provision made for fire demand in water supply schemes ? **6**

   c) State the permissible limit as per Govt. of India norms for drinking water for the following : **6**
      i) Iron
      ii) Hardness
      iii) pH
      iv) Turbidity
      v) Chloride
      vi) Sulphate

SECTION – II

7. a) Prove that theoretically, the surface loading (Q/A) and not the depth is a measure of effective removal of particles in a sedimentation tank. **8**

   b) Design horizontal flow type sedimentation tank of rectangular shape with the following data : **8**
      i) Diameter of the particle to be settled = 0.001 cm.
      ii) Temperature of water = 10°C.
      iii) Design discharge = 2 MLD.
      iv) Specific gravity of silt and clay = 2.65.
      v) Kinematic viscosity = 1.3101×10^{-2} cm^2/sec.

OR

8. a) What is Stoke's law ? What are its limitations ? **6**

   b) What is the purpose of aeration of water ? Explain with a neat sketch cascade aerator. **6**

   c) Explain the theory of coagulation. **4**

9. a) Explain advantages and disadvantages of lime-soda process of water softening. **6**

   b) Explain in short, operational troubles associated with Rapid Sand Gravity Filter. **6**

   c) Explain break point chlorination with sketch. **4**

OR

10. a) Draw a neat sketch of rapid sand gravity filter showing various components. **6**

    b) Calculate the dimensions of rapid sand filter for 1 lakh population with 150 1/capita/day. Assume the filtration rate and mean size of sand 1.5 mm. Find the depth of sand bed for head loss of 2 m if break through index B = 0.002. Assume rate of filtration : 100 lit/min/m^2. **6**

    c) Explain reverse osmosis. **4**

11. a) Explain the necessity of distribution reservoir and the way in which its capacity is fixed. **6**

    b) What is the purpose of providing an ESR ? Explain how its capacity is calculated. **6**

    c) Differentiate between fire reserve and break down reserve. **6**

OR

12. Write short note on : **18**

    i) Systems of water supply

    ii) Appurtenances in the distribution system

    iii) Plumbing in building

    iv) Flush and Post type fire hydrant.

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T.E. (Printing) (Semester – II) Examination, 2011
THEORY OF PRINTING MACHINES AND MACHINE DESIGN
(2003 Course)

Time : 4 Hours Max. Marks: 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Black figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables slide rule, Mollier charts, electronics pocket calculator and steam tables is **allowed**.*

*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define the terms related to helical gears **6**

   i) Helix angle

   ii) Circular pitch

   iii) Normal circular pitch

   b) Two mating involute spur gears of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 rpm. The module pitch of the teeth is 12 mm. If the addendum of each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length each, find.

   i) The addendum for pinion and gear wheel;

   ii) The length of arc of contact

   Assume pinion to be driver. **10**

OR

2. a) State the advantages of involute profile as a gear tooth profile. **4**

   b) Derive an expression for the length of the arc of contact in a pair of meshed spur gear. **12**

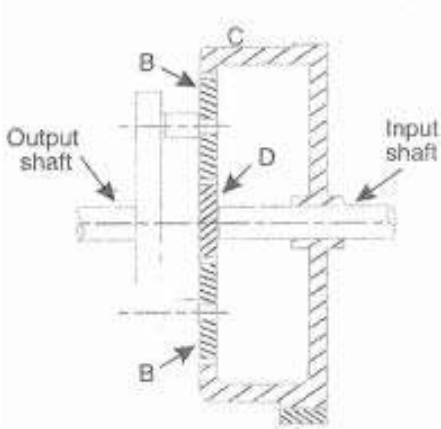
P.T.O.

3. a) What do you understand by gear train ? Discuss the various gear trains. **10**

   b) What are the various types of torques in an epicyclic gear train. **6**

OR

4. In the epicyclic reduction gear, as shown in fig., the sunwheel D has 20 teeth and is keyed to the input shaft. Two planet wheels B; each having 50 teeth, gear with wheel D and are carried by an arm A fixed to the output shaft. The wheels B also mesh with an internal gear C which is fixed. The input shaft rotates at 2100 r.p.m. Determine the speed of the output shaft and the torque required to fix C when the gears are transmitting 30 kW. **16**



5. Draw the profile of a cam operating a roller reciprocating follower and with the following data :

   Minimum radius of cam = 25 mm,

   Lift = 30 mm, Roller diameter = 15 mm.

   The cam lifts the follower for 120° with uniform velocity followed by a dwell period of 30°. Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at a uniform speed of 150 rpm, calculate the maximum velocity and acceleration of the follower during the descent period. **18**

OR

6. What are the different types of motion which a follower can moves. Draw and explain the displacement, velocity and acceleration diagrams for any two follower motions. **18**

SECTION – II

7. a) Compare the Soderberg, Goodman and Gerber Approach for fatigue analysis. **8**

   b) A transmission shaft of cold drawn steel 27 Mn2 (Sut = 500 N/mm^2 and Syt= 300 N/mm^2) is subjected to a fluctuating torque which varies from – 100 N–mm to + 400 N-mm. The factor of safety is 2 and the expected reliability is 90%.

   Neglecting the effect of stress concentration, determine the diameter of the shaft.

   Take K_a = 0.8, K_b = 0.85, K_c = 0.897

   Assume the distortion energy theory of failure. **8**

OR

8. a) What is Stress concentration ? What are its causes and explain the methods of reducing stress concentration ? **8**

   b) Differentiate between the various forms of dynamic loading. **8**

9. A spur pinion having 20 teeth is to mesh with a gear having 43 teeth. The pinion and gear are to be made of plain carbon steels having ultimate tensile strengths of 600 N/mm^2 and 400 N/mm^2 respectively. The pinion is to be driven by a three phase induction motor having a speed of 1440 r.p.m. and 10 kW rating. The starting torque of the motor is twice the working torque. If the surface hardness of the gear pair is to be 400 BHN, design a gear pair with a factor of safety of 1.5.

   Assume velocity factor accounts for the dynamic load.

   Assume 20° full depth involute tooth system.

   Y = 0.484 – (2.87/Z) and b = 10 m

   First choice of std. modules in mm recommended by ISO :

   1, 1.25, 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40.

   K = 0.16[BHN/100]^2 K_a = 2 and K_m = 1. **18**

OR

10. a) Draw the FBD of a spur gear pair and derive the relationship for the various forces acting on them. **8**

    b) Derive the relationship for the beam strength of a helical gear pair. **10**

11. a) Explain the procedure of selection of bearing from manufacturer's catalogue. **12**

    b) Compare ball and roller contact bearings. **4**

OR

12. a) A deep-groove ball bearing having diameter of 60 mm and rotating at 1440 rpm is subjected to a radial force of 2500 N and an axial force of 1200 N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2. If the expected rating life is 25000 hours, calculate the required basic dynamic capacity of the bearing. **8**

    b) Explain bearing life with the help of graph of percentage bearings in operation Vs the bearing life. **8**

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T.E. (Chemical) (Semester – I) Examination, 2011
MASS TRANSFER – I
(Common to Bio-Technology) (2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket, calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Calculate the rate of diffusion of carbon dioxide CO_2 through a membrane of 1 mm thick at 25°C, if partial pressure of CO_2 is 1 cm Hg on one side and zero on other side. Calculate diffusional flux for CO_2, solubility coefficient or Henery law constant is 0.90 cm^3 gas (STP)/Cm^3 atm, The diffusivity is 1.1×10^{-10} m^2/s, (1 std atm = 76 cm Hg pressure). **8**

   b) Explain possible mechanism of diffusion through "crystalline solids" and through "porous solids". **8**

OR

2. a) Calculate the rate of diffusion of NaCl across a film of water (Non diffusing) solution of 2 mm thick at 20°C when the concentration on opposite sides of the film are 25 and 5% by wt NaCl respectively. The diffusivities of NaCl is $1.2\times10^{-5}cm^2/s$ at 20°C. Density of 25 and 5 wt% NaCl at 20°C are 1081 and 1027 kg/m^3. **8**

   b) Derive expression for steady state diffusion of A through non diffusing B. Draw partial pressure gradient diagram for the steady state diffusion of A through stagnant B from distance Z_1 to Z_2. **5**

   c) Explain the term "effective diffusivity" along with equation. **3**

P.T.O.

3. a) With neat sketch explain Higbie's Penetration theory. Discuss in brief limitations of surface renewal theory and film theory. **8**

   b) Explain Chiton Colburn Analogy, write corrosponding dimentionless groups of mass and heat transfer. **8**

OR

4. In absorption of SO_2 from SO_2 - air mixture by means of water in a wetted wall column, equilibrium relationship is as follows :

x (SO_2)	0	0.07	0.21	0.285	0.33	0.385
y (SO_2)	0	0.03	0.12	0.2	0.275	0.42

SO_2 composition in main gas stream is 37% and in main liquid stream is 13%. Equilibrium composition at fixed temperature and pressure condition are 20% in gas phase and 28.5% liquid phase. Calculate overall mass transfer coefficient in gas and liquid phase. All percentage given in mol%. Data individual mass transfer coefficient in gas phase is 1.47×10^{-3} kg moles/ m^2.sec. **16**

5. a) It is desired to absorb 80% of acetone in gas containing 1 mole% acetone in air in counter current stage operation. The total inlet gas flow rate to the tower is 30 kg mole/hr and total inlet pure water flow to be used to absorb the acetone is 90 kg mole H_2O/hr. The process is to operate isothermally at 300 K and total pressure of 101.3 KPa. The equilibrium relationship for acetone (A) in the gas liquid is $Y_A = 2.53X_A$. Determine number of theoretical stages required for separation. **12**

   b) Write a note on absorption with chemical reaction. **6**

OR

6. Write a note on **(any three)** : **18**

   a) Minimum L/G ratio

   b) Absorption and stripping factor

   c) Choice of solvent for absorption

   d) Height equivalent to equilibrium stage.

SECTION – II

7. a) A gas (B) - benzene (A) mixture is saturated at 1 atm 50°C the partial pressure of benzene equals the equilibrium vapour pressure P_A of benzene at 50°C is 275 mm Hg or 0.362 std atm. Calculate the absolute humidity and molal absolute humidity at saturation. **8**

   b) Derive the expression for wet bulb depression, considering a drop of liquid immersed in a rapidly moving stream of unsaturated vapour gas mixture. Also define the terms psychrometric ratio and Lewis relationship. **8**

OR

8. a) For an air-water vapour mixture having dry bulb temperature of 65°C, calculate the wet bulb temperature using the formula for wet bulb depression, Data : absolute humidity ($Y' = 0.0245$ kg Vap./kg dry air, $Y'_w = 0.0365$ kg Vap/kg dry air) λ_w, latent heat of vapourization = 2419.3 kJ/kg, psychrometric ratio = 950 J/kg subscript 'w' indicates at wet bulb temperature. **8**

   b) Explain vapour - liquid equilibrium in Humidification operation. Which are important seven lines are present (Seven different parameter) E.g.% saturation lines (curve), Draw and explain using schematic chart representation. **4**

   c) Explain "Evaporative Cooling" is non adiabatic operation. **4**

9. a) A batch of wet solid is to be dried form 25 to 6% moisture content on wet basis. The initial weight of solid is 160 kg and drying surface is $1m^2$ per 40 kg of dry solid. Determine total time required for drying. Assume $X_C = 0.2$ kg of moisture / kg of dry solid. Use following data of falling rate period. **10**

X	0.2	0.18	0.16	0.14	0.12	0.1
N kg/m².Sec	0.3×10^{-3}	0.26×10^{-3}	0.239×10^{-3}	0.208×10^{-3}	0.18×10^{-3}	0.15×10^{-3}

X	0.09	0.08	0.07	0.064
N kg/m².Sec	0.097×10^{-3}	0.07×10^{-3}	0.043×10^{-3}	0.025×10^{-3}

b) Explain movement of moisture within solid based on capillary movement and unsaturated surface drying. **6**

OR

10. a) A porous solid is dried in a batch dryer under constant drying conditions. 5 hours are required to reduce the moisture content from 30% to 10%. The critical moisture content is found to be 16% and equilibrium moisture content is 2%. All moisture content are dry basis. Assume the rate of drying during the falling rate period is proportional to free moisture content. How long it will take to dry the same solids from 35 to 6% ? **8**

b) Summarize the different terms to describe the moisture content of substance. Describe and plot of types of moisture using moisture content (X axis) Vs relative humidity of gas **4**

c) Draw and explain typical rate of drying curve, under constant drying conditions. **4**

11. a) Describe the following operating characteristics of sieve tray column using following points. Draw the diagram of gas flow rate Vs liquid flow rate to explain satisfactory operation of tray tower

i) Flooding ii) Weeping iii) Coning. **10**

b) Describe various types of packing used in packed tower along with selection criteria of packing. **8**

OR

12. Write a note on **(any three)** : **18**

a) Venturi scrubber

b) Gas pressure drop for counter flow of liquid and gas in random packings

c) Wetted wall tower

d) Sparged vessel and dependancy of gas bubbles on rate of flow thro'orifice.

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T.E. (Chemical) (Semester – I) Examination, 2011
PROCESS INSTRUMENTATION AND INSTRUMENTAL ANALYSIS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic Tables, Slide Ruler, Mollier Charts, Electronic Pocket Calculator and Steam Tables is **allowed**.*
*6) Assume suitable data if **necessary**.*

SECTION – I

1. a) What are transducers ? Explain types of transducers. **8**

   b) Explain all the static characteristics of measuring instruments. **8**

OR

2. a) A thermometer showing a steady temperature of 27°C is suddenly immersed in an oil bath at 160°C. Time constant of thermometer is 7 sec. **8**

   Find :

   i) temperature reading on the thermometer after 7 sec

   ii) time required for 90% response

   iii) time required for temperature reading of 100°C.

   b) Explain the difference between accuracy and precision in an instrument. **8**

3. a) Define temperature and give classification of temperature measuring instruments. **8**

   b) Explain with diagram, construction and working, filled-system thermometers. **8**

OR

4. a) Write note on optical thermometer. **8**
   b) Explain with diagram, construction and working RTD. **8**

5. a) Define pressure and give classification of pressure measuring instruments. **9**
   b) Explain with diagram, construction and working diaphragm. **9**

OR

6. a) Explain with diagram, construction and working calibration of pressure sensors using dead-weight tester. **9**
   b) Explain with diagram, construction and working bellows. **9**

SECTION – II

7. a) Explain with diagram, construction and working orifice meter. **8**
   b) Explain with diagram, construction and working rotameter. **8**

OR

8. a) Explain with diagram, construction and working venturimeter. **8**
   b) Explain with diagram, construction and working vortex-flow meter. **8**

9. a) Explain classification of level measuring instruments. **8**
   b) Write note on buoyancy methods using floats and displacers. **8**

OR

10. a) Explain with diagram, construction and working capacitance method. **8**
    b) Explain with diagram, construction and working radiation method. **8**

11. Describe with diagram the following techniques of composition analysis. **18**
    a) IR absorption spectroscopy
    b) Ultraviolet absorption spectroscopy.

OR

12. Write note on : **18**
    a) HPLC
    b) gas chromatography
    c) liquid chromatography.

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T.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING THERMODYNAMICS – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions *: 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) State and explain fundamental property relations. **6**

   b) The enthalpy of a binary liquid system of species 1 and 2 at fixed T and P is represented by the equation.

   $H = 400\ x_1 + 600\ x_2 + x_1x_2\ (40\ x_1 + 20\ x_2)$

   where H is in J/mol. Determine expressions for $\overline{H}_1$ and $\overline{H}_2$ as functions of x_1, numerical values for the pure species enthalpies and numerical values for the partial enthalpies at infinite dilution $\overline{H}_1^{\infty}$ and $\overline{H}_2^{\infty}$. **10**

   OR

2. a) Derive an equation for estimation of fugacity of any pure component from equation of state. **8**

   b) A 30% by mole methanol-water solution is to be prepared. How many cubic metres of pure methanol (molar volume 40.727×10^{-6} m^3/mol) and pure water (molar volume 18.068×10^{-6} m^3/mol) are to be mixed to prepare 2 m^3 of the desired solution. The partial molar volume of methanol and water in a 30% solution are 38.632×10^{-6} m^3/mol and 17.765×10^{-6} m^3/mol respectively. **8**

3. a) Explain excess properties. **6**

   b) The excess Gibbs energy of a binary liquid mixture at T and P is given by

   $G^E/RT = (-1.2x_1 - 1.5x_2)x_1x_2$

   Find expression for $\ln \gamma_1$ and $\ln \gamma_2$ at same T and P. **12**

   OR

P.T.O.

4. a) The azeotrope of ethanol-benzene system has a composition of 44.8% (mol) ehanol with a boiling point of 341.4 K at 101.3 KPa. At this temperature the vapor pressure of benzene is 68.9 KPa and vapor pressure of ethanol is 67.4 KPa. What are the activity coefficients in a solution containing 10% alcohol ? **9**

   b) At 300 k and 1 bar the volumetric data for a liquid mixture of benzene and cyclohexane are represented by $V = 109.4 \times 10^{-6} - 16.8 \times 10^{-6}\ x - 2.64 \times 10^{-6}\ x^2$, where x is the mole fraction of benzene and V has the units of m^3/mol. Determine the expression for volume change of mixing for the standard state based in Lewis-Randall rule. **9**

5. Binary system acetonitrile (1) /nitromethane (2) confirms closely to Raoults law. Vapor pressures for the pure species are given by the following Antoine equation

$$\ln P_1^{sat} / \text{KPa} = 14.2724 - \frac{2945.47}{T - 49.15}$$

$$\ln P_2^{sat} / \text{KPa} = 14.2043 - \frac{2972.64}{T - 64.15}$$

T is in K.

a) Prepare a graph of P–x–y for a temperature of 348.15 K.

b) Prepare a graph of T–x–y for a pressure of 70 KPa. **16**

OR

6. For the system n-pentane (1) – n heptane (2) the vapor pressures are given by the Antoine equation $\ln P = A - \frac{B}{T - C}$ where P is in KPa, T is in K. The constants are as follows.

Component	**A**	**B**	**C**
n-pentane	13.8183	2477.07	40.00
n-heptane	13.8587	2911.32	56.56

Assuming that the solution formed is ideal calculate

a) The composition of the liquid and vapor in equilibrium at 95 KPa and 336.2 K.

b) The composition of vapor in equilibrium with liquid containing 34% (mol) pentane and the equilibrium pressure of 95 KPa.

c) Total pressure and the vapor composition in equilibrium with a liquid of composition $x_1 = 0.44$ at T = 333.2 k. **16**

SECTION – II

7. a) Write short notes on
   i) Liquid-liquid equilibria
   ii) Solid-liquid equilibria. **8**

   b) Explain the different criteria of phase equilibrium with relevant equations. **8**

OR

8. a) Derive Clausius-Clapeyron equation using the criteria of phase equilibrium. **8**

   b) Explain following two methods of consistency tests : **8**
   i) Using coexistence equation
   ii) Using partial pressure data.

9. a) Deduce the relationship between mole fraction of species and the extent of reaction for multiple reactions. **8**

   b) Estimate the standard free energy change and the equilibrium constant at 700 k for the reaction.

   $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

   The standard heat of formation and standard free energy of formation of ammonia at 298 K are – 46,100 J/mol. and – 16,500 J/mol. The specific heat data are given below

   for N_2 : $Cp = 27.27 + 4.93 \times 10^{-3} T$

   for H_2 : $Cp = 27.01 + 3.51 \times 10^{-3} T$

   for NH_3 : $Cp = 29.75 + 25.11 \times 10^{-3} T$ **10**

OR

10. a) Calculate the equilibrium constant at 298 K for the reaction $N_2O_4(g) \rightarrow 2NO_2(g)$ Given that the standard free energies of formation at 298 K are 97540 J/mol for N_2O_4 and 51,310 J/mol for NO_2. **8**

b) Develop expressions for the mole fractions of reacting species as functions of the reaction coordinate for

i) A system initially containing 2 mol NH_3 and 5 mol O_2 undergoing the reaction $4\ NH_3\ (g) + 5\ (O_2)\ g \rightarrow 4NO\ (g) + 6H_2O\ (g)$.

ii) A system containing 3 mol H_2S and 5 mol O_2 initially and undergoing the reaction $2H_2S\ (g) + 3O_2(g) \rightarrow 2H_2O\ (g) + 2SO_2\ (g)$. **10**

11. a) Explain phase rule and Duhems theorem for reacting system. **6**

b) In the synthesis of ammonia stoichiometric amounts of nitrogen and hydrogen are sent to a reactor where the following reaction occurs.

$N_2 + 3H_2 \rightarrow 2\ NH_3$

The equilibrium constant for the reaction at 675 K may be taken equal to 2×10^{-4}.

i) Determine the percent conversion of nitrogen to ammonia at 675 K and 20 bar.

ii) What would be the conversion at 675 K and 200 bar ? **10**

OR

12. a) A mixture of 1 mol CO and 1 mol water is undergoing the water gas shift reaction at a temperature of 1100 K and a pressure 1 bar. The equilibrium constant for the reaction is K = 1. Assume that the gas mixture behaves as ideal gas. Calculate

i) The fractional dissociation of steam

ii) The fractional dissociation of steam if the reactant steam is diluted with 2 mol nitrogen. **9**

b) For the reaction $SO_2(g) + \frac{1}{2} O_2(g) \rightarrow SO_3(g)$ in equilibrium at 900 K, what pressure is required for a 90% conversion of SO_2 if the initial mixture is equimolar in the reactions ? Assume ideal gases. Data :

ΔG^0_{298} for SO_2 = – 300,194 J/mol.

ΔG^0_{298} for SO_3 = – 371,060 J/mol. **7**

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T.E. (Chemical) (Semester – II) Examination, 2011
MASS TRANSFER – II (Common to Biotechnology)
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
4) Your answers will be valued as a whole.
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) **Assume** suitable data, **if necessary**.*

SECTION – I

1. a) Derive the Rayleigh equation for differential distillation. **6**

   b) A mixture of 35 mole % A and 65 mole % B is to be separated in a fractionating column. The concentration of A in the distillate is 93 mole % and 96% of all product A is in the distillate. The feed is half vapour and the reflux ratio is to be 4.0. The relative volatility of A to B is 2.0. Calculate the number of theoretical plates in the column and locate the feed plate. **12**

OR

2. a) Compare azeotropic and extractive distillation. **6**

   b) A mixture of benzene and toluene containing 40 mole percent benzene is to be separated to give a product of 90 mole percent of benzene at top and a bottom product with not more than 10 mole percent benzene. Using an average value of 2.4 for the volatility of benzene relating to toluene, calculate the number of theoretical plates required at total reflux. Also calculate the minimum reflux ratio, if the feed is liquid and at its boiling point. **12**

3. a) A solution containing 5% acetaldehyde and 95% toluene is to be extracted with water in five stage cross current extraction unit to extract acetaldehyde. Toluene and water are essentially insoluble. If 25 kg of water each time are used per 100 kg of feed, calculate the amount of acetaldehyde extracted and final concentration of exit solution.

   The equilibrium relationship is given as

   $Y = 2.20\ X$

   where $Y = \frac{\text{kg acetaldehyde}}{\text{kg water}}$, $X = \frac{\text{kg acetaldehyde}}{\text{kg toluene}}$ **12**

   b) Explain the selection criteria for solvent for liquid-liquid extraction. **4**

OR

P.T.O.

4. a) Describe the principle and operation of continuous counter current multistage liquid-liquid extraction. **10**

   b) Explain triangular diagram. **6**

5. a) Experiments on decolorization of oil yielded the following equilibrium relationship $y = 0.5\ x^{0.5}$.

   y = gm of colour removed/gm of adsorbent

   x = colour in the oil gm of colour/1000 gm of colour-free oil

   100 kg oil containing 1 part of colour to 3 parts of oil is agitated with 25 kg of the adsorbent. Calculate the % of colour removed if

   a) all 25 kg adsorbent is used in one step

   b) 12.5 kg adsorbent is used initially, followed by another 12.5 kg of adsorbent. **12**

   b) Explain different types of industrial adsorbents. **4**

OR

6. A solution of washed raw can sugar ia coloured by the presence of impurities. It is to be decolourized by treatment with an adsorptive carbon in a contact filtration plant. The data for an equilibrium isotherm is given below. The original solution has a colour concentration of 9.6 measured on a arbitrary scale and it is desired to reduce the colour to 0.96. Calculate the necessary dosage of fresh carbon per 2000 kg solution.

   a) For a single stage process

   b) For a three stage counter current operation.

Kg carbon / Kg solution	0	0.001	0.004	0.008	0.02	0.04
Equilibrium colour	9.6	8.6	6.3	4.3	1.7	0.7

16

SECTION – II

7. Flaked soyabeans are to be leached with hexane to remove the soyabean oil. The flakes in layer form are fed onto a slowly moving perforated endless belt that passes under a series of continuously operating sprays. As the solid passes under each spray, it is showered with liquid. The showered liquid percolates through a solid, collects in a through below and is recycles to the spray by means of pump. The sprays are spaced in such a way that the solid leaving a spray is permitted to drain for a period of 6 min. before it reaches the next spray. The solvent also passes from trough to trough in counter current fashion with respect to a moving belt and hence maintaining truly continuous counter current stagewise operation with each spraying and draining constituting a stage.

   It is found that the flakes retain solution after 6 min. drain time to an extent depending upon the oil content of the solution. The solution retained as function of oil concentration (entrainment) data are as follows :

Solution composition weight % oil in solution	0	20	30
Solution retained kg solution/kg insoluble solid	0.58	0.66	0.70

   The soyabean flakes entering the unit contain 20% oil by weight and are to be leached to 1% oil (on solvent-free basis). The net forward flow of solvent to be 1 kg hexane introduced as a fresh solvent is free of oil. The solvent draining from the flakes is generally free of solid except in the first stage : The rich miscella contains 10% of the insoluble solid in the feed as a suspended solid, which falls the perforations of the belt during loading. Determine graphically theoretical stages required. **18**

OR

8. a) Derive an expression for the determination of number of stages required in case of multistage counter current leaching. **12**

   b) Write short note on factors affecting solid-liquid extraction. **6**

9. a) A hot solution containing 5000 kg of Na_2CO_3 and water with a concentration of 25% by weight Na_2CO_3 is cooled to 293 k (20°C) and crystals of Na_2CO_3. 10 H_2O are precipitated. At 293 k (20°C) , the solubility is 21.5 kg anhydrous Na_2CO_3 per 100 kg of water. Calculate the yield of Na_2CO_3 crystals obtained if 5% of the original water in the system evaporates on cooling. **12**

Atomic weight : Na = 23, C = 12, O = 16, H = 1

b) State and explain working principles of vacuum crystallizer. **4**

OR

10. a) Describe methods of supersaturation and state Miers's supersaturation theory. **10**

b) Explain effects of temperature on solubility with neat diagram. **6**

11. a) Explain electrodialysis with neat sketch. **6**

b) Define nanofiltration and give industrial applications. **6**

c) State membrane material selection criteria. **4**

OR

12. a) Explain with neat sketch hollow fibre membranes for gas permeation. **8**

b) What are the various membrane modules ? Define membrane fouling. **6**

c) State and explain general membrane equation. **2**

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T.E. (Petroleum Engineering) (Semester – II) Examination, 2011
PROPERTIES OF RESERVOIR ROCKS AND FLUIDS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections must be written in **separate** answer books.*
*2) Question No.**1** (one) and No.**7** (seven) is **compulsory**.*
*3) Attempt **three** questions from **each** Section.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Neat** diagrams should be drawn **wherever** necessary.*
*6) **Use** of non-programmable calculator is **allowed**.*
*7) Assume suitable data if **necessary**.*

SECTION – I

1. Derive the linear flow equation for turbulent gas flow. **18**

2. Write an essay on stress on rock properties. **16**

3. Define Rs, Bo, co, μo, Bg, μg, cg, Bw, cw and explain each with a variation in pressure. State SI units of each and their approximate range. **16**

4. a) Define permeability and explain Klinkenberg effect. **6**

   b) Write a note on relative premeability. **5**

   c) Derive an expression for gas flow in porous media. **5**

P.T.O.

SECTION – II

5. a) Draw and explain PV, PT, P-x, P-density diagrams for a single, dual and multi component system. **10**

   b) Explain flash and differential liberation process. **6**

6. a) What are K values ? Explain. **8**

   b) Explain in detail how a flash calculation is done. **8**

7. a) Derive the Platcau equation and explain its significance. **9**

   b) Explain one method to measure capillary pressure. **9**

8. Derive the Sauve EOS in terms of Z. What is Zv and Zl ? **16**

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[3963] – 112

T.E. (Petrochemical) (Semester – I) Examination, 2011
MATHEMATICS FOR PETROCHEMICAL ENGINEERS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** answer books.*

*2) In Section **I**, attempt Q.No.**1** or Q.No.**2**, Q.No.**3** or Q.No.**4**, Q.No.**5** or Q.No.**6**. In Section **II**, attempt Q.No.**7** or Q.No.**8**, Q.No.**9** or Q.No.**10**, Q.No.**11** or Q.No.**12**.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) Figures to the **right** indicate **full** marks.*

*5) Use of non-programmable electronic pocket calculator is **allowed**.*

*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) A company manufactures three types of products A,B,C. The production department produces each day components sufficient to make 50 units of A, 25 units of B and 30 units of C. The company wishes to optimise the daily production, where only 100 man-hours are available daily to assemble the products, given the following information :

Product	**Profit contribution per unit of product**	**Assembly time per product per hour**
A	12	1
B	20	2
C	45	3

The company has a daily order committment for 20 units of product A and a total of 15 units of products B and C. Formulate a LP model, to maximise the total profit. **6**

P.T.O.

b) Solve the following LP problem :

Maximise $Z = 2x_1 + x_2 – 3x_3$,

Subject to the constraints :

$x_1 + x_2 – x_3 \leq 7$

$3x_1 – x_2 + 2x_3 \leq 13.$ **10**

OR

2. a) Find all basic solutions for the system of equations :

$x_1 + 2x_2 + 3x_3 = 4$

$2x_1 + 3x_2 + 5x_3 = 7.$

State which are

i) basic feasible solutions

ii) non-degenerate solutions. **6**

b) Solve the following LP problem :

Minimize $Z = 2x_1 + 8x_2$, subject to the conditions :

$5x_1 + 2x_2 \geq 30,$

$2x_1 + 2x_2 \geq 14$

$x_1 + 4x_2 \geq 12.$ **10**

3. a) Solve the following assignment problem to minimize the cost :

	I	**II**	**III**	**IV**	**V**
A	41	72	39	52	25
B	22	29	49	65	81
C	27	39	60	51	40
D	45	50	48	52	37
E	29	40	45	26	30

6

b) The cost of transporting the product from various sources to various destinations is given in the table below :

	D_1	D_2	D_3	D_4	Capacity
S_1	27	23	31	69	150
S_2	10	45	40	32	40
S_3	30	54	35	57	80
Demand	90	70	50	60	

Find the optimum solution, to minimize the cost, using Vogels Approximation method. **10**

OR

4. a) Four salesmen are assigned to four counters in a shop. Each person can handle any counter. The service hours of each counter, when manned by each salesman is given below :

		Salesmen			
		A	**B**	**C**	**D**
Counters	**P**	51	72	38	62
	Q	22	29	49	65
	R	37	39	50	51
	S	45	50	48	62

How should the salesmen be allocated to appropriate counters, so as to minimise the service time ? Each salesman can handle only one counter. **6**

b) Solve the following transportation problem, using Vogel's Approximation method :

		Warehouse				
		a	b	c	d	**Requirement**
Customer	**A**	8	9	6	3	**18**
	B	6	11	5	10	**20**
	C	3	8	7	9	**18**
	Supply	**15**	**16**	**12**	**13**	

10

5. a) The age and blood pressure of 10 persons are given below :

Age :	56	42	36	47	49	42	60	72	63	55
B.P. :	147	125	118	128	145	140	155	164	149	150

Find :

i) Correlation coefficient

ii) Estimate the blood pressure of a person whose age is 45 years. **8**

b) In a binomial distribution, consisting of 5 independent trials, probability of obtaining 1 and 2 successes are 0.4096 and 0.2048 respectively. Find the mean and standard deviation of the distribution. **5**

c) A company manufacturing staple pins markets its products in packets of 1,000 and there is a small chance of 0.001 of a staple pin to be defective. The company guarantees not more than 4 defective pins in each packet. What is the probability that a packet will fail to meet the guarantee ? If the company sells 10,000 packets, what is the expected number of guarantee claims ? **5**

OR

6. a) Find the mean and standard deviation of the distribution :

Marks :	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
No. of students :	12	18	35	42	50	45	20	8

6

b) In a certain examination, the average marks obtained were 50%, while standard deviation was 5%. If 2000 candidates appeared for the examination, how many obtained more than 60%, assuming that the marks were distributed normally ? (Area corresponding to z = 2 is 0.4772). **6**

c) Fit a Poisson distribution to the following data and test the goodness of fit by applying the χ^2 test :

x	**f**
0	155
1	157
2	58
3	22
4	8

($\chi^2_{3,\,0.05} = 7.815$). **6**

SECTION – II

7. a) With usual notations prove the following :

i) $\Delta^2 y_2 = \nabla^2 y_4$

ii) $\nabla\Delta = \Delta - \nabla = \delta^2$

iii) $(E^{½} + E^{-½})\,(1+\Delta)^{½} = 2 + \Delta$. **9**

b) The following table gives the specific heat of ethyl alcohol at different temperature. Estimate the specific heat corresponding to 15° C and 45° C.

Temp. (x°C)	0	10	20	30	40	50
Sp. heat (y)	0.51	0.55	0.57	0.59	0.62	0.67

8

OR

8. a) Using Stirling's formula compute y(35) given that y(10) = 600, y(20) = 512, y(30) = 439, y(40) = 346 and y(50) = 243. **8**

b) Find the value of $\log 2^{1/3}$ from $\int_0^1 \frac{x^2}{1+x^3}\,dx$ using Simpson's $\frac{1}{3}$ rule with h = 0.25. **9**

9. a) Find the root of the equation $e^x = 2x + 1$, correct to 4 places of decimals, using Newton-Rapson method. **8**

b) Solve the following system of equations by Guass-Seidel method

$$50x_1 + 2x_2 - 3x_3 + 6x_4 = 190$$
$$3x_1 + 65x_2 + 2x_3 + x_4 = 80$$
$$-x_1 + x_2 + 33x_3 + 3x_4 = 60$$
$$x_1 - 3x_2 + 2x_3 - 55x_4 = 60.$$

8

OR

10. a) Fit a second degree parabola by taking x as the independent variable.

x	0	1	2	3	4
y	1	5	10	22	38

8

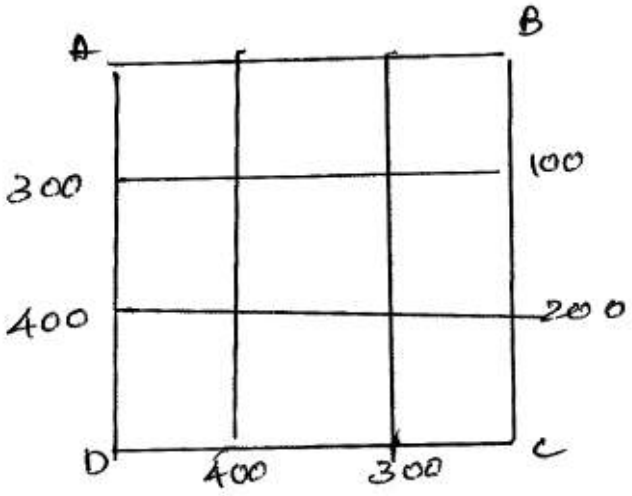
b) Solve the following equations using any iteration method :

$$3x + 4y + 15z = 54.8$$
$$x + 12y + 3z = 39.66$$
$$10x + y - 2z = 7.74$$

8

11. a) Use Runga-Kutta method of fourth order to solve $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$ to find the value $y(0.1)$ and $y(0.2)$. **9**

b) Solve the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the following square mesh with boundary values as shown below in the figure. (Use symmetry). **8**



OR

12. a) Use modified Euler's method to solve $\frac{dy}{dx} = x - y^2$, $y(0) = 1$ to calculate $y(0.4)$ taking $h = 0.2$. **8**

b) Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2} = -4(x^2 + y^2)$ over the square mesh with sides $x = 0$ $y = 0$ $x = 3$, $y = 3$ with $u = 0$ on the boundary and mesh length of unit 1. **9**

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T.E. (Petrochemical Engineering) (Semester – I) Examination, 2011
PROCESS AND ANALYSIS INSTRUMENTATION
(2003 Course)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Attempt Q.**1A** or **B**, Q.**2A** or **B**, Q.**3A** or **B**, Q.**4A** or **B**, Q.**5A** or **B**, Q.**6A** or **B**.*

*2) Figures to the **right** indicate **full** marks.*

*3) **Use** of electronic calculators, steam table is **allowed**.*

*4) **Draw** neat sketch **wherever** necessary.*

SECTION – I

1. A) a) Explain the various process lags with example. **6**

   b) Explain the importance of the valve positioner in control valves. **6**

   c) Explain the various components of SCADA. **6**

   OR

   B) a) Explain the various sealing techniques in pressure gauges. **6**

   b) What are the factors to be considered while selecting a control valve ? **6**

   c) Explain servo and regulator control. **6**

2. A) a) Explain the types of measurement uncertainties in detail. **8**

   b) Define : Accuracy, Precision, Repeatability, Reproducibility, Hysterisis, Drift, Fidelity, Dead zone. **8**

   OR

   B) a) Give the classification of the measuring instruments. **8**

   b) What is Strouhal number ? Describe a flow meter using the same. **8**

3. A) a) Write a note on the Resistance Temperature Detectors (RTD). **8**

   b) Explain pressure measurement using enlarged leg manometer. **8**

   OR

P.T.O.

B) a) Explain the various hydrostatic pressure methods for level measurement. **8**

b) A venturimeter with throat diameter 0.065 m and coefficient of discharge 0.95 is used to calibrate a pitot static tube. Air flows through a 110 mm diameter pipe in which the venturi is fitted. The difference in water level in the manometer attached to the venturi is 50 mm. The pitot static tube is placed at the downstream of the venturi. Water manometer attached to it shows a reading of 7 mm. Calculate the flow rate through the pipe and the coefficient of velocity of the pitot tube. Assume the density of air as 1.13 kg/m^3 and that of water as 100 kg/m^3. **8**

SECTION – II

4. A) a) Explain the magnetic susceptibility method for oxygen analysis. **6**

b) Describe UV spectroscopy. **6**

c) Discuss Orsat analysis. **6**

OR

B) a) Explain composition analysis using refractive index method. **6**

b) Describe in brief viscosity measurement. **6**

c) Discuss the various methods of density measurement. **6**

5. A) a) Describe the various sampling techniques. **8**

b) Write a note on Gas Chromatography. **8**

OR

B) a) Classify analysis instruments. **8**

b) Write a note on X ray diffraction method used for composition analysis. **8**

6. A) a) Zirconia cells are now frequently used as oxygen analysis cells, specially in power plants. Describe this method of analysis. **8**

b) Explain the method of analysis using thermal conductivity. **8**

OR

B) a) Discuss total hydrocarbon analysis. **8**

b) Write a note on the mass spectrometer. **8**

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T.E. (Petrochemical Engineering) (Semester – II) Examination, 2011
UNIT PROCESSES IN ORGANICS SYNTHESIS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **any three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Describe with flowsheet the alkali process for manufacture of vinyl chloride monomer. **12**

   b) Describe the photochlorination process for conversion of cyclohexane to chlorocyclohexane. **6**

2. a) Describe with flowsheet the process for manufacture of styrene from ethyl benzene. **12**

   b) Write a note on Biazzi nitrator. **4**

3. a) Describe with flowsheet the process for manufacture of ethanol by fermentation. **12**

   b) Explain DVS along with significance. **4**

4. a) Describe the continuous process for manufacture of aniline from chlorobenzene. **10**

   b) Explain the methods used for working up of sulfonation process. **6**

P.T.O.

SECTION – II

5. a) Describe with flowsheet the process for manufacture of ethyl acetate. **12**

   b) Mention the types of oxidative reactions with examples. **6**

6. a) Describe with flowsheet the liquid phase oxidation process for conversion of acetaldehyde to acetic acid. **12**

   b) Write a note on catalysts used in hydrogenation. **4**

7. a) Describe with flowsheet the process for conversion of benzene to dodecyl benzene. **12**

   b) Explain desulfonation process with significance. **4**

8. a) Write notes on :

      1) Bechamp reduction

      2) Oxynitration

      3) Friedel Crafts alkylation and acylation. **12**

   b) Compare sulphuric acid and sulphur trioxide as agents for sulfonation. **4**

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[3963] – 131

T.E. (Computer/IT) (Semester – I) Examination, 2011
DATABASE MANAGEMENT SYSTEMS
(2003 Course)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*

*2) Neat diagrams must be drawn **wherever** necessary.*

*3) **Black** figures to the right indicate **full** marks.*

*4) Assume suitable data, if **necessary**.*

SECTION – I

1. a)

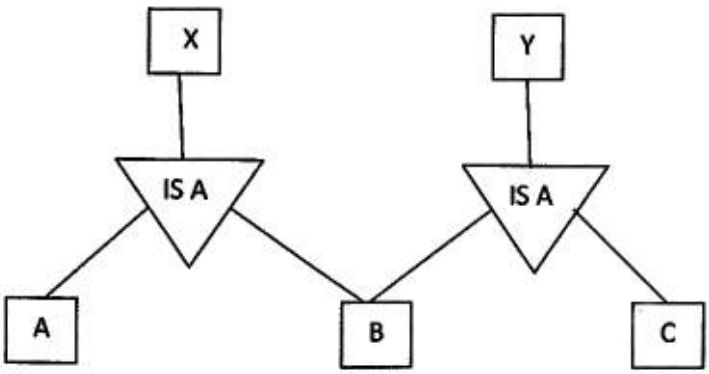

Figure 1

Define specialization, Generalization. Figure 1 shows a lattice structure of generalization and specialization. For entity sets A, B and C, explain how attributes are inherited from the higher-level entity sets X and Y. **6**

b) Explain the distinction between

i) Disjoint and overlapping design constraints.

ii) Condition defined and user defined design constraints. **8**

c) Define primary key, foreign key and unique key constraints with example. **4**

OR

P.T.O.

2. a) A computer institute conducts various courses. For each course there are several batches throughout the day. Every batch has minimum and maximum capacity. The number of students admitted to a batch cannot exceed the maximum capacity. Also for every batch there is a starting date and a student cannot be admitted to the batch after fifteen days to starting of the batch. For each course certain basic qualification is required for a student to get admission. Through out the course time, the institute conducts tests. The result of the student depends on the marks in these tests.
   i) Draw an E-R model (Assume suitable attributes).
   ii) Convert above E-R into relational model, identify all key attributes. **8**

   b) Specify CODDs norms to be satisfied by RDBMS. **6**

   c) We can convert and weak entity set to a strong entity set by simply adding appropriate attributes. Why, then, do we have weak entity sets ? Explain with example. **4**

3. a) Explain the concept of cursor and trigger. How cursor is used in embedded SQL, explain with example. **8**

   b) Consider following schemas :

   Emp(empno, ename, address, dno)

   Dept(dno, dept_name, location)

   Emp_dependents(d_name, relation, age, empno)

   Dept and emp are related as one to many.

   Emp and Emp_dependents related as one to many.

   Write queries using relational algebra.
   i) List the names of dependents for employees whose name starting with ‘a’.
   ii) List the names of employees for dno = 10 who doesn’t have any dependents.
   iii) List the names of employees who are working in the same city as they are staying.
   iv) List the name of employee who is having most dependents. **8**

OR

4. a) Consider relation schemas given in Q.3 b, write queries using SQL. **8**

   b) What is view in SQL and how it is defined ? Discuss the problems that may arise when one attempts to update a view. How are views typically implemented, explain with example. **8**

5. a) Compute the closure of the functional dependencies given for relation schema

   R = (A, B, C, D, E)

   A->BC, CD->E, B->D, E->A

   Also, compute the canonical cover Fc and list the candidate keys for R. **10**

   b) Write the definations of 4 NF and BCNF using the notions of domain constraints and general constraints. **6**

OR

6. a) Specify Armstrong's axioms. Use Armstrong's axioms to prove the soundness of the decomposition rule. **8**

   b) A functional dependency α->β is called a partial dependency if there is a proper subset γ of α such that γ->β. We say that β is partially dependent on α. A relation schema R is in second normal form (2NF) if each attribute A in R meets one of the following criteria :

   - It appears in a candidate key.
   - It is not partially dependent on a candidate key.

   Show that every 3 NF schema is in 2 NF. (Hint : Show that every partial dependency is a transitive dependency). **8**

SECTION – II

7. a) Explain the basic steps involved in query processing. What is the role of relational algebra in query processing ? **8**

   b) Discuss the techniques for allowing a hash file to expand and shrink dynamically. What are the advantages and disadvantages of each ? **8**

OR

8. a) Explain the structure of B+ tree. Explain insertion and deletion operation in B+ trees using suitable example. **8**

b) What are the reasons for having variable length records ? Explain the implementation of variable length record using fixed-length representation in detail. **8**

9. a) What do you understand by serializable and non-serializable schedule ? How would you test whether the given schedule S is conflict serializable schedule ? **8**

b) Discuss the problems with concurrency. Describe any two methods based on locks to control concurrency. **8**

c) Explain multiple granularity. **2**

OR

10. a) How does the recovery take place in case of log file based deferred database modification scheme ? What is the log file structure used ? **8**

b) Discuss how serializability is used to enforce concurrency control in a database system. Why is serializability sometimes considered to restrictive as a measure of correctness for schedules ? **8**

c) Draw the state diagram representing various transaction states. **2**

11. a) What is a fragment of a relation ? What are the main types of fragments ? Why is fragmentation a useful concept in distributed database design ? **8**

b) Explain in detail ODMG language constructs for object definition and object manipulation. **8**

OR

12. a) Explain the various issues the decide the time cost of communication between client and server. **8**

b) Explain how objects are stored in the relational database. **8**

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[3963] – 14

T.E. (Mechanical) (Semester – I) Examination, 2011
INDUSTRIAL ENGINEERING AND MANAGEMENT
(2003 Course)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) State and explain any six tools and techniques used in Industrial Engineering. **6**

   b) Differentiate between time study and work sampling. **4**

   c) State and explain the six process chart symbols used in method study. Draw two hand process chart for assembly of a nut, bolt with washer. **6**

OR

2. a) Define “Industrial Engineering” and state the functions of Ind. Engg. Dept. in industry. **6**

   b) Define “method study” and state its importance as a part of work study. Also list the various steps in method study. **4**

P.T.O.

c) The observer time and performance ratings for five elements in a work study are given below. Compute standard time per piece assuming rest and personal allowance as 12% and contingency allowance as 3% of basic time. **6**

Element	1	2	3	4	5
Observer time (min.)	0.2	0.07	0.4	2.4	0.2
Rating %	85	80	90	80	85

3. a) Explain the man-machine system and its three aspects. **6**

   b) Define Ergonomics and state its importance in the industry and design of a product. **4**

   c) Describe the four factors to be considered for design of "workspace". **6**

OR

4. a) Explain the ergonomic considerations in design of a product. **6**

   b) Define "Anthropometry" and explain its two types. **4**

   c) What is percentile ? Why it is necessary to use percentile in design of some products ? **3**

   d) Sketch the maximum and normal hand capacities for a seated person in a given area. **3**

5. a) Define 'Management'. Explain the principles of scientific management. **6**

   b) Define Leadership. Explain important five qualities of a good leader. **6**

   c) What is 'production' and 'productivity' ? Explain important five techniques to improve productivity. **6**

OR

6. a) Explain the functions of management. **6**

   b) Define "Motivation". Explain the Maslow's theory of needs. **6**

   c) Explain any three forms of Business Organization. **3**

   d) Explain three types of organization structure. **3**

SECTION – II

7. a) Define the cost and give the basis of classification of costs. **8**

   b) Explain the following concept :
      1) Transfer pricing
      2) Capital Evaluation Technique. **8**

OR

8. a) Explain the various costs associated with production. Why it is necessary to analyse the production costs ? **8**

   b) The past data regarding the sales of SPMS for the last five years is given. Using the least square method, fit a straight line, estimate the sales for the year 1996-1997.

Year	1991	1992	1993	1994	1995
Sales	35	56	79	80	40

8

9. a) Explain the factors that influence the location for the following products. Justify your answer.
      1) Textile (cotton) Industries
      2) Steel
      3) Food Processing Industries
      4) Sugar Industries. **8**

   b) State for what applications the following material handling equipments are used. Justify your answer with sketch.
      1) Fork lift truck
      2) Jib crane
      3) Belt conveyor
      4) Roller conveyor. **8**

OR

10. a) Explain in brief significance and scope of facility layout and design in modern industry. **8**

    b) Explain following concept :

    1) Storage and ware housing

    2) Facility services. **8**

11. a) What are the objectives of PPC ? How they are achieved in industry ? **6**

    b) What is sales forecasting ? Explain need for it. **6**

    c) ABC Corporation has got a demand for particular part at 10,000 units per year. The cost per unit is Rs.2 and it costs Rs.36 to place an order and to process the delivery. The inventory carrying cost is estimated at 9 percent of average inventory investment.

    Determine :

    1) Economic Order Quantity

    2) Optimum number of orders to be placed per annum

    3) Minimum total cost of inventory per annum. **6**

OR

12. Write short note on the following (**any three**) : **18**

    1) VED analysis

    2) Demand forecasting

    3) Capacity planning and process planning

    4) FMS

    5) Aggregate planning.

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T.E. (Civil) (Semester – I) Examination, 2011
STRUCTURAL DESIGN – I (New)
(2008 Pattern)

Time : 4 Hours | Max. Marks : 100

Instructions *: 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data, **if necessary**.*
*5) Answer Q.**1** or Q.**2**, Q.**3** or Q.**4** from Section **I** and Q.**5** or Q.**6** and Q.**7** or Q.**8** from Section **II**.*
*6) Use of IS 800:2007 and steel table is **allowed**.*
7) Take fy = 250 MPa and fu = 410 MPa.

SECTION – I

1. a) State the advantages of steel structures. **4**

   b) Define characteristics strength, characteristic stress and partial safety factor. **6**

   c) Design a bouble angle tension member connected on each side of 10 mm thick gusset plate, to carry an axial load of 340 KN. Use M20 black bolts of 4.6 grade. **15**

OR

2. a) Explain the limit state of serviceability in brief. **6**

   b) State the difference between plastic and slender section. **5**

P.T.O.

c) Determine the tensile strength of a roof truss member 2 ISA 90×90×12 mm connected to 12 mm thick gusset plate by M20 black bolts of 4.6 grade as shown in Fig.1. **14**

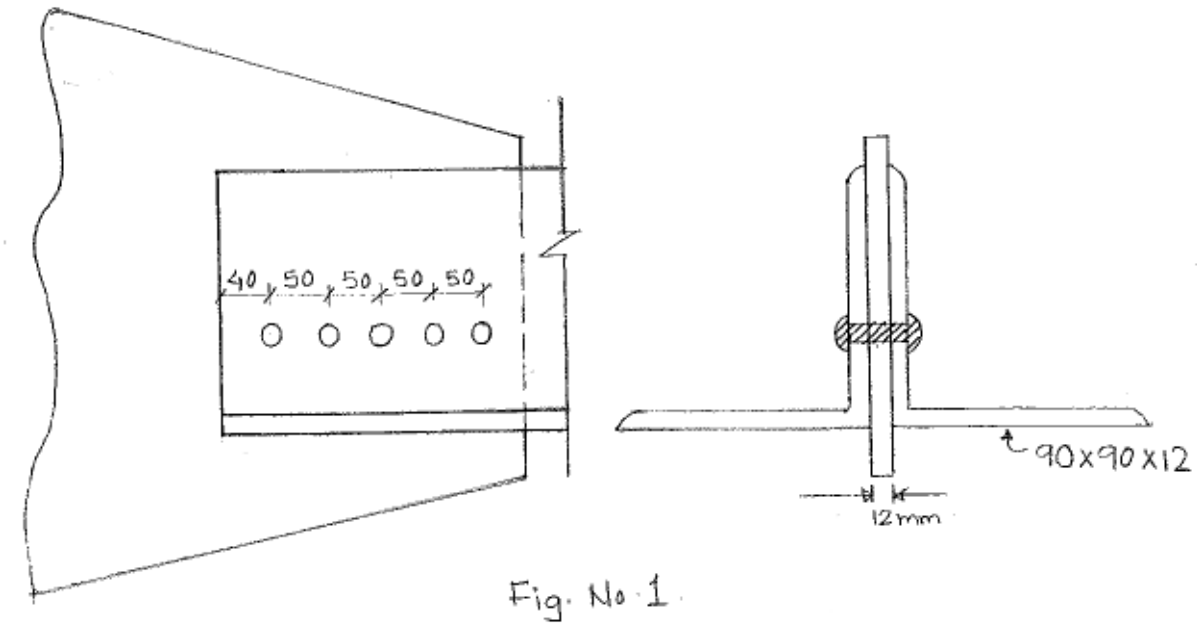

Fig. No 1

3. a) In a truss a strut 4 m long consists of 2 ISA 100×100×8 mm connected to each side of 12 mm thick gusset plate by weld. Calculate the design strength of the member. **13**

b) Design a slab base for a column ISHB 350 @ 661.2 N/m carrying a factored load of 1000 KN. Also design the welded connection between slab base and column. Concrete grade is M20 and steel of Fu410. **12**

OR

4. a) A column 6 m long is effectively held in position and restrained against rotation at both ends, caries a working load of 700 KN. Use beam (I) section for design. Take fy = 250 MPa and Fu = 410 MPa. **10**

b) Design a laced column with 2 channel sections placed toe to toe has an effective length of 8 m carries a factored load of 1800 KN. **15**

SECTION – II

5. a) Design a laterally supported continuous beam of span 7m each carries a working udl of 50KN/m (including self weight) as shown in Fig. 2. **13**

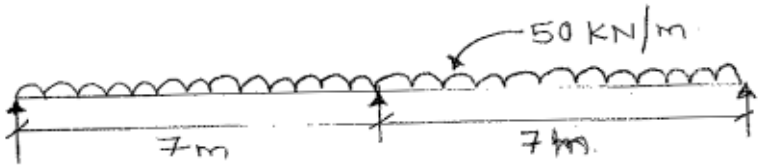

Fig. No. 2

b) Design a simple base plate for a ISHB 300 column to carry a factored load of 700 KN and factored bending moment of 80 KNm. Take grade of concrete M20, Fy = 250 MPa and Fu = 410 MPa. **12**

OR

6. a) Calculate the UDL over a laterally unsupported beam ISLB 400 @ 558.2N/m for a length of 4 m. **13**

b) Two secondary beams ISLB 300 @ 369.8 N/m and ISLB 500 @ 369.8 N/m carrying working reaction of 160 KN and 350 KN respectively connected to the web of the main beam ISWB @1311.6 N/m. Design bolted connection by M20 black bolts of 4.6 grade. **12**

7. a) Design a welded plate girder for an effective span of 28 m and carrying a factored uniformly distributed load of 35 KN/m and factored two concentrated loads of 140 KN acting at 8 m from both ends.
Design flange and web section.
Provide connection between web and flange. **12**

b) Find the panel point loads for dead load, live load and wind load on the compound fink truss as shown in fig. 3.

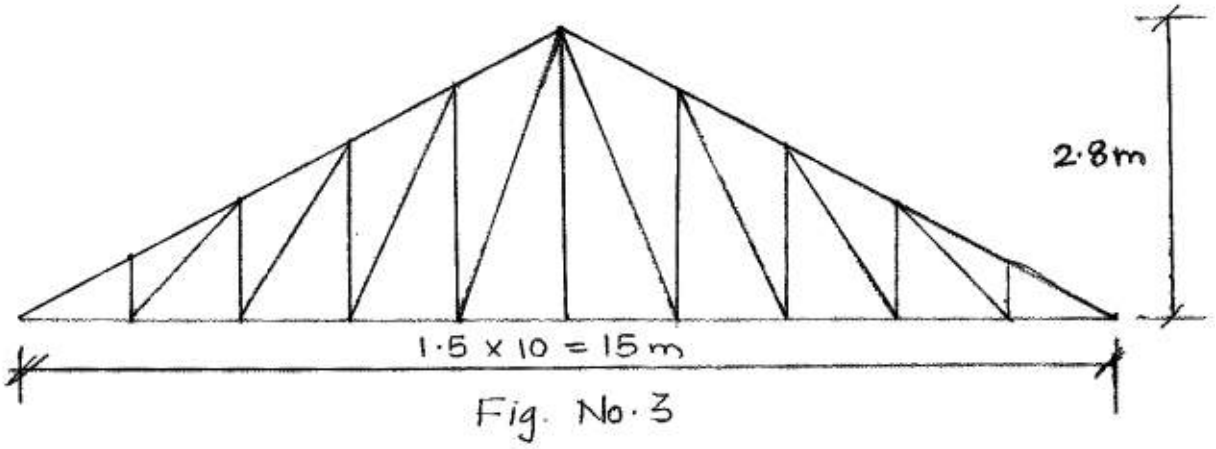

Fig. No. 3

Spacing between the truss is 6 m
The basic wind speed = 39 m/sec, K_1 = 1, K_2 = 0.91, K_3 = 1, Cpe = 0.8, Cpi = $\pm$ 0.5. Use GI sheets. **13**

OR

8. a) Design an end bearing stiffener and find the dimensions of web section for a welded plate girder of length 25 m having maximum factored moment of 7031 KNm and maximum factored shear force of 1125 KN. **10**

b) The truss has 4.0 KN as dead load, 5.0 KN as live load and – 7.0 KN (upward) as wind load on intermediate panel points. Design the member AB and AC as shown in Fig.4. **15**

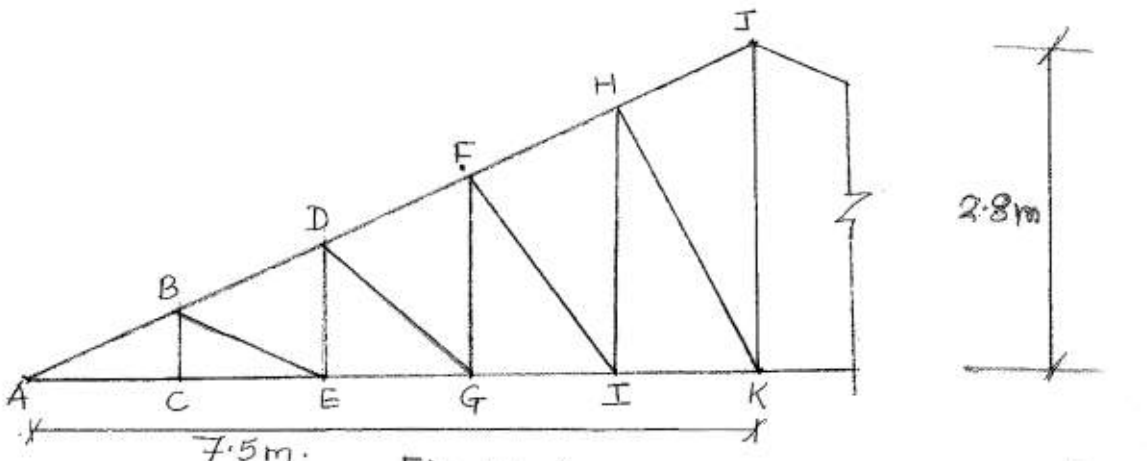

Fig No. 4 Total Span = 15 m

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T.E. (Civil) (Semester – II) Examination, 2011
HYDROLOGY & WATER RESOURCES ENGINEERING (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

Instructions *: 1) Answer **3** questions from **each** Section after considering options.*
*2) **Each** Section should be written in **separate** book.*
*3) Illustrative figures to be drawn to support your answers **wherever** necessary.*
*4) Numbers written on the **right** indicate **full** marks.*
*5) **Use** of calculators is **allowed**.*
*6) **Assume** suitable data if necessary and clearly mention it in your answers.*
*7) **Solve** questions as **1** or **2**; **3** or **4**; **5** or **6** from Section **I** and **7** or **8**; **9** or **10**; **11** or **12** from Section **II**.*

SECTION – I

1. a) Explain different forms of precipitation. **4**

   b) Explain with neat and labeled figure weighing bucket type of raingauge. **6**

   c) Compute and draw DAD curve, and find the average depth of precipitation that may be expected over an area of 2400 sq. km, due to the specific storm which lasted for 24 hrs. Assume the storm centre to be located at the centre of the area. The isohytel map for the storm gave the areas enclosed between different isohyets as follows :

Isohyet (mm)	Enclosed Area (sq.km.)
21	543
20	1345
19	2030
18	2545
17	2955
16	3280
15	3535
14	3710
13	3880
12	3915

8

OR

2. a) What are the WMO recommendations for density of raingauge network. Based on this what are the recommendations by Indian Standard (IS:8389-1983) ? **8**

b) The mass curve of rainfall of duration 100 min is given below. If the catchment has a ϕ index of 0.6 cm/h, calculate the total surface runoff from the catchment.

Time for the start of the rainfall (min)	0	20	40	60	80	100
Cumulative rainfall (cm)	0	0.5	1.2	2.6	3.3	3.5

6

c) In a catchment area covering 100 sq. km. the average annual precipitation observed at five raingauge stations is given as follows. Find the number of additional rain gauge stations required if the permissible error is 10%.

Station	1	2	3	4	5
Precipitation (cm)	75	100	90	65	50

4

3. a) Explain factors affecting runoff. **8**

b) Determine the ordinates of a storm hydrograph resulting from 3 hour storm with rainfall of 2.0, 5.75 and 3.5 during subsequent 3 hrs intervals. The ordinates of unit hydrograph are as given below. Assume initial loss 5 mm, infiltration index 3.0 mm/hr and baseflow of 10 cumec. **8**

Time (hrs)	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
Ordinates of UH (Cusec)	0	110	365	500	390	310	250	235	175	130	95	65	40	22	10	0

OR

4. a) The flow pattern observed at 2 hr intervals corresponding to a 2 hr storm over an area of 450 km^2 is as given below. Find the ordinates of 2h unit hydrograph. Assume constant baseflow of 15 m^3/s. **10**

Time (hr)	0	2	4	6	8	10	12	14	16	18	20	22	24
Flow (m^3/s)	18	110	268	330	270	150	125	80	70	45	37	20	15

b) Explain : **6**

i) Design flood

ii) Standard project flood

iii) Flood attenuation.

5. a) The mean monthly discharge of a reservoir at a proposed dam site is given below. Determine the minimum storage capacity so as to utilize all the available water through uniform regulated rate of release. **8**

Month	J	F	M	A	M	J	J	A	S	O	N	D
Discharge (MCM)	110	100	60	50	35	45	160	200	280	160	120	100

b) Find the life of a reservoir with the initial capacity of 8000 ha-m, if the average annual inflow is 10000 ha-m and the average annual sediment inflow is 2×10^6 kN. Assume sp. weight of sediment as 11.2 kN/m^3. The useful life of a reservoir will terminate when 80% of its initial capacity is filled with sediment. The values of trap efficiency for different values of capacity inflow ratio are as follows. The capacity interval is 20%. **8**

C/I	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
η%	87	93	95	95.5	96	96.5	97	97.3	97.4	97.5

OR

6. a) Define various levels and storages of reservoir. **5**

b) What is apportionment of total cost of reservoir ? Explain various methods of the same. **6**

c) Explain with neat figure how the economic height of the dam is fixed ? **5**

SECTION – II

7. a) Define

i) Cumec day

ii) Hectare metre

iii) Kor depth

iv) Base period

v) C.C.A.

vi) Duty

vii) Paleo irrigation

viii) G.C.A.

ix) Time factor. **9**

b) The following table gives certain data for the three crops. Calculate

i) Calculate Delta for each crop

ii) Volume of water required for each crop

iii) Volume of water to be stored in the reservoir. **9**

Crops	**Base period in days**	**Field Duty in (ha/cumec)**	**Area under crops (ha)**	**Remarks**
Wheat	120	1800	4800	Transit losses = 15% Reservoir Losses = 25%
Sugar Cane	360	800	5600	
Cotton	200	1400	2400	

OR

8. a) Find the frequency of irrigation if

   a) Field capacity of soil = 30%

   b) Permanent wilting percentage = 10%

   c) Mass density of soil = 1300 kg/m^3

   d) Effective depth of root zone = 800 mm

   e) Daily consumptive use of the water for the given crop = 15 mm

   f) Readily available moisture = 75%. **6**

   b) How are crops classified ? State the principal Indian crops and their seasons. Describe the factors affecting the water requirements of the crops. **8**

   c) Enlist all the factors affecting duty of the crop. **4**

9. a) State Dupuit's assumptions. Derive the expression for the discharge from the well through a confined aquifer. **8**

   b) Define Specific Yield, Storage Coefficient, Transmissivity, Water table aquifer. **4**

   c) What is water logging ? State the causes and effects of water logging. **4**

OR

10. a) Write a short note on rotational water supply system. **4**

    b) Explain in short lift irrigation. **6**

    c) Distinguish between : **6**

       i) Pumping test and recovery test

       ii) Artesian well and flowing well

       iii) Storage coefficient and specific yield.

11. a) Explain with neat figures :

    i) Wilting point

    ii) Unconfined aquifer

    iii) Capacity factor

    iv) Delta. **8**

    b) Write the detailed step by step procedure to estimate design discharge at head for design canal. **8**

OR

12. a) Derive the expression for spacing for the tile drain. **4**

    b) What are major, medium and minor irrigation projects ? What are advantages and disadvantages of irrigation ? **6**

    c) Explain in brief methods of application of water. **6**

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T.E. (Civil) (Semester – II) Examination, 2011
STRUCTURAL DESIGN – II (New)
(2008 Pattern)

Time : 4 Hours Max. Marks : 100

***Instructions** : i) Answer Q.**1** or Q.**2**, Q.**3** or Q.**4** in Section – **I**.*

*ii) Answer Q.**5** or Q.**6**, Q.**7** or Q.**8** in Section – **II**.*

*iii) Answer to **two** Sections should be written in **separate** answer books.*

*iv) Figures to the **right** indicate **full** marks.*

*v) **Use** of IS : 456-2000 and non-programmable calculator is **allowed**.*

*vi) Mere reproduction from IS code as answer will **not** be given full **credit**.*

*vii) **Neat** diagrams must be drawn **wherever** necessary.*

*viii) Assume any other data if **necessary**.*

SECTION – I

1. A) Answer the following : **9**

i) Why is limit state method considered more desirable than working stress method ?

ii) What is the difference between singly reinforced and doubly reinforced section ?

iii) What is ultimate load theory ? What is its significance ?

P.T.O.

B) A simply supported beam of size 230 mm wide and 564 mm effective depth is reinforced with 4 number 12 mm diameter bars. The span of beam is 4 m.

Find :

i) Depth of neutral axis

ii) Types of section

iii) Moment of resistance

iv) Uniformly distributed load on beam in addition to its self weight.

Use Material : M20 grade concrete

Fe415 grade reinforcement.

W.S.M. is recommended. **8**

C) A rectangular reinforced concrete beam has a width of 200 mm and is reinforced with 2 bars of 20 mm diameter at an effective depth of 400 mm.

Find :

i) Depth of neutral axis

ii) Type of reinforced section

iii) Moment of resistance.

Materials : M20 grade concrete,

Fe415 grade reinforcement.

L.S.M. is recommended. **8**

OR

2. A) Answer the following **9**

i) Why is the over-reinforced design not preferred ?

ii) What is a balanced design ?

iii) What is a nominal flexural strength of beam ?

B) A rectangular beam has the following details :

i) Size of beam – 230 mm$\times$560 mm effective depth

ii) Compression steel – 3 number 20 mm diameter bars at 40 mm effective cover from top

iii) Tension steel – 3 number 25 mm diameter bars.

Find :

i) Depth of neutral axis

ii) Type of reinforced section

iii) Moment of resistance of section.

Materials : M20 grade of concrete, Fe415 grade of reinforcement.

Method : W.S.M. **8**

C) A tee beam has following details :

i) Width of flange = 1200 mm

ii) Depth of flange = 100 mm

iii) Width of rib = 300 mm

iv) Effective depth = 560 mm

v) Tension steel = 4 number 25 mm diameter bars.

Materials : M20 grade of concrete,

Fe415 grade of reinforcement.

Method : L.S.M.

Find :

i) Position of neutral axis

ii) Type of reinforced section

iii) Ultimate flexural strength. **8**

3. The central line plan of building is as shown in fig. (see page no.6). Classify the slabs structurally and design the slab S_4 and S_5 only for flexure by limit state method. Draw neat sketches showing details of reinforcement.

   Take live load = 4 KN/m^2

   floor finish = 1.5 KN/m^2

   Materials : M20 grade concrete,

   Fe415 grade reinforcement.

   Assume suitable data if required. **25**

   OR

4. Design the I and II flights of a open-well staircase as shown in fig.(see page no.6) with the following data :

   i) No. of risers in I and III flight = 10

   ii) No. of risers in II flight = 6

   iii) Floor to floor height = 3.9 m

   iv) Live load = 4 kN/m^2

   v) Floor finish = 1 kN/m^2

   Materials : M20 grade of concrete,

   Fe415 grade of reinforcement.

   Show detailed load calculations. Draw the reinforcement details in sectional elevation for both flights (I and II). **25**

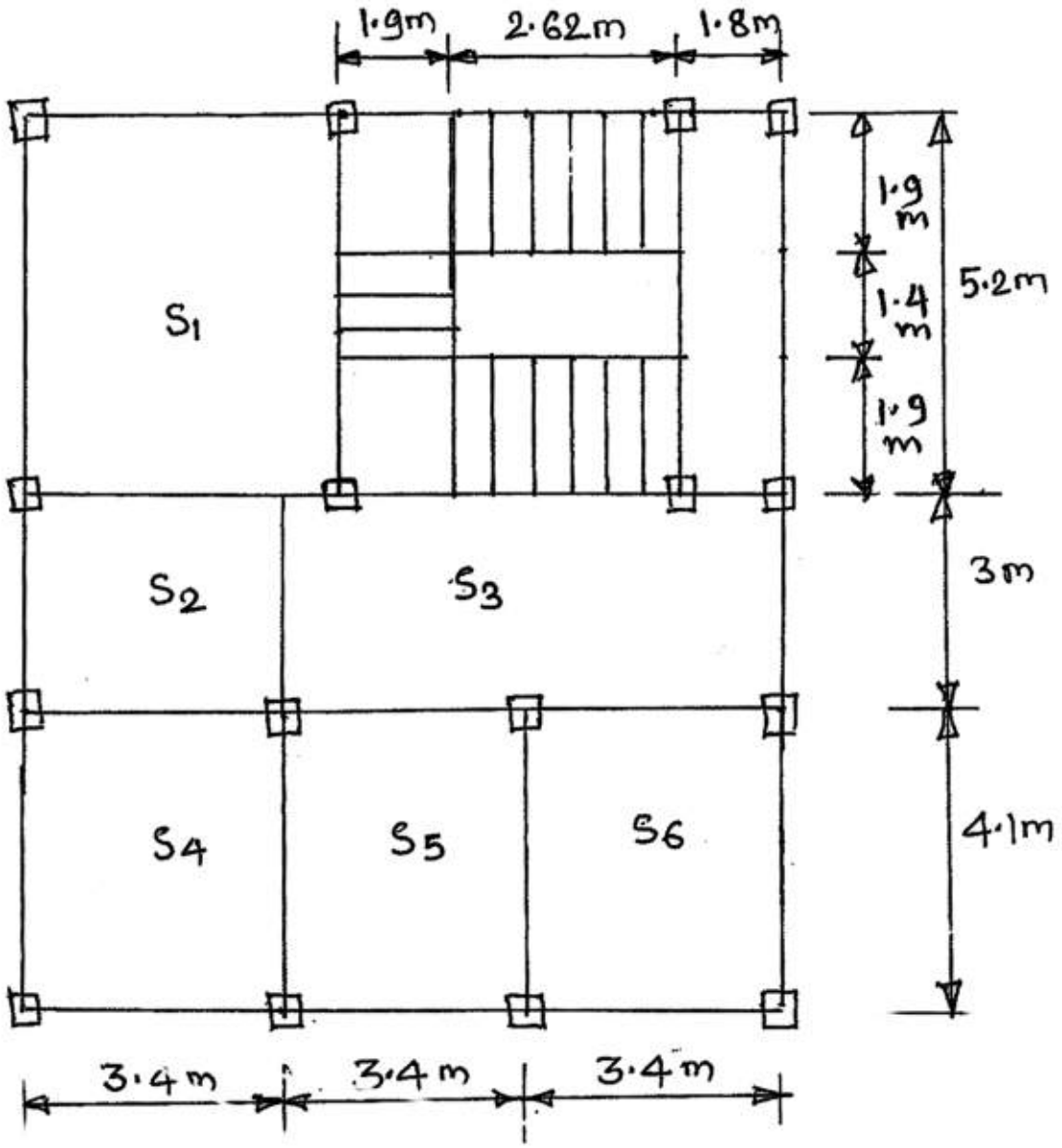


fig. for Q.3 and Q.4.

SECTION – II

5. Answer the following :

a) Explain the term redistribution of moments in RC structures. Enlist its advantages. **6**

b) Explain why minimum shear reinforcement is to be provided in beams in RC structures. **4**

c) Design T beam section by LSM for the following details. Effective simply supported span = 6 m, thickness of top slab = 110 mm, working udl on beam 30 kN/m including its self weight. The beam has to support 230 mm thick wall. Use M20 grade of concrete and Fe415 steel. Sketch all the reinforcement details. **15**

OR

6. a) A RC beam ABC of rectangular section is simply supported at A and C and continuous over support B. Span AB=BC= 4 m. The beam carries dead load (including its self weight) of 20 kN/m and uniformly distributed live load of 28 kN/m. Calculate design moments at central support B and near midspan of AB and BC after 30% redistribution of moments. Draw the design moment envelop. **17**

b) 250 mm wide and of 500 mm effective depth support section of rectangular RC beam is reinforced with 3 bars of 20 mm dia on tension side. Two-legged stirrups of 8 mm dia are provided at a spacing of 200 mm c/c. Calculate the shear strength of the support section. M20 grade of concrete and Fe415 steel is used. **8**

7. Design a short RC column by LSM with material M20 and Fe415 to carry a working load of 600 kN and working moment of 100 kN.m about major axis bisecting the depth of column. Assume the effective length of column as 4.5 m. Also design the footing for this column. Take SBC = 200kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **25**

OR

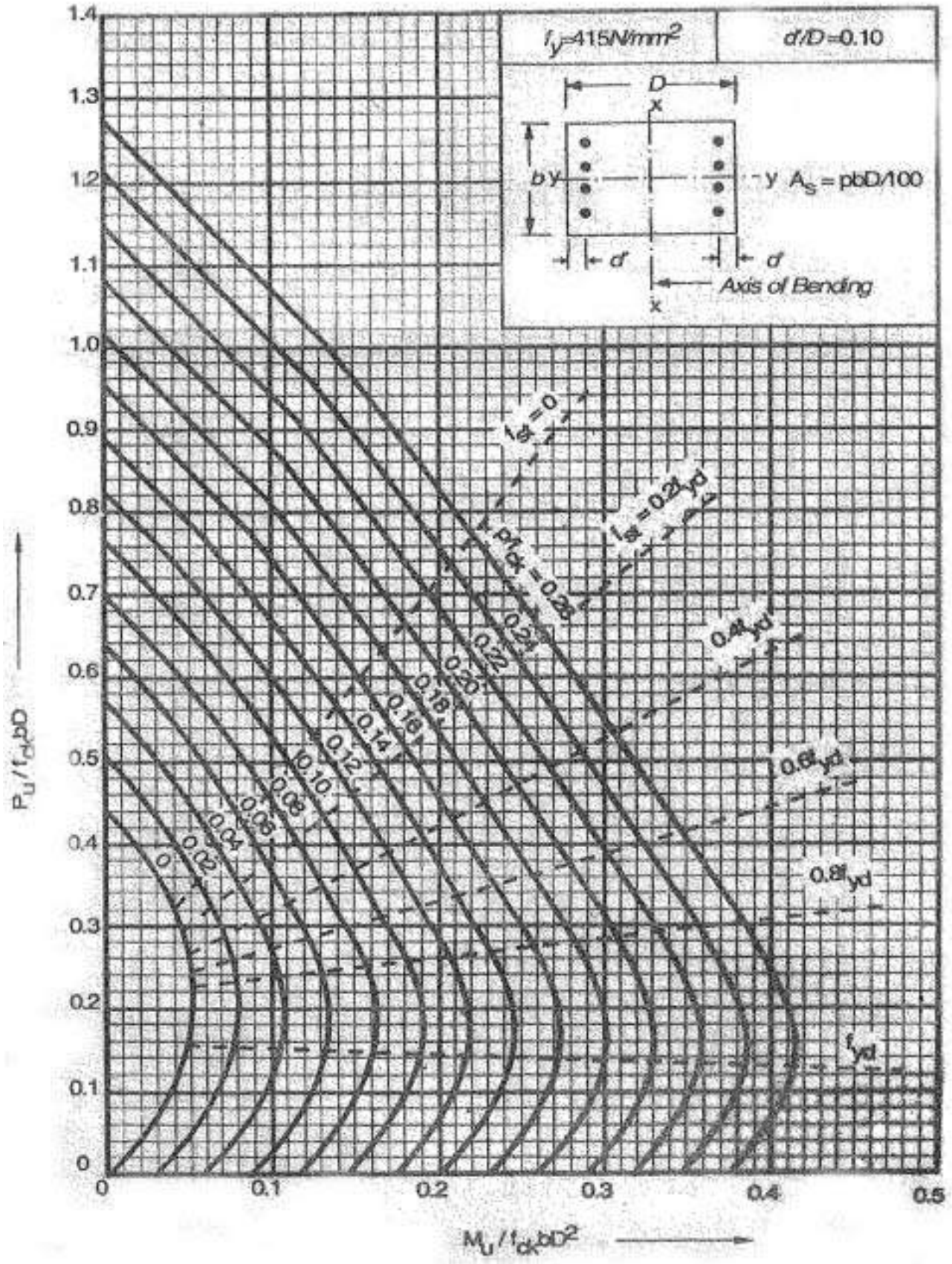
8. a) Explain in brief : **9**

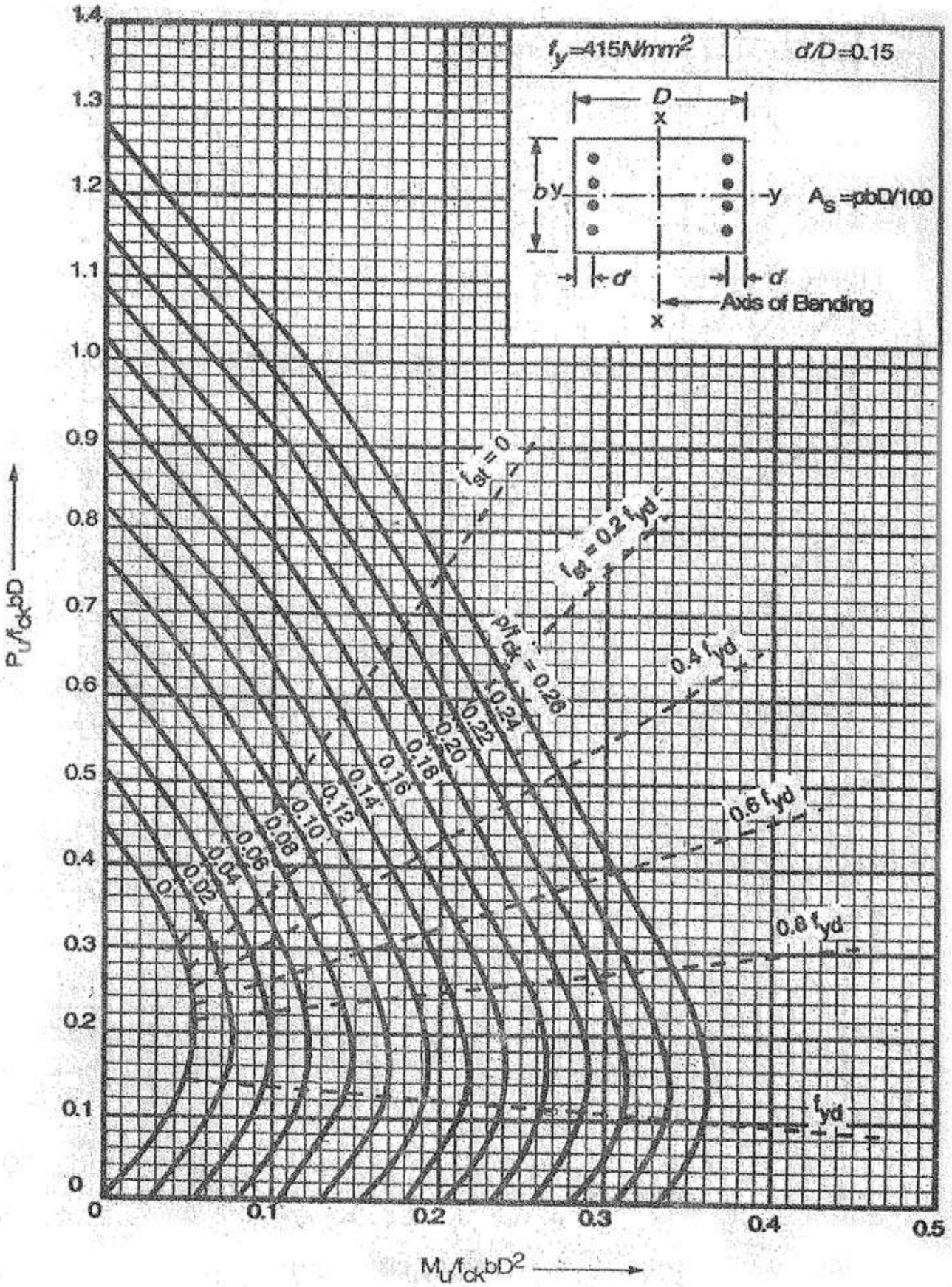
   i) Longitudinal reinforcement in a column

   ii) P_u-M_u interaction diagrams

   iii) Transverse reinforcement in a column.

   b) Design a short column to carry a working axial load of 800 kN and working moments of M_x = 58 kN.m and M_y = 10 kN.m acting about axes bisecting the depth and width of the column respectively. The effective length about X-axis is 4.8 m and about Y-axis is 3.2 m. The unsupported length about both axes is 4 m. Use M 20 grade of concrete and Fe 415 steel. Show detailed design calculations and reinforcement details in plan and sectional elevation. **16**


f_y=415N/mm²
d'/D=0.10
D
x
b
y
A_s = pbD/100
d'
Axis of Bending
$P_u/f_{ck}bD$
$M_u/f_{ck}bD^2$
p/f_{ck} = 0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0
f_{sc} = 0
f_{sc} = 0.2f_{yd}
0.4f_{yd}
0.6f_{yd}
0.8f_{yd}
f_{yd}


f_y=415N/mm²
d'/D=0.15
D
x
b
y
-y
A_s=pbD/100
d'
d'
Axis of Bending
x
$P_u/f_{ck}bD$
$M_u/f_{ck}bD^2$
f_{st} = 0
f_{st} = 0.2 f_{yd}
0.4 f_{yd}
0.6 f_{yd}
0.8 f_{yd}
f_{yd}
p/f_ck = 0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
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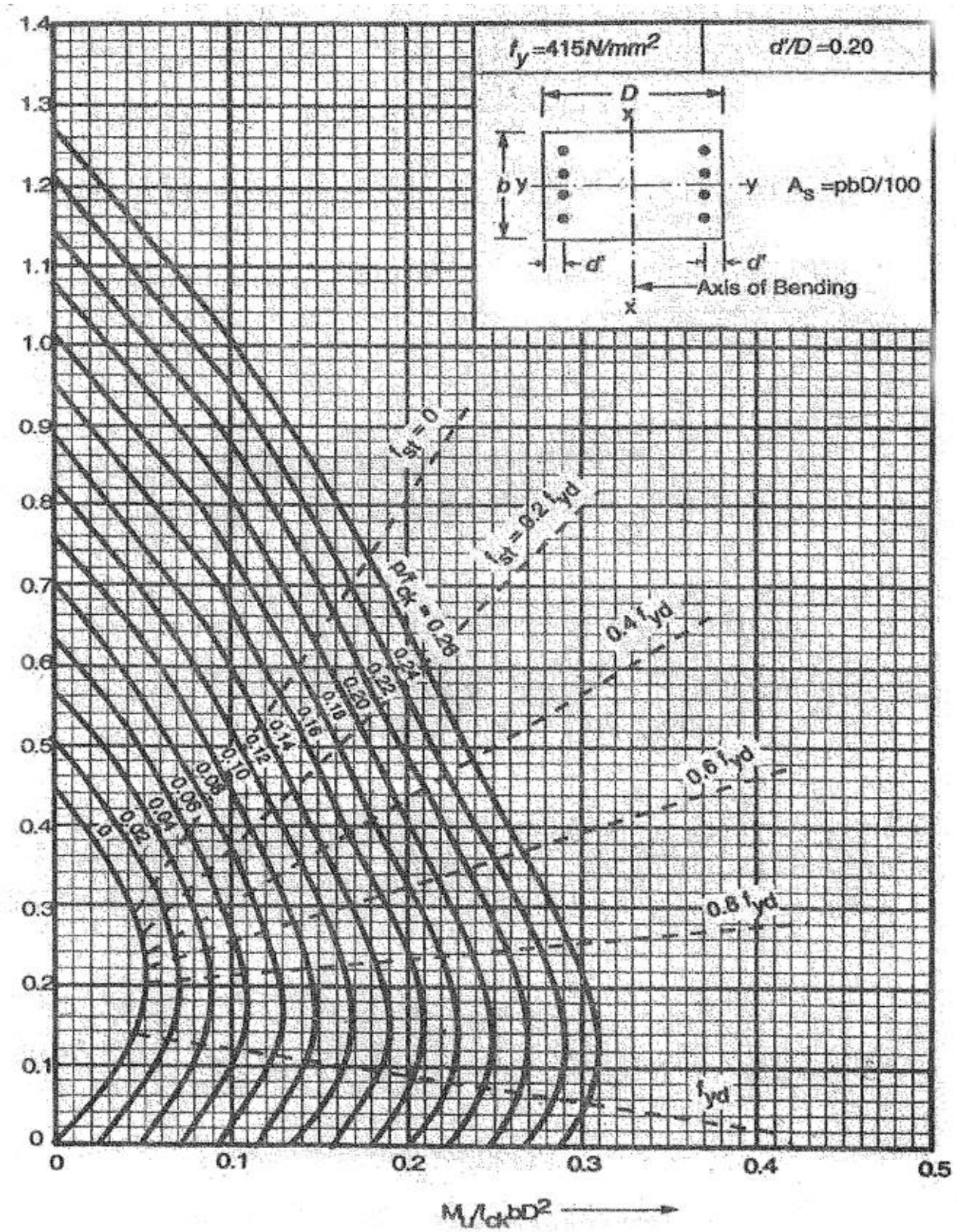
0.3
0.4
0.5


f_y=415N/mm^2
d'/D =0.20
D
b
y
A_s =pbD/100
d'
Axis of Bending
f_{st} = 0
f_{st} = 0.2 f_{yd}
0.4 f_{yd}
0.6 f_{yd}
0.8 f_{yd}
f_{yd}
p/f_{ck} = 0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
0.4
0.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
$M_u/f_{ck}bD^2$

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T.E. (Civil) (Semester – II) Examination, 2011
ENVIRONMENTAL ENGINEERING – I (New)
(2008 Pattern)

Time : 3 Hours | Total Marks : 100

Instructions : *1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Black** figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*
*6) Attempt Q.**1** or Q.**2**, Q.**3** or Q.**4**, Q.**5** or Q.**6** from Section **I** and Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12** from Section **II**.*

SECTION – I

1. a) What are intakes ? Where are these used ? **4**

   b) Give general design considerations in design of intakes. **6**

   c) 200 litres per head per day water is to be supplied to the town. Estimate the domestic water requirements of this town in the year 2020 by projecting the population of the town by the incremental increase method, from the data given below : **8**

Year	Population
1960	2,50,000
1970	4,80,500
1980	5,50,300
1990	6,38,600
2000	6,95,200

OR

2. a) What are different types of pipes available for use in water supply system ? Discuss merits of each. **4**

   b) Give the standards as per IS 10500 of the following for the drinking water

   i) Turbidity ii) Total solids iii) Chlorides

   iv) Sulphates v) Nitrates vi) Fluorides. **6**

   c) Compare the fire demand for a city having population of 1,40,000 using

   i) Kuichling's formula

   ii) Buston's formula

   iii) Freeman's formula

   iv) National Board of Fire under Writer's formula. **8**

3. a) Explain the purpose of aeration in water treatment. What are its limitations ? **4**

   b) What do you understand by treatment of water ? Why is it necessary ? Give an outline of various processes adopted for treatment of water. **6**

   c) Calculate the important dimensions of mixing unit, flocculating unit and settling tank unit intended to treat a design discharge of 13 MLD. Check for important design criteria. **6**

OR

4. a) Describe in brief various types of screens used for screening water. **4**

   b) Write down mathematical expression for gas transfer and discuss the factors by which gas transfer can be optimised. **6**

   c) A coagulation-sedimentation plant clarifies 50 MLD water. The raw water has an alkalinity equivalent of 4 mg/l of $CaCO_3$. The filter alum required at the plant is 20 mg/l. Determine the filter alum and the quick lime (containing 88% to CaO) required per year by the plant. Use the following molecular weights : (Al = 27, S = 32, O = 16, H = 1, Ca = 40, C = 12). **6**

5. a) Explain what do you understand by

   i) Dual media filters

   ii) Mixed media filters. **4**

   b) Explain fully how chlorine reacts with water and mention the rate of various factors and conditions accompanying the reaction. **6**

c) Design six slow sand filter beds from the following data :

Population to be served = 50,000 persons

Per capita demand = 150 lit/head/day

Rate of filteration = 180 lit/hr/sq.m

Length of each bed = Twice the breadth.

Assume maximum demand as 1.8 times the average daily demand also assume that one unit out of six will be kept as standby. **6**

OR

6. a) What are the merits and demerits of the rapid filters as compared with the slow sand filters ? **4**

b) Explain :

i) Pre-chlorination

ii) Post chlorination and

iii) Break-point chlorination. **6**

c) Chlorine usage in the treatment of 25000 m^3/day is 9 kg/day. The residual chlorine after 10 min contact is 0.2 mg/l. Calculate the dosage in miligrams per lit and the chlorine demand of the water. **6**

SECTION – II

7. a) Differentiate between permanent and temporary hardness. How to remove temporary hardness ? **4**

b) Explain the demineralisation process of water softening. Differentiate clearly between a cation exchanger and an anion exchanger. **6**

c) The analysis of a water shows the following : free CO_2 : 3 PPM, alkalinity : 65 PPM, non-carbonate hardness : 90 PPM, total Magnesium : 10 PPM. Assume that it is possible to remove all but 30 PPM of Carbonate hardness with lime and that the finished water is to have total hardness of 80 PPM. Determine the amounts of chemicals required per million litres of water. **8**

OR

8. a) Compare lime soda and zealite process. **4**

b) Explain the adsorption process for odour and colour removal. **6**

c) A sample of raw water contains 200 mg/l hardness as $CaCl_2$ and 75 mg/l hardness as $MgSO_4$. Compute the quantities of lime and soda required to treat 1MLD water. If sloked lime of 85% purity is available in place of pure lime, what will be the required quantity of slaked lime ? **8**

9. a) Write benefits of rain water harvesting system. **4**

b) Describe the various methods of distributing water and discuss the advantages and disadvantages of each. **6**

c) What is a service reservoir ? Give the importance of distribution system. Draw the neat sketch of an elevated tank and show on it all of its component parts and appurtenances. **6**

OR

10. a) Explain methods of Rain Water Harvesting. **4**

b) Write note on the wastage of water in public water supplies. State various methods of detection and prevention of wastage. Enumerate the causes of such wastage. **6**

c) What do you know about Rain Water Harvesting ? Draw a sketch of Roof-Top Rain Water Harvesting system for a bungalow. **6**

11. a) Define following :

i) Noise pollution ii) Air pollution. **4**

b) Explain various techniques used to control noise pollution. **6**

c) Write short note on :

i) Green house effect ii) Acid rain. **6**

OR

12. a) What are the causes and effects of noise induced permanent threshold shaft ? **4**

b) Explain following plume behaviours with sketches :

i) Coning ii) Lofting iii) Trapping. **6**

c) Write short notes on :

i) Electrostatic precipitator ii) Fabric filter. **6**

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[3963] – 220

T.E. (Mechanical Engineering) (Semester II) Examination, 2011
REFRIGERATION AND AIR CONDITIONING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

*4) **Black** figures to the **right** indicate **full** marks.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*6) Assume suitable data, if **necessary**.*

SECTION – I

UNIT – I

1. a) Define : COP, EER, One Ton Refrigeration. **6**

   b) Write a note on 'Magnetic Refrigeration'. **4**

   c) Derive an expression for COP of Bell Colemn cycle. **6**

OR

2. a) Write a note on 'vortex tube refrigeration'. **4**

   b) What are the advantages and limitations of Air Refrigeration Systems ? **4**

   c) A Bell Colemn air refrigeration cycle is working between the pressure of 1 bar and 8 bar. Temperature at the compressor inlet is 20°C and at the inlet to expander is 30°C. Index of compression and expansion is 1.3. Estimate the net work done per cycle, refrigerating effect and COP.

   If the system is designed to produce 10 tons of refrigeration having actual COP as 60% of the theoretical COP, find the actual power required to run the refrigerator. **8**

P.T.O.

UNIT – II

3. a) Derive an expression for COP of an ideal vapour absorption system. **6**

   b) What is under cooling of refrigerant ? Which methods are used to achieve this ? **4**

   c) A vapour compression refrigeration plant operates between evaporator and condenser temperature at – 15°C and 40°C respectively. The refrigerant is dry and saturated at the suction. Discharge temperature of refrigerant is 98°C. The bore and stroke of compressor are 85 mm each. It runs at 750 rpm with volumetric efficiency of 82%. The liquid enters the expansion valve at 32°C. Calculate i) COP ii) Mass flow rate of refrigerant and iii) capacity use following properties of refrigerant.

Saturation Temperature °C	**V_g m^3/kg**	**h_f kJ/kg**	**h_g kJ/kg**	**S_f kJ/kgk**	**S_g kJ/kgk**
– 15	0.24	43.4	458.7	0.18	1.742
40	0.043	131	468.6	0.48	1.567

   Take Cp of liquid refrigerant as 1.62 kJ/kgk. **6**

OR

4. a) Explain actual VCR cycle with the help of T-s diagram. **6**

   b) What is the effect of super heating of refrigerant vapour on COP of VCR cycle ? Explain with the help of p-h and T-s diagrams. **6**

c) In an absorption system heating, cooling and refrigeration takes place at 150°C, 30°C and – 20°C respectively. Find the theoretical COP of the system.

If the generator temperature is increased to 190°C and evaporator temperature is decreased – 30°C, find the percentage change in theoretical COP. **4**

UNIT – III

5. a) Explain : GWP, ODP. **6**

b) Write a note on desirable properties of refrigerants. **6**

c) A two stage ammonia plant is used to achieve a temperature of – 40°C when the ambient temperature is 48°C. The intermediate pressure is 3.4 bar. Calculate the COP and capacity of the system if the flow of refrigerant through the evaporator is 0.5 kg/s. **6**

OR

6. a) Write a note on 'TEWI'. **4**

b) What is a secondary refrigerant ? Name two secondary refrigerants. **3**

c) What are the advantages of cooling refrigerant vapour in between stages of multistage compression ? What are the different methods used to achieve this ? **4**

d) Explain cascade system with a neat sketch and p-h diagram. **7**

SECTION – II

UNIT – IV

7. a) Write a note on 'Evaporative cooling'. **4**

   b) Define : ADP, RSHF, GSHF. **6**

   c) Air at 25°C and 60% RH is supplied to the drug formulation unit. It is conditioned to this state, first by cooling and dehumidifying and then by reheating it. Cooling coil surface temperature is 13°C and ambient conditions are 32°C DBT and 65% RH. If the air supply rate is 15,000 m3/hr, determine :

      i) Cooling coil capacity in TR

      ii) Bypass factor of cooling coil

      iii) Heating capacity in kW

      iv) Heating coil surface temperature if bypass factor is 0.3

      v) Mass of water vapour removed per hour. **6**

OR

8. a) What are the factors influencing human comfort ? Explain the concept of effective temperature. **6**

   b) What is infiltration load and ventilation load ? **4**

   c) Two air streams are mixed steadily and adiabatically. The first air stream enters at 32°C DBT and 40% RH while second enters at 12°C and 90% RH. The flow rates of the two streams are 20 m^3/min and 25 m^3/min respectively. Determine the specific humidity, RH and mass flow rate after mixing. **6**

UNIT – V

9. a) Compare : Unitary air conditioning and central air conditioning. **4**

   b) Write a note on 'All water system'. **6**

   c) Explain air handling unit with a neat sketch. **6**

OR

10. a) What is a fan coil system ? **4**

b) Explain automatic expansion valve with a neat sketch. **6**

c) What are the different methods used to control capacity of compressors in air conditioning systems ? Explain any one method. **6**

UNIT – VI

11. a) Write a note on 'Duct Materials'. **4**

b) Derive an expression for equivalent diameter of a circular duct for a rectangular duct when quantity of air passing through them is same. **6**

c) Write a note on 'cold storages'. **6**

d) What is 'CAMA' ? **2**

OR

12. a) Write a note on classification of ducts. **4**

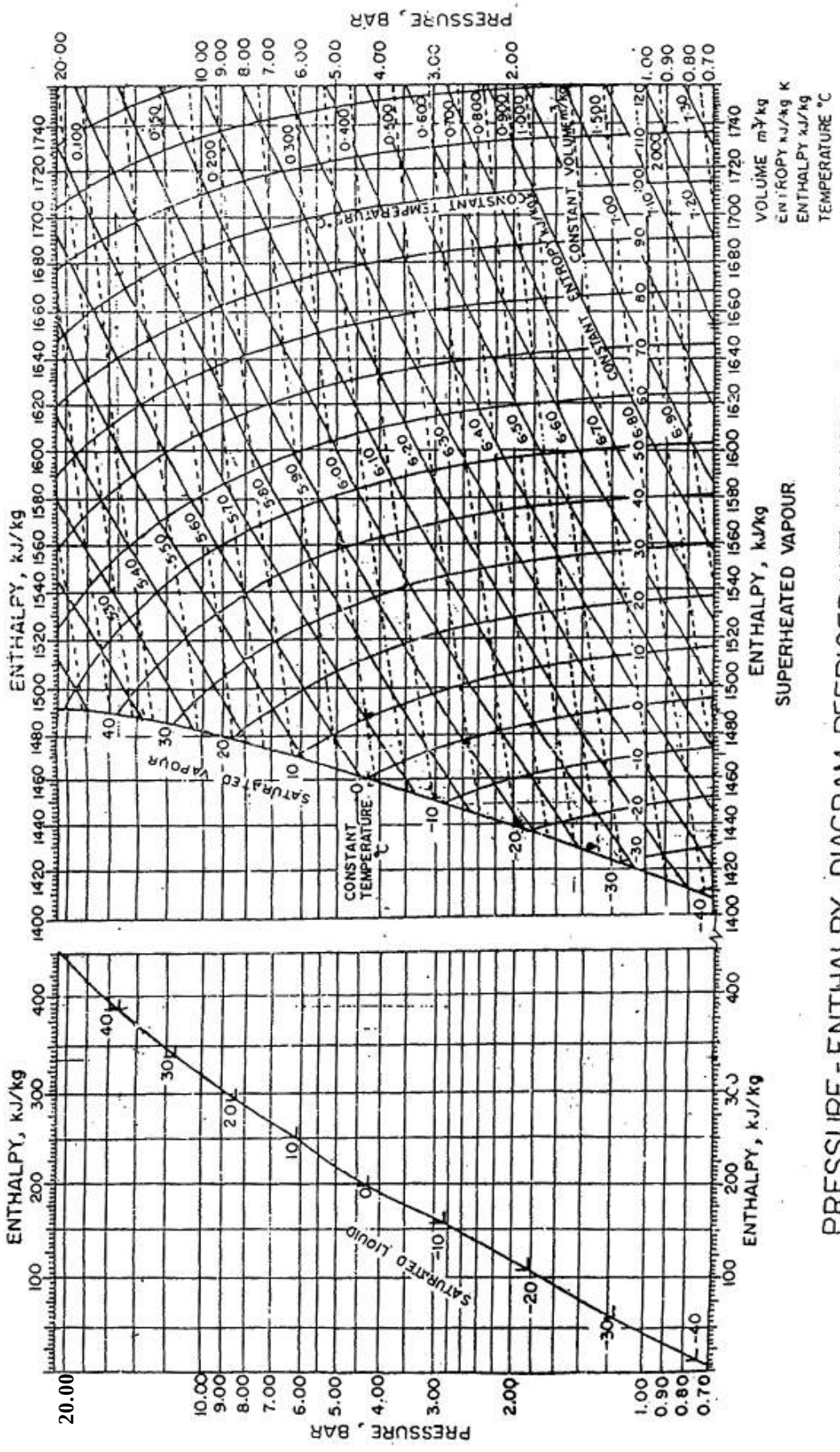
b) Explain the factors which are responsible for spoiling food and vegetables. What are the methods of preservation of food and vegetables ? **8**

c) A rectangular duct of 800 mm$\times$550 mm size carries 5 m^3/s of air having density 1.15 kg/m^3. Determine the equivalent diameter of duct if

i) Air flow is same

ii) Air velocity is same.

Also find pressure loss per 100 m length if f = 0.0015. **6**


PRESSURE - ENTHALPY DIAGRAM REFRIGERANT, AMMONIA (R 717)
PRESSURE, BAR
ENTHALPY, kJ/kg
SATURATED LIQUID
SATURATED VAPOUR
SUPERHEATED VAPOUR
CONSTANT TEMPERATURE °C
CONSTANT ENTROPY kJ/kg K
CONSTANT VOLUME m³/kg
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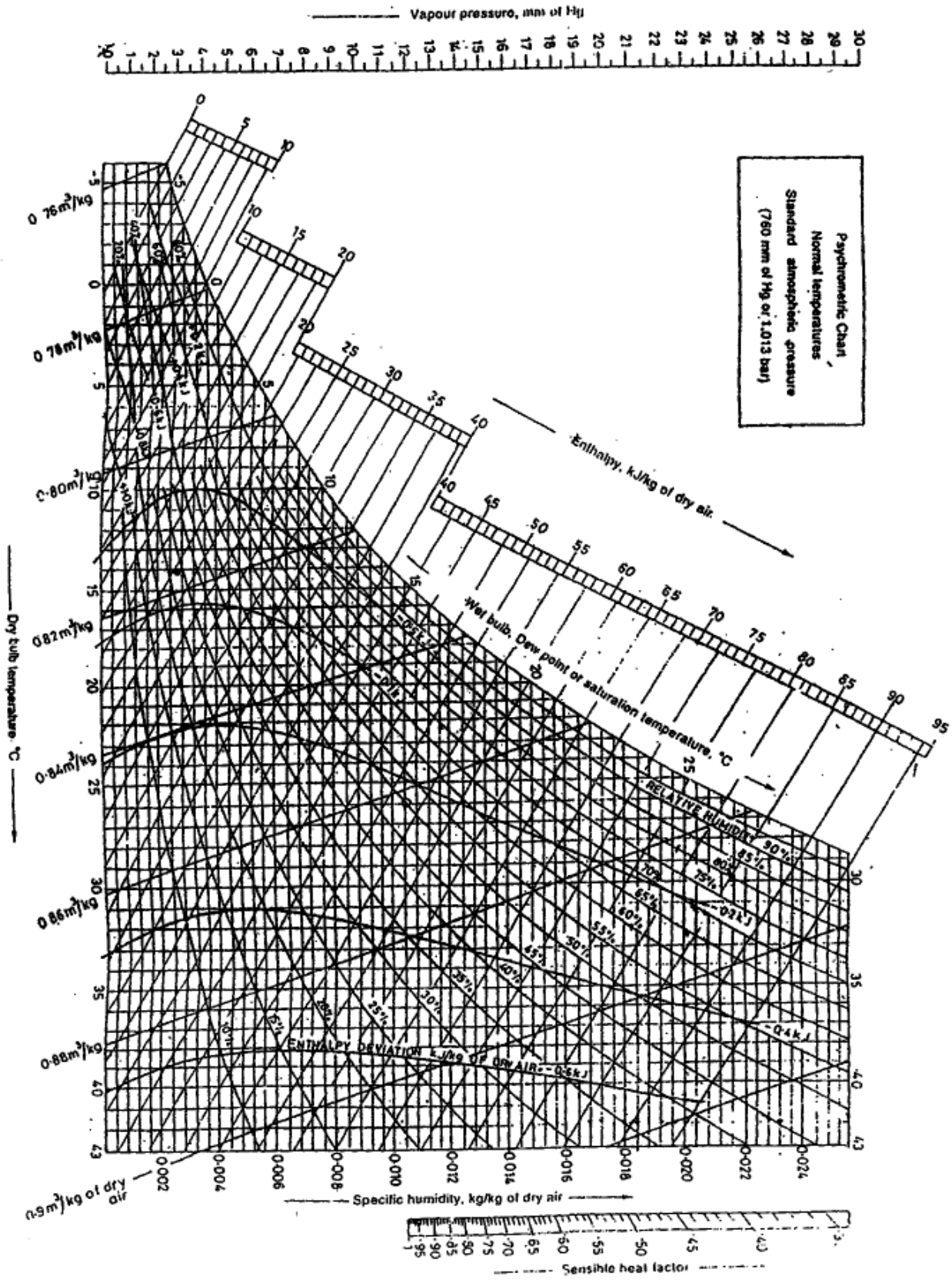
Vapour pressure, mm of Hg
Psychrometric Chart
Normal temperatures
Standard atmospheric pressure
(760 mm of Hg or 1.013 bar)
Enthalpy, kJ/kg of dry air
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Dry bulb temperature, °C
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RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR

[3963] – 220

T.E. (Mechanical Engineering) (Semester II) Examination, 2011
REFRIGERATION AND AIR CONDITIONING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

*3) **Neat** diagrams must be drawn **wherever** necessary.*

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SECTION – I

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   c) A vapour compression refrigeration plant operates between evaporator and condenser temperature at – 15°C and 40°C respectively. The refrigerant is dry and saturated at the suction. Discharge temperature of refrigerant is 98°C. The bore and stroke of compressor are 85 mm each. It runs at 750 rpm with volumetric efficiency of 82%. The liquid enters the expansion valve at 32°C. Calculate i) COP ii) Mass flow rate of refrigerant and iii) capacity use following properties of refrigerant.

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      iv) Heating coil surface temperature if bypass factor is 0.3

      v) Mass of water vapour removed per hour. **6**

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UNIT – V

9. a) Compare : Unitary air conditioning and central air conditioning. **4**

   b) Write a note on 'All water system'. **6**

   c) Explain air handling unit with a neat sketch. **6**

OR

10. a) What is a fan coil system ? **4**

b) Explain automatic expansion valve with a neat sketch. **6**

c) What are the different methods used to control capacity of compressors in air conditioning systems ? Explain any one method. **6**

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b) Derive an expression for equivalent diameter of a circular duct for a rectangular duct when quantity of air passing through them is same. **6**

c) Write a note on 'cold storages'. **6**

d) What is 'CAMA' ? **2**

OR

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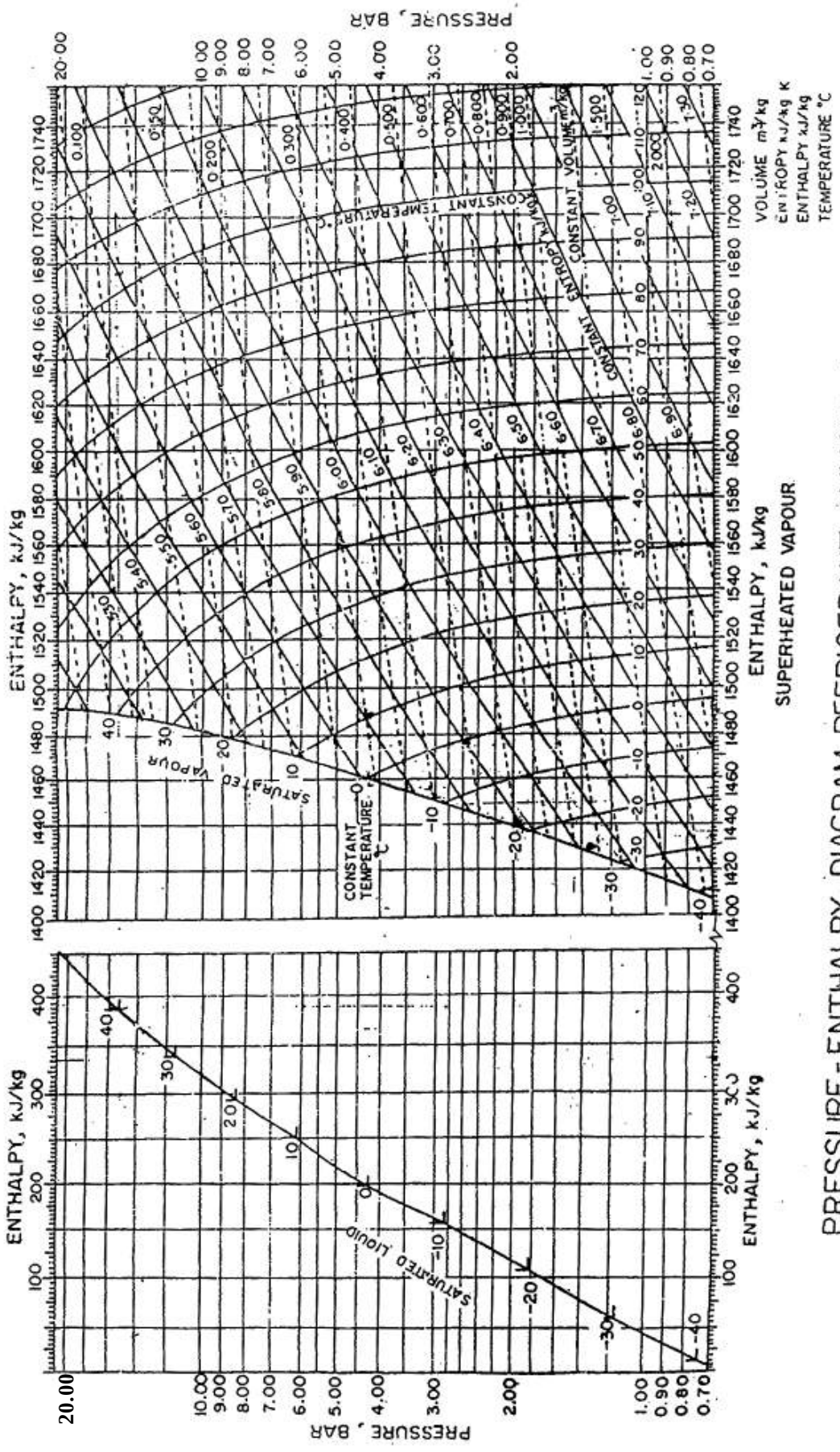
b) Explain the factors which are responsible for spoiling food and vegetables. What are the methods of preservation of food and vegetables ? **8**

c) A rectangular duct of 800 mm$\times$550 mm size carries 5 m^3/s of air having density 1.15 kg/m^3. Determine the equivalent diameter of duct if

i) Air flow is same

ii) Air velocity is same.

Also find pressure loss per 100 m length if f = 0.0015. **6**


PRESSURE - ENTHALPY DIAGRAM REFRIGERANT, AMMONIA (R 717)
PRESSURE, BAR
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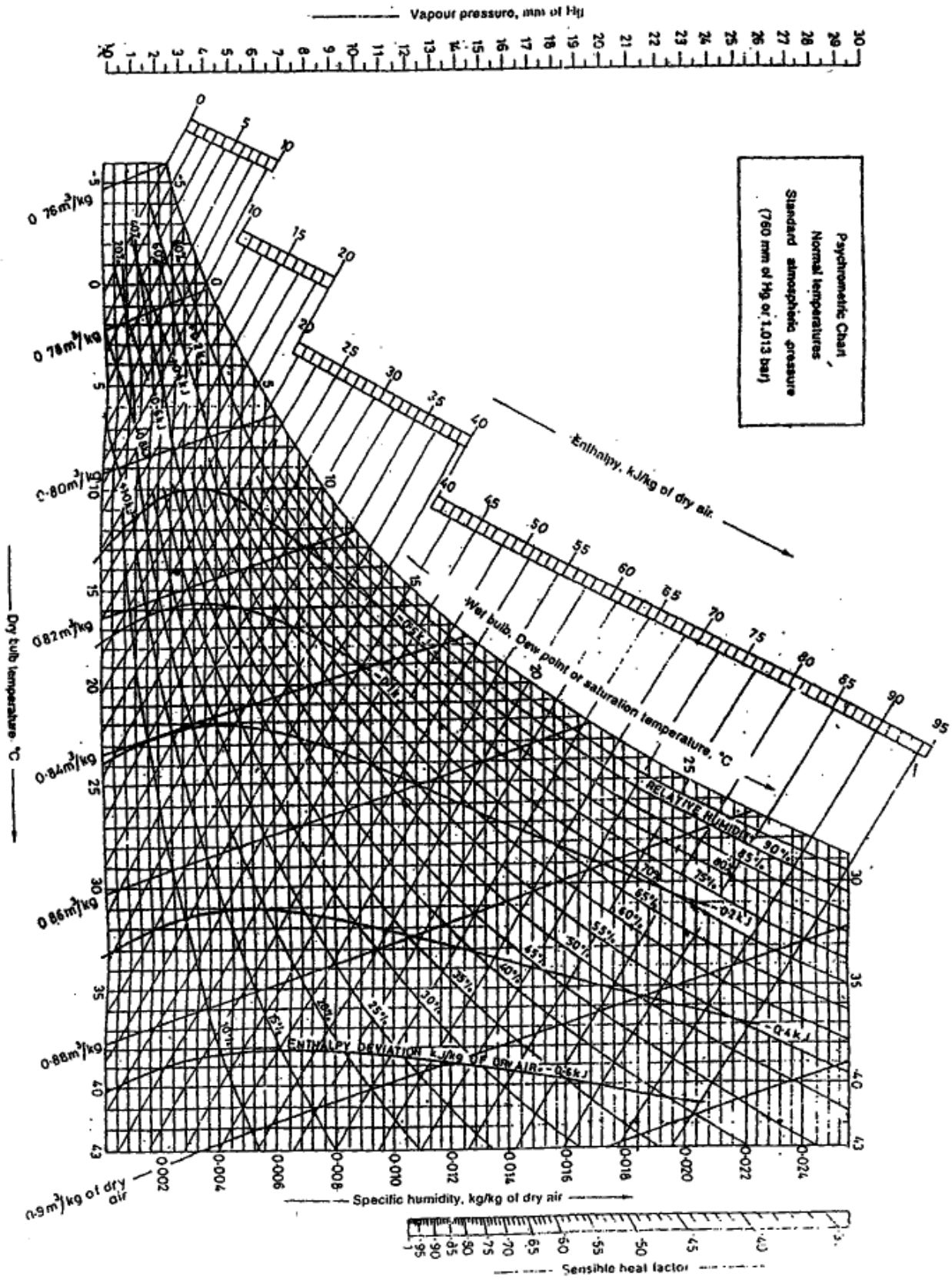
CONSTANT VOLUME m³/kg
VOLUME m³/kg
ENTROPY kJ/kg K
ENTHALPY kJ/kg
TEMPERATURE °C


Vapour pressure, mm of Hg
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Specific humidity, kg/kg of dry air
Sensible heat factor
RELATIVE HUMIDITY
ENTHALPY DEVIATION kJ/kg OF DRY AIR

[3963] – 240

T.E. (Production) (Semester – II) Examination, 2011
PRODUCTION METALLURGY
(Common to Production S/W)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

Instructions : *1) Attempt Q.**1** or Q.2, Q.**3** or Q.**4**, Q.**5** or Q.**6** from Section **I** and Q.**7** or Q.**8**, Q.**9** or Q.**10**, Q.**11** or Q.**12** from Section **II**.*
*2) Answer **any 3** questions from **each** Section.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
*6) **Use** of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, **if necessary**.*

SECTION – I

1. 1) Draw neat Fe-Fe_3C equilibrium diagram with all important phases and temperatures. Explain all the reactions on it. **8**

   2) Discuss slow cooling of AISI 1020 from austenitic temperature to room temperature and draw the microstructure at room temperature. **4**

   3) Define the following :
   Numerical aperture, Magnification power of objective, Ledeburite. **6**

OR

2. 1) Draw and explain ray diagram of metallurgical microscope. **6**

   2) State what do you understand by St 35, Fe 230 K, 25C5, Fe E 320. **4**

   3) What do you understand by Widmanstatten structure ? **4**

   4) Explain sulphur printing. **4**

P.T.O.

3. 1) What is hardenability ? Explain Jominy end Quench test. **6**

   2) What is Retained Austenite ? How it can be eliminated ? **4**

   3) Explain stages of tempering with variations in properties. **4**

   4) Explain secondary hardening. **2**

OR

4. 1) Differentiate between Annealing and Normalising. **4**

   2) What are the characteristics of Martensitic transformation. **4**

   3) Draw 777 diagram for AISI 1080 steel and show following cooling curves on the same : **6**

      a) 100% Bainite

      b) 100% fine Pearlite

      c) 50% Pearlite and 50% Martensite.

   4) Define Austenite and Bainite. **2**

5. 1) Compare nitriding and carburising. **4**

   2) Explain in brief – Patenting and Martempering. **4**

   3) Which surface hardening treatment would you recommend to obtain high hardness on the teeth of gears of 0.15% C steel ? Explain in brief. **4**

   4) Explain induction hardening. **4**

OR

6. 1) Discuss heat treatment after carburising. **4**

   2) Differentiate between Austempering and Ausforming. **4**

   3) Explain in brief, advantages and limitations of flame hardening. **4**

   4) Discuss carbonitriding in detail. **4**

SECTION – II

7. a) What is carbon equivalent in cast iron ? What is role of it ? **3**

   b) Explain about chilled cast iron. What are typical uses of chilled cast iron ? **4**

   c) What are the advantages of alloy steel over plain carbon steel ? **4**

   d) Explain sensitization in stainless steel. **3**

   e) Draw microstructures of the following : **4**
      1) Ferritic malleable cast iron
      2) Ferrite pearlitic spheroidal gray cast iron.

OR

8. a) Explain Ni-Resist cast iron. **4**

   b) What are advantages of cast iron over plain carbon steel ? **4**

   c) Suggest suitable material for following applications and explain why ? (any **two**)
      1) Lathe bed
      2) Road roller wheel
      3) Razor blade
      4) Juice carrying pipe in sugar industries. **5**

   d) Explain heat treatment for 18:4:1 tool steel. **5**

9. a) Give typical composition, one property and one application of the following : **12**
      1) Phosphor Bronze
      2) Cartridge Brass
      3) Tinmans solder
      4) Babbit.

   b) Tin bronzes show pronounced coring. Explain. **2**

   c) What is super alloy ? **2**

OR

10. a) Give reasons for the following : **9**

    1) $\alpha+\beta$ Brasses can not be cold worked

    2) Bearing material must be heterogenous in nature

    3) Small quantity of Cu is added in babbits.

    b) Explain role of sodium in Al-Si alloy. **3**

    c) What is dezincification ? **2**

    d) Draw microstructure of alpha brass. **2**

11. a) What is composite material ? Give its typical classification. **4**

    b) Write short note on (**any three**) : **12**

    1) Nano material

    2) Metal matrix composite

    3) Biomaterials

    4) Sandwich structure composite.

OR

12. a) Explain properties of glass fiber and its hand lay up process in detail. **6**

    b) Explain min. 2 materials with their properties which are used as matrix material. **6**

    c) Define following : **4**

    1) yarn

    2) rovings

    3) mat

    4) staples.

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[3963] – 25

T.E. (Mechanical S/W) (Sem. – II) Examination, 2011
THERMAL ENGINEERING – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

UNIT – I

1. a) How does the increase in condenser temperature affect cop ? Also explain the influence of evaporator temperature on cop. Which of the two temperature have more influence on cop ? **6**

b) Describe the Bell-Coleman cycle and obtain an expression for the cop of the cycle. **5**

c) An air refrigeration used for food storage provides 25 TR. The temperature of air entering the compressor is 7°C and the temperature at exit of cooler is 27°C find

i) COP of the cycle

ii) Power per tonne of refrigeration required by compressor.

The quantity of air circulated in the system is 3000 kg/h. The compression and expansion both follows the law $PV^{1.3} = C$ and take $\gamma = 1.41$ and CP = 1.0 kJ/kg°k for air. **5**

OR

2. a) "The cop of an air refrigeration cycle is very low, but still air refrigeration system is most common in the air craft". Discuss the statement. **5**

   b) Describe briefly with the help of a diagram, the vapor absorption system of refrigeration. In what way this system is advantageous over the vapor compression system. **5**

   c) An ammonia refrigerator works between – 10°C and 38°C the vapor being dry at the end of isentropic compression. There is no under cooling of liquid ammonia and the liquid is expanded through a throttle valve after leaving the condenser. Calculate i) power per TR and ii) cop. Use following properties of refrigerant, cp for liquid = 4.75 kJ/kg°k and cp for vapor = 3.0 kJ/kg°k. **6**

Temp. °C	Enthalpy kJ/kg			Entropy kJ/kg°k		Specific volume m^3/kg
	liquid hf	latent hfg	vapor hg	liquid sf	vapor sg	vapor
– 10	– 808.71	1296.47	487.7	5.5257	10.4539	0.41949
– 38	– 581.57	1108.34	526.77	6.3111	9.8742	0.08817

UNIT – II

3. a) Derive an expression for specific humidity and show that it is function of vapor pressure and barametric pressure of air. **5**

   b) When is dehumidification of air necessary ? And how it is achieved ? **4**

   c) Calculate all the psychrometric properties of air when dry bulb temperature is 21°C and relative humidity is 30% at barometric pressure of 760 mm of Hg. Use psychrometric relations only. **7**

OR

4. a) Describe unitary and central air-conditioning system. **6**

   b) Draw a block diagram of a simple year round air-conditioning of system and briefly explain the process on a psychrometric chart. **5**

   c) One kg of air at 40°C dry bulb temperature and 50% relative humidity is mixed with 2 kg of air at 20°C dry bulb temperature and 20°C dew point temperature. Calculate the temperature and specific humidity of mixture. Use psychrometric chart. **5**

UNIT – III

5. a) Explain the following as referred to air compressors

      i) Volumetric efficiency

      ii) Isothermal efficiency. **6**

   b) Discuss how the clearance affects the performance of multistage compressor. **4**

   c) A two stage reciprocating air compressor delivers 40.5 kg/min at 9.8 bar. The intake pressure is 1 bar and temperature is 15.5°C. The compression follows $PV^{1.31} = C$ and inter cooler cools the air back to the intake temperature. Neglecting clearance, calculate

      i) Optimum intermediate pressure

      ii) Power to be delivered to each cylinder

      iii) Rate of heat transfer from cylinder and intercooler. **8**

OR

6. a) Plot and discuss the characteristics of centrifugal and axial flow compressor. **4**

   b) Derive an expression for Roots efficiency of Roots of air blower. **5**

   c) A Rotary vane compressor works between pressure limit of 1 bar and 1.5 bar and gives 4 m^3/min of free air delivered when running at 200 rpm. Determine power required to drive compressor when ports are so placed that there is 50% pressure rise due to internal adiabatic cmpression before back flow occurs. Assume mechanical efficiency of 100 %. Determine also blower efficiency. **9**

SECTION – II

UNIT – IV

7. a) What are the requirements of good combustion chamber in SI engine ? **6**

   b) Explain with P-θ diagram detonation in SI engine. **6**

   c) Explain following terms : **4**

      i) Ignition lag

      ii) Pre-ignition.

OR

8. a) Explain various stages of combustion in CI engine. **6**

   b) Compare induction swirl and compression swirl. **6**

   c) Discuss variables affecting delay period. **4**

UNIT – V

9. a) Explain themodynamic cycle of supercharged CI engine. **6**

   b) Explain with neat sketch constant pressure turbochanging. What are its advantages ? **6**

   c) What are the limits of turbochanging ? **4**

OR

10. a) Describe with neat sketch three way catalytic converter. **6**

    b) What are various methods to measure CO content of exhaust gas ? Explain any one method in detail. **6**

    c) What is cause of diesel smoke ? What are the ways of controlling diesel smoke ? **4**

UNIT – VI

11. a) Discuss relative advantages and disadvantages of closed cycle and open cycle gas turbine plants. **5**

b) Explain gas turbine cycle with reheat. **5**

c) A closed cycle gas turbine uses helium as a working substance. The gas enters compressor at 4 bar and 320 K and discharges at 16 bar and 590 K. It then enters a regenerator of 70% effectiveness. The turbine inlet condition is 15.5 bar and 1400 K. The turbine exhausts at 4.2 bar and 860 K and enters the regenerator. Determine :

i) Compressor and turbine efficiencies

ii) Thermal efficiency of cycle

iii) Heat rejected in cooler before compressor

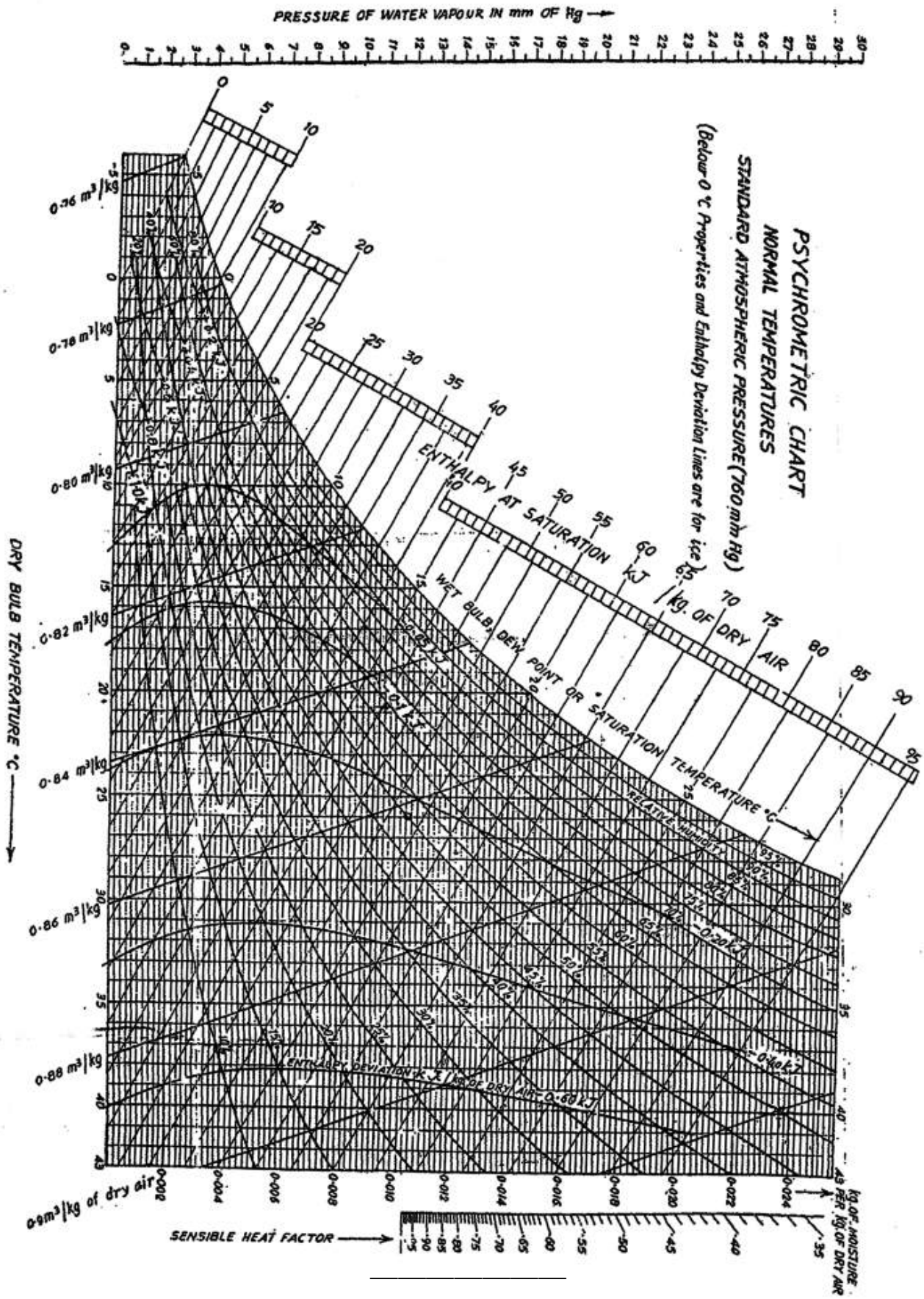
iv) Helium flow rate for net power output of 100 MW. Take c_p and γ for helium 5.2 and 1.67 respectively. **8**

OR

12. a) Explain with neat sketch turbo fan engine. **5**

b) Explain any one method of thrust augmentation. **5**

c) The atmospheric air in which a jet travels at speed of 223 m/sec is 0.562 bar. The gas enters nozzle at 2 bar and 833 K and leaves nozzle exit at pressure 1 bar. Calculate velocity of jet at nozzle exit, nozzle exit area, propelling thrust and thrust power if nozzle efficiency is 0.95 and mass flow 22.5 kg/sec. **8**


PSYCHROMETRIC CHART
NORMAL TEMPERATURES
STANDARD ATMOSPHERIC PRESSURE (760 mm Hg.)
(Below 0 °C Properties and Enthalpy Deviation Lines are for ice)
PRESSURE OF WATER VAPOUR IN mm OF Hg
DRY BULB TEMPERATURE °C
WET BULB, DEW POINT OR SATURATION TEMPERATURE °C
ENTHALPY AT SATURATION kJ/kg. OF DRY AIR
SENSIBLE HEAT FACTOR
kg. OF MOISTURE PER kg. OF DRY AIR
m³/kg of dry air
RELATIVE HUMIDITY
ENTHALPY DEVIATION

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T.E. (Electrical) (Semester – II) Examination, 2011
DESIGN OF ELECTRICAL MACHINES (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) Define :

   1) Leakage coefficient

   2) Stacking factor

   3) Real flux density

   4) Apparent flux density. **4**

   b) Write a short note on :

   a) Rotating hysteresis

   b) Pulsation losses in electrical machines. **8**

P.T.O.

c) The hysteresis loss in a sample of iron was found to be 4.9 W/kg at a frequency of f = 50 Hz and at a maximum flux density of B_m = 1Wb/m^2

a) Calculate there from the coefficient η in the expression, loss/cycle = $\eta B_m^{1.7}$ J/m^3 ; the specific gravity of iron is 7.5.

b) Calculate the loss per kg at f = 25 Hz and a flux density B_m = 1.8 Wb/m^2. **4**

OR

2. a) Explain the principal components of leakage flux for polyphase machines. **8**

b) Explain Carter's fringe curves. **8**

3. a) Draw heating curve and cooling curve and explain the following terms :

a) Heating time constant

b) Cooling time constant

c) Final steady temperature rise

d) Hot spot temperature. **8**

b) Estimate the main dimensions of a 500 KVA, 6600/400 V, 3 phase, 50 Hz core type oil immersed self cooled distribution transformer. Given : voltage per turn = 20 V, area factor for stepped core = 0.56, window space factor = 0.3, current density = 3A/mm^2, flux density B_m = 1.2 Wb/m^2, width of largest step = 0.85 d, distance between centre of adjacent limbs = 1.85 a. Assume $A_y = A_i$. **8**

OR

4. a) Enlist specifications of transformers as per IS 2026. **6**

   b) Determine the dimensions of the core, number of turns and the cross sectional area of conductors in the primary and secondary windings of a 100 KVA, 2200/480 V, single phase core type transformer to operate at a frequency of 50 Hz, assuming the following data :

   Voltage per turn = 7.5 V, Maximum flux density = 1.2 Wb/m^2, Ratio of net cross sectional area of core to the square of diameter of circumscribing circle = 0.6, $\frac{H_W}{W_W} = 2$, window space factor = 0.28, current density = 2.5 A/mm^2, stacking factor = 0.9. Assume that the yoke section is 20% larger than core section. **10**

5. a) Derive the formula for the axial forces developed in the transformers. **8**

   b) Calculate the active and reactive components of no load current of a 400 V, 50 Hz single phase transformer having the following particulars :

   Core of transformer steel, stacking factor = 0.9, density = 7.8×10^3 kg/m^3, length of mean flux path = 2.2 m, gross iron area = 10×10^{-3} m^2, primary winding turns = 200, joints equivalent to 0.2 mm air gap. Use following data for calculations :

B_m (Wb/m^2)	0.9	1	1.2	1.3	1.4
MMF(AT/m)	130	210	420	660	1300
Iron loss (W/kg)	0.8	1.3	1.9	2.4	2.9

10

OR

6. a) Derive the expression for total leakage reactance of a transformer referred to primary side. **8**

   b) Full load efficiency of a 300 KVA transformer is 98.2% at unity power factor. Design number of cooling tubes necessary, if the temperature rise is to be limited to 35° C. The tank area may be assumed as 4.92 m^2. Assume tube diameter as 5 cm and average length of tube as 105 cm. Heat dissipation of tank surface = $12.5\ W/m^2 - {}^{\circ}C$. Heat dissipation of tubes = $8.8\ W/m^2 - {}^{\circ}C$. **10**

SECTION – II

7. a) Derive the output equation of 3 phase induction motor. State the units and meanings of each symbol used. **8**

   b) Estimate the main dimensions, air gap length, stator turns per phase and cross-sectional area of stator conductors for a 3 phase, 20 HP, 400 V, 6 pole, 50 Hz, 970 rpm Δ stator of squirrel cage induction motor. Assume magnetic and electric loadings as 0.45 Wb/m^2 and 23000 ac/m respectively, ratio of core length to pole pitch 0.85, full load efficiency = 0.88, power factor = 0.89, current density = 4 A/mm^2, K_{ws} = 0.955. **8**

OR

8. a) With reference to ac windings compare

   1) single layer winding and double layer winding

   2) fractional slot winding and integral slot winding

   3) 2 plane overhang and 3 plane overhang. **6**

   b) Calculate :

   i) diameter

   ii) length

   iii) number of turns per phase

   iv) full load current and cross-section of conductors of 3 phase, 120 kW, 2200 V, 50 Hz, 750 rpm (synchronous speed) star connected slip ring IM from the following particulars :

   B_{av} = 0.48 Tesla, ac = 26000 ac/m, efficiency = 92%, power factor = 0.88

   L = 1.25z, K_{ws} = 0.955, current density = 5A/mm^2. **10**

9. a) Discuss the factors that affect the choice of air gap in induction motor. **8**

   b) A 3ϕ, 6 pole, 50 Hz, 415 V, 11 kW λ connected squirrel cage induction motor has 72 stator slots with 20 conductors/slot. The machine has full load η = 89% and full load p.f. = 0.86.

      i) Estimate the number of rotor slots.

      ii) Assuming mmf of rotor to be 0.85 times stator mmf, find the bar current and end ring current. **8**

OR

10. a) Explain cogging and crawling in 3 phase induction motor. **8**

    b) Discuss in detail unbalanced magnetic pull and its estimation. **8**

11. Write short notes on : **18**

    a) MMF calculations for air gap of 3ϕ IM.

    b) Effect of saturation on calculation of mmf of 3ϕ induction motor.

    c) Performance calculation of 3 phase induction motor from circle diagram.

OR

12. a) Write short note on calculation of no load current of 3ϕ IM. **6**

b) Estimate the magnetising current of 11 KV, 50 Hz, 3ϕ, λ connected, 12 pole IM with a stator bore of 90 cm and core length 25 cm. The stator has 108 slots with 3 mm slot opening. A rotor has 144 slots with 2 mm slot opening. There are 2 ventilating ducts of width 1 cm each in both stator and rotor. The air gap length is 1 mm. Take B_{av} = 0.6 Wb/m^2-AT for iron path can be taken as 45% of that required for the air gap. Assume K_{ws} = 0.955.

Width of slot / air gap	2	3	10	20
Carter's coefficient	0.35	0.45	0.9	0.95

12

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T.E. (Electronics) (Semester – II) Examination, 2011
DRIVES & CONTROL (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **All** questions carry **equal** marks.*

SECTION – I

1. a) What are phase controlled converters ? Explain with circuit diagram and waveforms working of 3ϕ fully controlled converter with RL load. Assume $\alpha = 60^{\circ}$. Deduce the equation for output load voltage. **10**

   b) What is motor wasting ? Explain. **4**

   c) What is the effect of some impedance on converters ? **4**

   OR

2. a) What are dual converter ? Explain with diagram and waveforms working of 1ϕ dual converter with circulating current mode operation. **10**

   b) A 1ϕ dual converter is operated from a 120 V 60 Hz supplya and load resistance is R = 10Ω. The circulating inductance is L_c = 40 mH. Delay angles are $\alpha_1 = 60^{\circ}$ and $\alpha_2 = 120^{\circ}$. Calculate the peak circulating current and peak current of converter 1. **8**

P.T.O.

3. a) What is the necessities of driver circuits in power controller application ? Explain with diagram and waveform the working of microprocessor base control of DC drives. **10**

   b) What is PLL ? Explain in brief. **6**

OR

4. a) What are DC-to-AC converters ? Explain with circuit diagram and waveforms working of 3ϕ (transistorised) VSI with 180° conduction mode derive by primary resistance load (star conducted). **10**

   b) Compare VSI and CSI. **6**

5. a) What is slip power recovery in AC motor drives ? Explain with torque speed characteristics of 3ϕ I.M. by using V/f technique. **10**

   b) What is soft start ? Explain in brief. **6**

OR

6. Short notes **any three** : **16**

   1) P.f. improvement techniques in converters

   2) Speed control techniques of series motors

   3) Protection circuits for DC drives

   4) Four quadrant chopper drives

   5) Regenerative braking techniques in DC motors.

SECTION – II

7. a) Draw the circuit diagram and explain the working of separate control and self control of synchronous motor. **6**

   b) A three phase 230 V, 60 Hz, four pole y-connected reluctance motor has $X_d = 22.5\,\Omega$ and $X_q = 3.5\,\Omega$. The armature resistance is negligible. The load torque is $T_L = 12.5$ N-m. The voltage-to-frequency ratio is maintained constant at the rated value. If the supply frequency is 60 Hz.

   Determine :

   a) The torque angle δ

   b) The line current I_a and

   c) The input p.f. **10**

OR

8. a) Explain reluctance synchronous motor drive and derive an expression for

   a) the reluctance torque

   b) the torque angle

   c) the pull out torque. **10**

   b) What are the differences between salient pole motors and permanent motor ? **6**

9. a) What is stepper motor ? Explain with principle of operation the working of a chopper drive (unipolar for stepper motor). **6**

   b) Draw and explain logic control circuit of a two phase on control of unidirectional stepper motor. **6**

   c) Explain different types of control of switched reluctance motor, stepper motor. **6**

OR

10. a) Draw and explain logic control circuit of a PM unidirectional stepper motor one phase on control scheme. **8**

    b) List the drive requirements for stepper motor drive. **4**

    c) What are the differences between half step and full step control of unidirectional stepper motor ? **6**

11. a) Explain traction drive with an application of road railway. **8**

    b) Explain neural network based pwm controller. **8**

OR

12. Answer **any four** : **16**

    1) 3ϕ brushless DC motor

    2) Breaking of DC motor

    3) Compare cylindrical and salient pole motor

    4) Neuro fussy system

    5) Harmonic reduction techniques in inverters.

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T.E. (Petrochemical) (Semester – II) Examination, 2011
TRANSPORT PHENOMENA (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Attempt Q.**1** or **2**, Q.**3** or **4**, Q.**5** or **6**, Q.**7** or **8**, Q.**9** or **10**, Q.**11** or **12**.*

*2) Figures to the **right** indicate **full** marks.*

*3) **Use** of electronic calculators is **allowed**.*

*4) Draw **neat** sketch **wherever** necessary.*

SECTION ONE

1. a) Give the molecular transport equations for momentum, heat and mass transfer respectively. State each term with its corresponding role in transport of these properties. **8**

   b) A property is being transported by diffusion through a fluid at steady state. At a given point 1 the concentration is $1.4 * 10^{-2}$ at point 2 at a distance $Z_2 = 0.6$ m, the diffusivity is equal to 0.013 m^2/s and the cross sectional area is constant. A) Calculate the flux B) Derive the equation for the property as a function of distance C) Calculate the property at the midpoint of the path. Assume any symbol for the property and the diffusivity. **8**

OR

2. a) Differentiate with respect to Transport phenomena the macroscopic versus microscopic analysis. **4**

   b) Ethyl alcohol with viscosity 0.0177 g/cm.s, is flowing through two parallel flat plates separated by a distance of 0.5 cm, at 273 K. The velocity of lower plate is 10 cm/s while upper plate velocity is stationary. Calculate the shear stress and velocity gradient. **4**

   c) What is control volume ? What do you understand by the Lagrangian and Eulerian approach of deriving the governing equations ? **4**

   d) Differentiate between Newtonian and Non-Newtonian fluids. **4**

P.T.O.

3. a) Explain the procedure of transport phenomena analysis. **8**

   b) Derive the momentum balance equation by a control volume approach. Express the final form in replacing shear stress terms in terms of velocity. **8**

4. a) Derive the differential equation of energy change. **8**

   b) Give the application of Navier Stokes equation for a falling film over a flat plate. **8**

5. a) Discuss the characteristics of turbulent flow in pipes. Justify role of turbulence in property transport. **6**

   b) Water at 15° C with density 999 kg/m^3 and viscosity 1.138*10^{-3} kg/ms is flowing steadily in a 6 cm horizontal pipe made of stainless steel at a rate of 0.4 m^3/min. Determine the pressure drop, the head loss and the required pumping power input for flow over a 50 m long section of the pipe. **6**

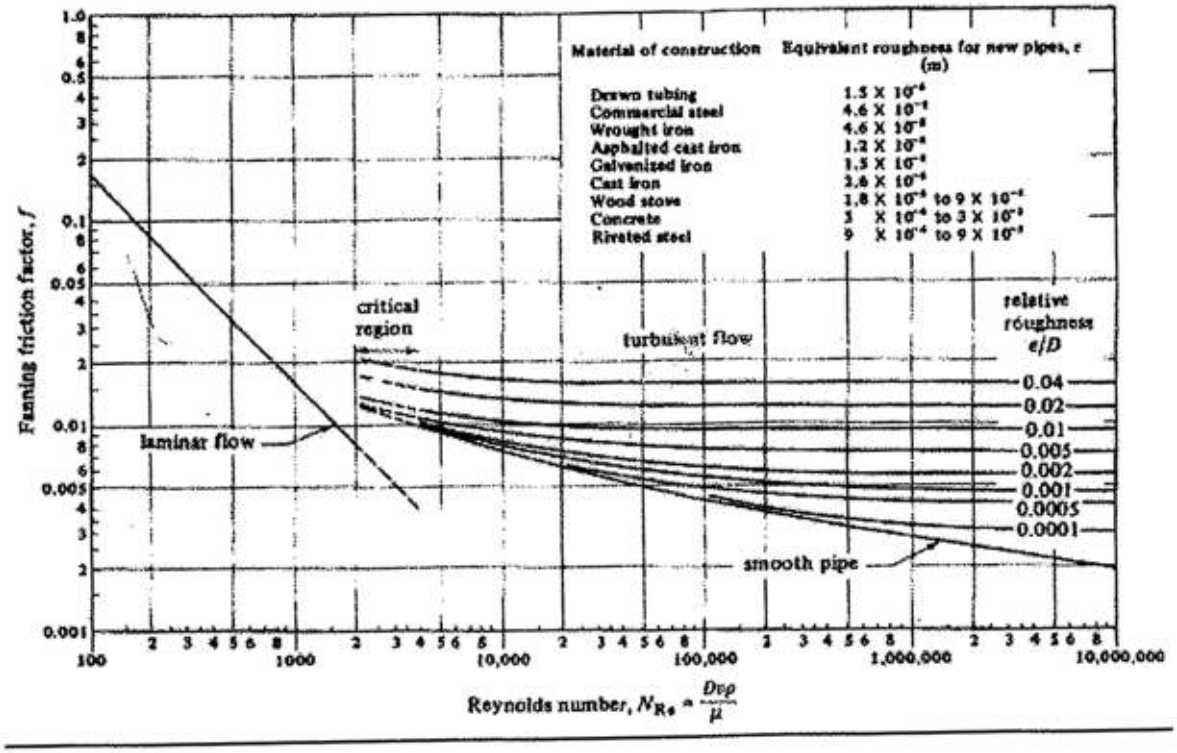

FIGURE FOR Q.No: 5.b

c) Derive the boundary layer equation for a laminar flow over a flat plate. **6**

OR

6. Write short notes on the following with neat labeled sketches wherever necessary : **18**

   1) The Boundary Layer Approximation

   2) Displacement and Momentum Thickness

   3) Boundary Layers with Pressure gradients.

SECTION TWO

7. a) Explain design aspects of stirred tank reactor with respect to geometry specification, types of impellers and importance of dimensionless numbers. **9**

   b) A flat-blade turbine agitator with disk having flat six blades is installed in a tank. The tank diameter is 1.83 m, the turbine diameter is 0.61 m, the width is 0.122 m and the depth of the liquid in the tank is equal to its diameter. The tank contains four baffles, each having a width of 0.15 m. The turbine is operated at 90 rpm and the liquid has a viscosity of 10 cp and a density of 929 kg/m^3. It is desired to scale up the system where equal rate of mass transfer is desired for a vessel whose volume is three times large. **9**

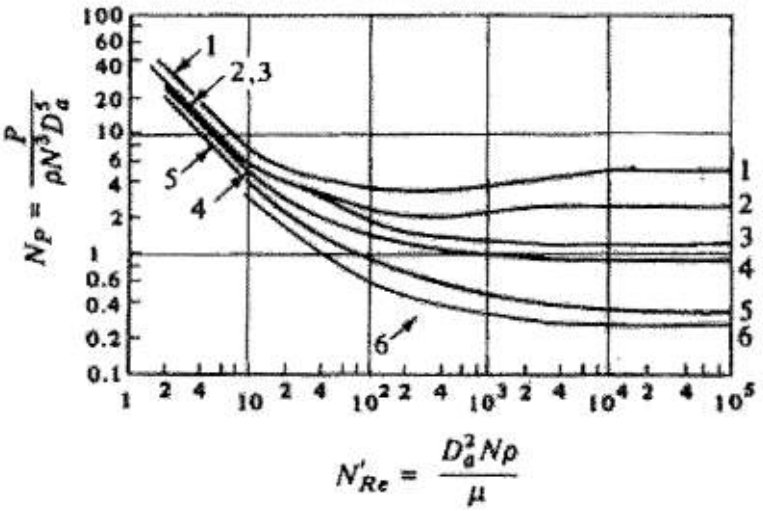

Figure for Q.No. 7 b

Power correlations for various impellers and baffles

Curve 1 : Flat six-blade turbine with disk, $D_a/w = 5$; four baffles each $D_t/J = 12$.

Curve 2 : Flat six-blade open turbine $D_a/W = 8$; four baffles each $D_1/l = 12$.

Curve 3 : Six-blade open turbine (pitched-blade) but blades at 45° $D_a/W = 8$; four baffles each $D_t/J = 12$.

Curve 4 : Propeller ; pitch = $2D_a$; four baffles each $D_t/J = 10$; also holds for some propeller in angular off-center position with no baffles.

Curve 5 : Propeller ; pitch = D_a ; four baffles each $D_t/J = 10$; also holds for same propeller in angular off-center position with no baffles.

Curve 6 : High-efficiency impeller ; four baffles each $D_t/J = 12$.

OR

8. a) Explain mixing with respect to its role, areas of application, industrial mixing problems. Give atleast four specific industrial applications. **9**

   b) What do you understand by Power number, Mixing time and Zwietering correlations ? Give expressions of each. **9**

9. a) Derive unsteady state heat conduction equation in one direction in a solid. Express the three dimensional form of above equation. **8**

   b) Discuss the application of Prandtl's mixing length theory in turbulent heat transfer. **8**

OR

10. a) Determine the temperature distribution in a conducting rod of length 10 cm with following values :

    conductivity k = 0.49 cal/s.cm.°C, at t = 0 temperature of the rod is zero and the boundary conditions are at length x = 0 temperature T = 100°C and at x = 10 the temperature is 50°C. The Cp of the rod is 0.2174 cal/g°C and density is 2.7 g/cm^3. Use the explicit finite difference method. **12**

    b) Give dimensionless numbers in heat transfer with expressions. **4**

11. a) Derive unsteady state mass diffusion equation in one direction. Express the three dimensional form of above equation. **8**

    b) Discuss the application of Prandtl's mixing length theory in turbulent mass transfer. **8**

OR

12. a) Give the solution scheme to unsteady state mass diffusion in one direction equation. What do you understand by stability and convergence of the above solution ? **12**

    b) Give dimensionless numbers in mass transfer with expressions. **4**

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T.E. (Petrochemical Engg.) (Semester – II) Examination, 2011
PROCESS EQUIPMENT DESIGN AND DRAWING (New)
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **three** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Figures to the **right** indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Define role of design engineer in process equipment design. **4**

   b) Write in details about code and standards. Enlist the names of organizations which develop these codes and standards. **6**

   c) Discuss in details about 'General procedure for process equipment design'. **6**

OR

2. a) Write note on important mechanical properties of material required in process equipment design. **7**

   b) Write how computer and CAD can be used for process equipment design. **6**

   c) Enlist 10 (international and national) process equipment design companies. **3**

P.T.O.

3. a) Two parallel shafts whose center line are 4.8 m apart are connected by an open belt drive. The diameter of larger pulley is 1.5 m and that of smaller pulley is 1 m. The initial tension in belt when belt is stationary is 3 KN. The mass of belt is 1.5 kg/m length. The coefficient of friction is 0.3. Taking centrifugal tension in account, calculate the power transmitted, when smaller pulley rotates at 400 rpm. **10**

   b) The load on a member consists of an axial pull of 30 KN, with shear force of 15 KN, find the diameter of member according to :

      a) Maximum Normal Shear Stress Theory

      b) Maximum shear stress theory

      c) Maximum principal strain theory

      d) Maximum strain energy theory. **6**

OR

4. a) Write criteria to select bearing for rotating system. **3**

   b) Design a cast iron flange coupling for a mild steel shaft transmitting 100 kW at 260 r.p.m. The allowable shear stress in the shaft is 40 MPa. The diameter of shaft is 80 mm. The allowable shear stress in the coupling bolts is 30 MPa. Width of key is 25 mm and thickness of key is 14 mm. **13**

5. a) Discuss with neat sketch different types of heads used in design of pressure vessel. Write formulae to design any two heads. **6**

   b) What do you mean by nozzle compensation ? Explain area for area method of nozzle compensation with neat sketch. **6**

   c) Write the procedure to calculate thickness of shell. Discuss criteria to select head for pressure vessel. **6**

OR

6. a) A cylindrical thermic fluid storage fluid storage tank has 1.0 meter inside diameter. It is subjected to an internal pressure of 3.0 kg/cm^2. Permissible stress for the material is 1260 kg/cm^2. Welded joint efficiency is 85%. Weight of the vessel with all its contents is 5000 kg. Torque exerted due to offset piping is 60 kg-m. The thermic fluid storage tank has torispherical heads. Crown radius of the head is equal to the diameter of the vessel. Knuckle radius of head is 6% of the diameter of the vessel. Stresses induced due to wind load can be neglected. Calculate minimum thickness required for cylindrical shell, torispherical head and equivalent resultant stress induced in shell. **13**

   b) Explain any one overpressure protection device used in pressure vessel. **5**

SECTION – II

7. a) Write functions of Baffles and Tie rods in shell and tube heat exchanger. Draw its neat sketch. **7**

   b) Enlist the process parameter useful in mechanical design of heat exchanger. **6**

   c) Discuss the criteria to select heat exchanger for any application in process industry. **3**

OR

8. a) What are the consequences of fouling in heat exchanger ? Explain types of fouling in details. **8**

   b) Discuss advantages and disadvantages of fixed tube, floating head and U tube heat exchangers. Draw neat sketch of any two. **8**

9. a) Discuss with neat sketch types of floating roofs along with accessories used for sealing in storage of volatile liquids. **6**

b) A cylindrical storage tank has diameter 30 meter and the tank height is 15 meter. Liquid stored in tank has density 810 kg/m^3. Material of construction is carbon steel having permissible stress 1300 kg/cm^2. Density of material used for fabrication is 7700 kg/cm^3.

The plates of size 3m$\times$1.2m in varying thickness are available for fabrication. Welded joint efficiency is 85% and corrosion allowance is not necessary. Calculate the cylindrical shell thickness of tank at different heights. Also estimate total number of plates required. **12**

OR

10. a) Discuss desorption and diffusion losses in storage of volatile liquid. **4**

b) Discuss area for area method of nozzle compensation. Draw neat sketches. **6**

c) What is application of wind girders in storage tanks ? Where it is connected ? Write formulae for required minimum section modulus of the stiffening ring. **8**

11. a) Discuss the various parts of storage tanks other than head, shell and bottom plate. **6**

b) Discuss various types of pipelines supports with neat sketch. **4**

c) Explain the design consideration for designing shaft of agitator. **6**

OR

12. Write short notes on : **16**

a) Joints used in storage vessel (with sketch)

b) Types of agitator used in industry (with neat sketch)

c) Pipe line color codes for different pipe lines

d) IS-2825 and IS-4503.

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T.E. (Polymer) (Semester – I) Examination, 2011
POLYMER MATERIALS (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be **valued** as a whole.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Classify the following polymers as commodity, engineering or high performance plastics :
   i) SAN
   ii) PTFE
   iii) Polycarbonate
   iv) Polystyrene
   v) PEEK
   vi) Polyamides. **3**

   b) Write a short note on "UHMWHDPE". **4**

   c) How is polyethylene cross linked ? State its applications. **5**

   d) Give 4 properties of Isotactic PP. **4**

   e) Polyvinyl acetate is amorphous whereas polyvinylalcohol exhibits crystallinity why ? **2**

OR

2. a) Write the structures of the following polymers and give one outstanding property of each :
   i) Polypropylene
   ii) EVA
   iii) Polyvinylalcohol
   iv) Polyvinylacetate
   v) HDPE. **5**

   b) What is the major difference between hot grade and cold grade of polyvinyl alcohol ? **3**

   c) State 3 applications of polyvinylalcohol. **3**

   d) Discuss the processing characteristics of PP. **3**

   e) What is 'LLDPE' ? How is it prepared ? Give 2 properties of LLDPE. **4**

3. a) How do organosols and plastisols in case of PVC vary in their composition ? **4**

   b) What is 'ABS' ? How is it prepared ? State its properties and applications. **5**

   c) How is PTFE processed ? Explain. **4**

   d) Write the structures of the following polymers :
   i) PVDF
   ii) PVDC
   iii) PTFE. **3**

OR

4. a) What is the difference between organosols and plastigels in case of PVC ? **4**

   b) How is PS foam prepared ? **4**

   c) Give 2 outstanding properties and 2 applications of PS. **4**

   d) Discuss compounding of PTFE. **4**

5. a) Explain the need to prepare the prepolymer syrup, method to prepare the prepolymer syrup and process to manufacture PMMA sheets. **6**

   b) List the desirable features of polycarbonate and also give its principal disadvantages. **4**

   c) How are the properties of Cellulose Acetate affected by the degree of substitution ? **4**

   d) Give 2 properties of Cellulose Acetate. **2**

OR

6. a) Discuss the processing characteristics of Polycarbonate. **6**

   b) Discuss Cellulose Acetate Butyrate w.r.t. method of preparation, applications and properties. **6**

   c) Give 2 outstanding properties and 2 applications of PMMA. **4**

SECTION – II

7. a) State the various ingredients which go into making of a polymeric paint and give use of each ingredient ? **6**

   b) What are primers w.r.t. paints ? Give 2 examples of primers. **4**

   c) Differentiate between evaporation type adhesives and pressure sensitive adhesives with examples. **4**

   d) Differentiate between lacquers, varnishes and stains. **4**

OR

8. a) List the important properties considered while choosing a solvent in paint application. **4**

   b) Give the use of the following additives w.r.t. paints and adhesives. Give 2 examples of each.
      i) Tackifiers
      ii) Antiskinning agents
      iii) Fillers. **6**

   c) Why are coatings applied onto a substrate ? List the types of coatings stating the difference between each types. Give examples of each type. **8**

9. a) What are the molecular requirements for a polymer to exhibit rubbery properties ? **5**

   b) Explain the various steps in the making of latex products. **6**

   c) What is vulcanisation ? How is natural rubber vulcanised ? Write a reaction for the same. **5**

OR

10. a) Explain the role of the following additives w.r.t. rubbers. Give examples .
      i) Tackifiers
      ii) Peptisers
      iii) Activators. **6**

   b) Discuss the various steps in the procurement of raw rubber. **6**

   c) Discuss the compounding additives in a typical rubber mix. **4**

11. a) What is oil extended SBR ? Discuss. **4**

   b) Give the rubber used in the following applications and reason for using the rubber in the given application. **6**

   c) Write a short note on “Thermoplastic Elastomers”. **6**

OR

12. a) Write the structure of the following rubbers.
      i) Neoprene rubbers
      ii) IIR
      iii) SBR
      iv) Nitrile rubber
      v) Natural rubber. **5**

   b) Explain how ribbed smoked sheets of natural rubber prepared. **6**

   c) What is mastication ? Discuss mastication of natural rubber. **5**

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T.E. (Information Technology) (Semester – II) Examination, 2011
MANAGEMENT INFORMATION SYSTEMS (New)
(2008 Pattern)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** sheet.*
*2) **Use** of logarithmic tables, slide rules and electronic pocket calculator is **allowed**.*
*3) **Neat** diagram must be drawn **wherever** necessary.*
*4) **Black** figures to the **right** indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Why does organization need Management Information Systems ? How can Management Information Systems be used to generate competitive advantage ? Are there some limitations of MIS ? If yes, point out these. **9**

   b) What is the purpose of strategic planning ? Explain how planning is an essential management process. **9**

OR

2. a) Explain 'function support role' and 'decision support role' of MIS. **9**

   b) Draw suitable diagram to explain various components and resources of Infomation Systems. **9**

P.T.O.

3. a) "Decisions are fuzzy and less structured at the strategic level of the hierarchy". Give suitable example to explain this scenario. **8**

   b) Write and explain various analytical modeling activities that help in using Decision Support System. **8**

OR

4. a) 'Knowledge Management' has became the buzz word in the last decade. Comment on the importance and future of knowledge Management. **8**

   b) Describe the concept of data warehousing. Discuss the need of data warehousing in modern business. **8**

5. a) What are several e-business applications that you might recommend to a small company to help it survive and succeed ? Why ? **8**

   b) Explain in brief different types of e-commerce from the perceptive of the buyer and seller relationship by giving suitable example for each. **8**

OR

6. a) With the help of any example web-site, explain the perspective of the buyer and seller in a B2B e-commerce type. Also mention the benefits over the traditional commerce. List the disadvantage if any. **8**

   b) What is the process or methodology used to learn more about customer's needs and behavior in order to develop stronger relationship with them ? **8**

SECTION – II

7. a) A mobile company is developing mobile billing system. Company is offering more than one mobile to a customer. The mobile company offers facilities like music on demand, internet, alerts and messages, electricity bill payment etc. Customer can choose facilities he wants. Customer can pay bill either in cash, using credit card or through ECS. The bill shows details about tariff, facility charges and rent. What type of daily, weekly and monthly report could be generated by this system ? As a system analyst; design a system having

   a) Input screen for application for new mobile number

   b) Format of Pending Bill Report

   c) Format of service wise customer report. **8**

   b) Any hospital is dedicated to a single objective-to provide the best possible care for their patients. "e-Sushrut" C-DAC's Hospital Management Information System is a complete ERP solution for hospitals. What are the subsystems needed to develop such HMIS ? What steps must be taken while developing such systems to supports variety of hospitals such as medium sized clinic, large sized hospitals, and super specialty hospitals. **8**

OR

8. a) Design the following formats of reports produced by payroll system. What information the organization will get from these reports ?

   i) Pay-Slip

   ii) Provident Fund Statement

   iii) Department wise salary summary. **8**

   b) What type of information systems you have experienced while studying in your Engineering college ? What type of information system you would suggest to your Principal/Head of the department for effective management of activities in the department. Give suitable examples. **8**

9. a) What do you mean by Enterprise Resource Planning (ERP) ? Discuss the nature of ERP packages that are available in the market and the criteria applied in evaluating these packages. **8**

   b) Describe in detail the role and importance of IT enabled services in today's changing business environment. **8**

OR

10. a) Explain any three Inbound Call Center Services which employ a dedicated team of live operators and offer 24/7 operator availability for the customers providing round-the-clock account management. **8**

    b) What are Outbound Call Center Services ? Explain any two outbound call center services which we experience in day-to-day life. **8**

11. a) Explain the various issues that are of primary concern for an auditor involved in information system audit. **9**

    b) What measures can be taken by the organization to prevent computer fraud ? Explain with suitable example. **9**

OR

12. Write short notes on **any three** of the followings : **18**

    a) Cyber laws

    b) Information Technology Act

    c) Patents

    d) Contingency management

    e) Cultural, political challenges of IT.

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T.E. (Production) (Semester – II) Examination, 2011
METROLOGY QUALITY CONTROL
(2003 Course)

Time : 3 Hours | Total Marks : 100

SECTION – I

1. a) Differentiate between line standard, end standard and wavelength standard with their merits and demerits. **7**

   b) Explain requirement, uses, limitations of sine bar, sine centre and universal sine centre. **9**

   OR

2. a) Design GO- NOGO gauges for checking the hole of diameter $\phi 25 \begin{matrix} +0.016 \\ +0.00 \end{matrix}$ mm. **6**

   b) Describe colibration of dial gauge. **8**

   c) Define roundness and circularity. **2**

3. a) Explain with neat sketch autocollimator with their application. **8**

   b) Explain with neat sketch various alignment test on milling machine. **8**

   OR

4. a) Describe the use of optical flats and monochromatic source of light for checking parallelism and flatness of surfaces. **8**

   b) Describe with a neat sketch the operating principle of linear voltage differential transformer comparator. **8**

P.T.O.

5. a) What are the different errors found in screw threads ? Explain the effect of pitch error on the effective diameter. **8**

   b) For a 20° pressure angle gear having 40 teeth and 4 mm module, calculate :

      1) Roller diameter for pcd measurement

      2) Distance over the rollers placed in opposite spaces

      3) Distance over two plugs spaced 20 teeth apart. **8**

   c) Explain drunken thread error. **2**

OR

6. Write a short note on : **18**

   1) Co-ordinate measuring m/c

   2) Universal measuring m/c

   3) Span micrometer.

SECTION – II

7. a) Explain Dr. W. Edward Deming 14 point and PDCA cycle for quality control. **10**

   b) Explain with neat sketch Juran Trilogy diagram. **6**

OR

8. Differentiate betweeen : **16**

   1) Quality of design and quality of conformance

   2) 100% inspection and selective inspection

   3) Cost of quality and value of quality

   4) Chance causes and assignable causes.

9. a) In a printed circuit board factory, the number of non confirmities observed in 26 samples of 100 circuit boards.

Sample No.	No. of Non-confirmities
1	21
2	24
3	16
4	12
5	15
6	5
7	28
8	20
9	31
10	25
11	20
12	24
13	16
14	19
15	10
16	17
17	13
18	22
19	18
20	39
21	30
22	24
23	16
24	19
25	17
26	15

Construct appropriate control chart. State whether the process is control. **8**

b) Describe the following terms

i) C_P

ii) C_{PK}

iii) AQL

iv) AOQL

v) LTPD

vi) α -risk

vii) β -risk

viii) AOQ. **8**

OR

10. Describe the following Quality Improvement Tools.

i) Cause and effect diagram

ii) Pareto analysis

iii) Check sheet

iv) Brain storming. **16**

11. a) What are the clauses of ISO 9000 series standard and their interpretation and implementation ? **10**

b) What are the concepts and requirements of ISO 14001 ? **8**

OR

12. Write a short note on : **18**

1) Malcom balbridge award

2) Structure of ISO 9000-2000

3) Environment Management System.

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T.E. (Electrical) (Semester – II) Examination, 2011
POWER SYSTEM – II
(2003 Course)

Time : 3 Hours | Total Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the right indicate **full** marks.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Derive the expression for A, B, C, D constants for long transmission line. **8**

   b) Explain the concept in detail for equivalent π circuit of long transmission line with its use. **8**

OR

2. a) What do you mean by surge impedance loading ? **8**

   b) Explain the term compensation and what are different methods of compensation ? **8**

3. a) What do you mean by a reactance diagram ? Explain how is it developed. **8**

   b) What do you mean by p.u. system ? Prove that the single phase and three phase values are same in p.u.system. **8**

OR

4. a) Explain the concept of subtransient, transient and steadystate current and impedance in detail. **10**

   b) How the selection of circuit breaker is done in power system ? What are the current limiting reactors ? Explain its use in power system. **6**

5. a) Derive the expression for three phase power in terms of sequence components that is symmetrical components. **9**

   b) Derive the expression of fault current in case of L-L fault. **9**

OR

6. a) What are symmetrical components used for unsymmetrical fault analysis ? State their use for same purpose. **9**

   b) Draw the sequence network for DLG fault and explain related theory. **9**

SECTION – II

7. a) Give classification of various types of buses in a power system for load flow studies and necessity of such classification. **6**

   b) Explain in detail Newton-Raphson method for load flow analysis along with flowchart. **10**

OR

8. a) Derive the general form of power flow equations for a n-bus power system and state various constraints to be considered while attempting a solution. **8**

   b) A sample power system has the following line data. Form bus admittance matrix for this system. Neglect shunt admittances at the buses. **8**

Bus Code	**Series Impedance in per unit**
1-2	0.02+j0.07
1-3	0.06+j0.22
2-3	0.04+j0.17
2-4	0.03+j0.15
3-4	0.02+j0.06

9. a) Derive the swing equation of a synchronous machine starting from first principle and explain its use in stability studies. **8**

   b) Define transient stability and methods to improve it. **8**

OR

10. a) Write a note on synchronizing power coefficients and explain their use. **8**

    b) A 50 Hz, four pole turbogenerator rated 120 MVA, 11 kV has an inertia constant of 7 MJ/MVA,

       i) Find the energy stored in the rotor at the synchronous speed.

       ii) If the mechanical input is suddenly raised to 90 MW for an electrical load of 60 MW, find rotor acceleration. Neglect mechanical and electrical losses.

       iii) If the acceleration calculated in part (ii) is maintained for 10 cycles, find the change in torque angle and rotor speed in rpm at the end of this period. **8**

11. a) Compare HVDC transmission system with HVAC transmission system. **10**

    b) Explain constant current control method for HVDC transmission system. **8**

OR

12. a) Explain different types of HVDC links. What are the recent developments in HVDC transmission systems ? **10**

    b) Explain constant ignition angle control method for HVDC transmission system. **8**

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T.E. (Electrical) (Semester – II) Examination, 2011
POWER ELECTRONICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Black** figures to the **right** indicate **full** marks.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Draw static characteristics of SCR and explain all the important voltage and current terms. **8**

   b) Explain turn on and turn off in GTO, using its construction diagram. **8**

   OR

2. a) Draw and explain VI characteristics of Triac with different operating modes. **8**

   b) Explain turn off of SCR using its dynamic characteristics. Why SCR is not preferred to be used in high frequency/inverter circuits ? **8**

3. a) Explain switching characteristics of MOSFET. Compare MOSFET with BJT. **8**

   b) What is Safe Operating Area (SOA) ? How the boundaries are defined in MOSFET ? **8**

   OR

4. a) Explain construction and characteristics of IGBT. What is Latchup ? How it can be avoided ? **10**

   b) Explain turn on and turn off process for MCT. **6**

P.T.O.

5. a) Draw a neat circuit diagram for a single phase full bridge rectifier feeding highly inductive load. Draw waveforms for $\alpha = 60^{\circ}$ for i) ouput voltage ii) output current and iii) input current taken from supply. **9**

   b) Draw the control characteristic of a 3 phase dual converter feeding a motor load. Show clearly the range of operation and firing angle control for motor operations. **9**

OR

6. a) Derive expression for average and rms output voltage for an highly inductive load fed from a single phase semibridge rectifier. Draw output voltage, output current, SCR current and diode current waveforms. **9**

   b) Draw neat circuit diagram for a 3 phase full bridge controlled converter feeding RL load. Specify firing sequence and conduction intervals of all SCRs. Draw output voltage waveform for $\alpha = 0$ condition. What is the condition for continuous conduction ? **9**

SECTION – II

7. a) Describe the working of type D chopper with appropriate waveforms. Indicate the range of duty cycle for operating quadrants. **8**

   b) What is time ratio control in dc chopper ? Explain the use of TRC for controlling the output voltage in chopper. **8**

OR

8. a) What is meant by step up chopper ? Explain its operation. Sketch the input voltage, input current, output voltage and output current waveforms. State the various assumptions made. **8**

   b) A step up chopper has output voltage of two to four times the input voltage for a chopping frequency of 2000 Hz. Determine the range of off periods for the gate signal. **8**

9. a) What is the purpose of connecting diodes in anti parallel with thyristor in inverter circuits ? Explain how these diode come into play ? **6**

   b) Explain 1ϕ full bridge inverter with necessary waveforms. **6**

   c) Explain current source inverter with necessary diagram and waveforms. **6**

OR

10. a) Explain series inverter with necessary diagram and waveforms. **6**

    b) Explain 3ϕ six pulse bridge inverter for 120° mode of operation. Explain each step and comapre with 180° mode. **12**

11. a) Discuss the techniques used to control the output voltage of inverter. **8**

    b) What is snubber circuit ? Give step by step procedure to design a snubber circuit. Explain working of snubber circuit. **8**

OR

12. a) Explain multiple pulse modulation used in inverter. Draw necessary waveforms to obtain four pulses per half cycle of output voltage waveforms. Why multiple pulse modulation is better than single pulse modulation ? **8**

    b) With reference to 1ϕ converter circuit mention the selection criterion about following :

       i) Step down transformer

       ii) Transformer with centre tap

       iii) Number of SCR

       iv) Number of power diodes. **8**

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T.E. (Electronics and Telecommunication/Electronics Indl. Elex.) (Semester – II)
Examination, 2011
INFORMATION THEORY AND CODING TECHNIQUES
(2003 Course)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answer **any 3** questions from **each** Section.*
*2) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*3) Answers to the **two** Sections should be written in **separate** books.*
*4) **Neat** diagrams must be drawn **wherever** necessary.*
*5) Black figures to the **right** indicate **full** marks.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) A DMS generates a string (which includes space between two words) - 'PUNE UNIVERSITY'. Find the code word using Huffmann algorithm and efficiency of the code. **8**

   b) "For a finite variance, the Gaussian random variable has the largest differential entropy attainable by any random variable". Justify the statement. Calculate the value of this entropy. For a random variable X, uniformly distributed over the interval (0, a), what is H(X) ? **8**

OR

2. a) Write the difference between Huffmann and LZ algorithm. Determine Lempel-Ziv code for the following bit stream 0100 1111 1001 0100 0001 0101 0110 0110 000. Recover the original sequence from the encoded stream. **8**

   b) Write short notes on :
   1) JPEG
   2) Shannon's source and channel coding theorem. **8**

P.T.O.

3. a) An analog signal having 4 KHz bandwidth is sampled at 1.25 times the Nyquist rate and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.
   i) What is the information rate of this source ?
   ii) Can the output of this source be transmitted without an error over an AWGN channel with a bandwidth of 10 KHz and a S/N ratio of 20 dB ?
   iii) Find the S/N ratio required for error free transmission.
   iv) Find the bandwidth required for an AWGN channel for error free transmission of the output of this source if S/N ratio is 20 dB. **8**

   b) Explain rate distortion function. **4**

   c) What are the implications of information capacity theorem ? Explain. **4**

OR

4. a) Explain sphere packing problem. **4**

   b) Consider a source X uniformly distributed on the set {1, 2 ... m}. Find the rate distortion function for this source with Hamming distortion defined as

$$d(x, \hat{x}) = 0, \quad x = \hat{x}$$
$$= 1, \quad x \neq \hat{x} \quad .$$

6

   c) Explain Shannon Hartley theorem of information capacity. **6**

5. a) For a (6, 3) code, the generator matrix G is given by

$$G = \begin{bmatrix} 1\,0\,0\,1\,0\,1 \\ 0\,1\,0\,0\,1\,1 \\ 0\,0\,1\,1\,1\,0 \end{bmatrix}$$

10

   i) Realize an encoder for this code.
   ii) Verify that this code is a single error correcting code.
   iii) If the received code word is 100 011, find the syndrome.

   b) Construct a systematic (7, 4) cyclic code using suitable generator polynomial. What are the error correcting capabilities of this code ? Construct the decoding table. For the received codeword 1101100, determine the transmitted data word. **8**

OR

6. a) For a linear cyclic code with $G(p) = X^3 + X + 1$, find out the codeword for message 1101 and syndrome for the received sequence 1111011 with the help of cyclic encoder and syndrome calculator using hardware arrangement. **10**

   b) Define burst error, what is the cause to generate burst error ? How burst error correction takes place ? Explain with suitable example. **8**

SECTION – II

7. a) Draw the state diagram, tree diagram and trellis diagram for K = 3, rate $1/3$ code generated by $g_1(x) = x+x^2$, $g_2(x) = 1+x$, $g_3(x) = 1+x+x^2$. What is the impulse response of the encoder of the specifications given ? Using the impulse response, determine the output sequence when the input is (1, 1, 0). **12**

   b) Explain how mapping by set partitioning is used to design TCM scheme. **6**

OR

8. a) Explain in detail about Viterbi algorithm with an example. **10**

   b) Enlist the important characteristics of block interleaver and explain how an interleaver/de-interleaver performs on bursty noise. **8**

9. a) Find the generator polynomial and minimum distance for the following codes :
   i) RS (15, 11)
   ii) RS (15,7). **8**

   b) Find the generator polynomial for BCH code over GF (8) using primitive polynomial $p(z) = z^3+z+1$ over GF(2) codeword. The code should correct t = 1,2 ... errors. **8**

OR

10. a) Use the prime numbers 3 and 11 to find public key, private key and n. Also encrypt any plain text m = 4 and decrypt it. **8**

    b) What are data encryption standards ? Discuss in brief about symmetric and asymmetric cryptography. **8**

11. a) A C-band satellite earth station working at 6375/4150 MHz channel receives signals from geo-stationary satellite at an elevation angle of 28°. The diameter of earth station antenna is 7.5m. Noise temperature is 100°K. Find G_T/T_S figure of earth station. If the heavy rain causes the system noise temperature to degrade by 20%. Find the new G_T/T_S. **8**

b) Explain **any two** : **8**

i) IS-95

ii) SPADE

iii) CDMA.

OR

12. a) Explain wireless communication and discuss the propagation effects related with it. **8**

b) Explain the following w.r. to satellite communication :

i) Kepler's law

ii) Station keeping

iii) Frequency reuse

iv) Geostationary orbit. **8**

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T.E. (Chemical) (Semester – I) Examination, 2011
PROCESS EQUIPMENT DESIGN – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*

*2) Answers to the **two** Sections should be written in **separate** answer books.*

*3) Figures to **right** indicate **full** marks.*

*4) **Neat** diagrams must be drawn **wherever** necessary.*

*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

*6) **Assume** suitable data if **necessary**.*

SECTION – I

1. A pressure vessel subjected to combined loading is to be designed to carry out certain chemical reaction. Best performance is obtained at 500 kN/m^2 and at a temperature of 150°C. The permissible stress for the material of fabrication is 106 MN/m^2. According to the process requirement the internal diameter of the vessel is 1500 mm. The shell is closed at both ends by standard shallow dished heads. Maximum torque due to offset piping is 120 kg-m. Since the material of construction is stainless steel, no corrosion allowance is necessary. Determine the minimum thickness of shell, heads and the stresses due to combined loading. Crown Radius of head is 1500 mm and stress intensification factor is 1.77. Weight of vessel and its content is 320000 kN. **18**

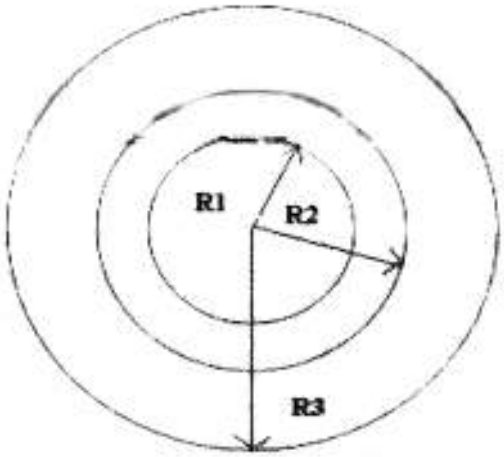
OR

2. a) A vessel and its head are to be connected with corrugated faced slip-on type flanges. For the specification as given below, design suitable gasket and bolts for such a connection. It is desirable to use a minimum number of bolts. Design pressure = 20 bar (gauge), Gasket material = 1.6 mm thick compressed asbestos, allowable pressure for flange material = 100 MPa, Poisson's ratio for flange material = 0.3, allowable stress for bolt material = 120 MPa, shell outside diameter = 800 mm, shell thickness = 10 mm, flange thickness = 20 mm. For the given operating conditions, is the flange thickness adequate ? If it is not, what alternative pressure would you recommend for safe operation till appropriate flanges are procured ? **10**

P.T.O.

b) A seamless spherical shell, 90 cm in diameter and 1 cm thick is being filled with a fluid under a pressure until its volume increases by 150 cm^3. Calculate the pressure exerted by the fluid on the shell if the modulus of elasticity is 2×10^6 kgf/cm^2 and Poisson's ratio as 0.3. **8**

3. a) A high pressure vessel consists of two concentric cylinders with shrink fit construction. The ID of shell is 350 mm. The shell is subjected to internal pressure of 150 MPa. The vessel is made of tensile steel with permissible stress of 500 N/mm^2. The modulus of elasticity and coefficient of linear expansion are 2×10^5 N/mm^2 and 12.5×10^{-6} per °C. The optimum value of interface radius R_2 is given by , $R_2 = (R_1R_3)$½.



Design the shrink fit constrcution vessel. Find out the temperature increase required for shrinking process. Calculate stresses in inner and outer shells. Draw a neat sketch showing variation of stresses in the shell. **10**

b) Explain with neat sketches, various supports for vertical and horizontal vessels. **6**

OR

4. A multilayer vessel having an inside diameter 30 cm and an outside diameter 59 cm has been formed by shrink fitting. The vessel is to operate under an internal pressure of 1330 kg/cm^2 and is constructed of three shells. The interface diameters are 37.5 cm and 46.8 cm respectively. Determine the

a) Maximum combined stresses at the interfaces of the concentric shells.

b) The hoop stress variation in each of the three shells. **16**

5. a) Design a saddle support for a horizontal vessel using following data :

Material low carbon steel, Vessel Diameter = 1230 mm

Length of shell = 8000 mm, shell thickness = 10 mm

Working pressure = 0.5 N/mm^2, Head thickness = 12 mm

Torispherical head-crown radius = 1230 mm

Knuckle radius = 75 mm

Total head depth = 257 mm

Corrosion allowance = 1.5 mm, permissible stress = 95 N/mm^2

Weight of vessel and its contents = 119430 N

Distance of saddle centre line from shell end = 320 mm, Angle = 120°

Value of k_1 = 0.107 and k_2 = 0.192 for the included angle 120°

Estimate, longitudinal bending moments, stresses in shell at the saddle and stresses in shell at mid span. **10**

b) What types of vessels are used for storage of gases ? Why ? **6**

OR

6. a) A storage vessel is required to store 45000 kg of oil, whose density is 910 kg/m^3. The diameter of the vessel can be taken as 2.5 m. If the plates in the size of 1.2 m×2.5 m in different thicknesses are available for fabrication, estimate the total number of plates required for fabrication of storage tank. Welded joint efficiency is 85%. Permissible stress of the material = 1020 kgf/m^3. **10**

b) What are the various causes for loss of volatile liquid during storage ? **6**

SECTION – II

7. A light oil is to be cooled in a 1:2 shell and tube heat exchanger at a rate of 54430 kg/hr from 100°C to 38°C. Cooling tower water is used as cooling medium which is available at 16°C and can be heated up to 32°C.

   Tubes of 19 mm OD and 16 mm ID are available with 16 ft length. Use the following data :

   Properties of light oil –

   Specific heat = 2345 J/kg K, Density = 850 kg/m^3, Viscosity = 2cP

   Thermal conductivity = 0.142 W/m K

   Properties of water –

   Specific heat = 4187 J/kg K, Density = 1000 kg/m^3, Viscosity = 2cP

   Thermal conductivity = 0.623 W/m K, Viscosity = 0.68 cP

   Fouling resistance on both sides may be taken as 0.0004 m^2 k/W. Metal wall resistance can be neglected. As a first estimate take overall heat transfer coefficient as 450 W/m^2 K.

   Design the heat exchanger in detail. Assume suitable data if needed. **18**

OR

8. a) 54000 kg/hr of benzene is cooled by pumping it through the shell side of shell and tube heat exchanger of 1000 mm ID shell, fitted with 5000 mm long tubes of 19 mm OD, arranged on 25 mm square pitch with 6 mm clearance. If the baffle spacing is 250 mm, calculate the shell side pressure drop.

   Data : Viscosity of benzene = 0.5×10^{-3} kg/(m-s)

   Density of benzene = 881 kg/m^3

   Following equation in consistent units may be used for calculating the pressure drop :

$$\Delta P_s = \frac{F_s G_s^{\,2} (n+1) d_s}{2\rho d_e}$$

   Where F_s = Shell side friction factor dependent on Reynolds number

   G_s = Mass velocity of shell side flow (kg/(m^2s))

   n = Number of baffles

   d_e = Equivalent diameter

   d_s = Shell

   Take F_s = 0.28 for above flow rate of benzene. **8**

b) Draw a neat sketch of shell and tube heat exchanger and name its parts. **5**

c) With neat sketches explain various types of baffles used for shell and tube heat exchanger. **5**

9. a) Estimate the size needed for a counter current Bayonet heat exchanger and estimate the cooling water rate required :

The following data is available :

Inlet and outlet temperatures of hot fluid are 232°C and 176°C respectively.

Inlet and outlet temperatures of cold fluid are 140°C and 154°C respectively.

ID of inner tube = 2.54 cm

OD of outer tube = 5.08 cm

Overall heat transfer coefficient for inner tube = 114 $W/m^2°C$

Overall heat transfer coefficient for outer tube = 57 $W/m^2°C$

Mass flow rate of hot fluid = 0.278 kg/sec

Heat capacity of hot fluid = 2594 J/kg°C

Heat capacity of cold fluid = 2427 J/kg°C. **12**

b) Write a short note on Bayonet heat exchanger. **4**

OR

10. a) Explain briefly, how the feed/product characteristics like concentration, foaming tendency, temperature sensitivity and scaling tendency affects the process design of calendria type evaporator. **6**

b) A single effect evaporator is to be operated at absolute pressure of 0.13 bar. Estimate the heat transfer area necessary to concentrate 4500 kg/hr of caustic soda solution from 10% to 41% (by wt.), using saturated steam at 117°C as heating media. For such a system the overall heat transfer coefficient may be taken as 1.25 kW/(m^2°C).

Data :

Specific heat of feed = 4000 J/kg°C

Specific heat of product = 3260 J/kg°C

Feed temperature = 18°C

Density of boiling liquid = 1390 kg/m^3

Boiling point rise of solution = 30°C

The liquid level in the evaporator is 1200 mm above the heating surface. **10**

11. a) Explain plate and frame filter press with neat sketch. **8**

b) Explain the working of Basket type centrifuge with neat sketch. **8**

OR

12. a) A rotary vacuum filter, operating at 2 rpm, filters a slurry at the rate of 1000 lit/min. Operating under the same vacuum and neglecting the resistance of filter cloth, at what speed must the filter be operated to give a filtration rate of 2000 lit/min ? **10**

b) Explain the process of filtration in rotary drum filter. **6**

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T.E. (Chemical Engineering) (Semester – II) Examination, 2011
CHEMICAL REACTION ENGINEERING – I
(Common to Bio-Technology)
(2003 Course)

Time : 3 Hours Total Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Differentiate between :

i) Elementary and nonelementary reaction

ii) Order and molecularity of reaction. **6**

b) What do you mean by steady state approximation in finding the correct mechanism and rate for homogeneous reactions ? **4**

c) Explain following mechanism with example : **6**

a) Free radical, chain reaction mechanism

b) Molecular intermediates, nonchain mechanism.

OR

P.T.O.

2. a) Phosphine decomposes when heated according to following reactions

$$4PH_3 \rightarrow P_{4(g)} + 6H_{2(g)}$$

at given instant the rate at which phosphine decomposes is 2.4×10^{-3} mol/lit.s. Express the rate in three different ways using differential notation and show relationship between them.

What is the rate of formation of i) P_4 and ii) H_2 ? **10**

b) The pyrolysis of ethane proceeds with an activation energy about 75000 cal. How much faster is the decomposition at 650° C than at 500° C ? **6**

3. a) Explain differential method and integral method of analysis of batch reactor data. **6**

b) Show that the decomposition of N_2O_5 at 70° C is first order reaction, calculate the value of rate constant, reaction is $N_2O_5 \rightarrow N_2O_4 + \frac{1}{2}O_2$. **10**

Time (min)	0	1	2	3	4
$C_{N_2O_5}$ **mol/lit**	0.16	0.113	0.08	0.056	0.040

OR

4. a) In gaseous reaction the time for half life change ($t_{½}$) for various initial partial pressure of the reactant was given as follows :

P_{A0} (torr)	200	300	400
$t_{½}$ (min)	150	99.8	75.3

Find the order of reaction. **10**

b) For first order reaction with variable volume show that

$$-\ln\left(1-\frac{\Delta V}{\in_A .V_0}\right)= kt\ .$$ **6**

5. A homogeneous liquid phase reaction with the stoichiometry and the kinetics

$$A \rightarrow B \quad -r_A = k.C_A^2$$

takes place with 50% conversion in mixed flow reactor.

i) Find the conversion if this reactor is replaced by another mixed flow reactor having volume 6 times that of original reactor.

ii) Find the conversion if original reactor is replaced by a plug flow reactor of the same size all else remain unchanged. **18**

OR

6. a) The elementary liquid phase reaction $A + B \rightarrow C + D$ is carried out in plug flow reactor. For equimolar amounts of A and B (C_{A0} = C_{B0} = 0.9 mol/lit), 94% conversion is achieved in it. If CSTR , 10 times as large as the plug flow reactor, were arranged in series with existing unit, which needs to be arranged first (in series) to enhance production rate. **12**

b) Explain batch and continuous flow recycle reactor with schematic representation. **6**

SECTION – II

7. a) The desired liquid phase reaction

$A + B \rightarrow R + T$ with $\frac{dC_R}{dt} = \frac{dC_T}{dt} = K_1 C_A^{1.5} C_B^{0.3}$ is accompanied by undesired reaction $A + B \rightarrow S + U$ with $\frac{dC_s}{dt} = \frac{dC_u}{dt} = K_2 C_A^{0.5} C_B^{1.8}$

order the contacting schemes given below from the standpoint of favourable product distribution from the most favourable to least favourable.

1) PFR

2) Plug flow reactor with side stream of B

3) CSTR

4) PFR with side stream of A. **10**

b) Define instantaneous fractional yield and overall fraction yield.

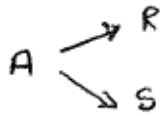
Find out instantaneous fractional yield of reaction (ψ)

$A + B \xrightarrow{K_1} R$ (Desired) $\frac{dC_R}{dt} = 1.0 C_A^{1.2} C_B^{1.4}$

$A + B \xrightarrow{K_2} S$ (Undesired) $\frac{dC_s}{dt} = 1.0 C_A^{0.6} C_B^{2.0}$. **6**

OR

8. a) Liquid phase reactant A decomposes as per following scheme



with rates $r_R = k_1 C_A^2$ $K_1 = 0.4\ m^3/mol.min$

$r_S = k_2 C_A$ $K_2 = 2\ (min)^{-1}$

Feed contains A with $CA_0 = 40\ mol/m^3$ enters the reactor decomposes and mixture of A, R and S leaves the reactor. Find operating conditions (X_A, ξ, C_R) which maximizes C_R in mixed flow reactor. **10**

b) Discuss the product distribution in First order series reaction

$A \xrightarrow{K_1} R \xrightarrow{K_2} S$. **6**

9. a) Determine the equilibrium conversion for following elementary reaction between $0^\circ C$ and $100^\circ C$

$A \rightleftharpoons R$

at 298 K $\Delta G^\circ = -14130$ J/mol

$\Delta H^\circ_R = -75300$ J/mol $C_{P_A} = C_{P_R}$ = Constant

i) Construct a plot of temperature Vs conversion

ii) What restrictions should be placed on reactor operating isothermally if conversion of 85% or higher is desired ? **10**

b) Estimate equilibrium constant at 800 K for the reaction

$C_2H_{4(g)} + H_2O_{(g)} \rightarrow C_2H_5OH_{(g)}$

At 298 K

ΔH_f° for H_2O = – 57798 cal/mol

$C_2H_5OH_{(g)}$ = – 56241 cal/mol

$C_2H_{4(g)}$ = 12495 cal/mol

ΔG° = – 2030 cal/mol at 298° K. **6**

OR

10. a) Explain optimum temperature progression for exothermic reversible reaction. **6**

b) Draw and explain energy balance equation line for adiabatic operations. **4**

c) Explain effect of temperature, pressure and inerts on equilibrium conversions (X_{AC}) for exothermic and endothermic reactions. **6**

11. A pulse of tracer of amount 3.7 mg is injected to stirred vessel through feed stream. The following table shows the measured concentration in the outflow stream. Calculate the mean residence time and generate 'E' curve. The volumetric flow rate and residence time are 0.5 L/S and 50 sec respectively. **18**

Time (sec)	0	10	20	30	40	50	60	70	80	90	100	110	120
Concentration mg/L	0	0.1	0.3	0.6	0.7	0.65	0.6	0.4	0.1	0.08	0.04	0.02	0

OR

12. Write short notes on (**any three**) : **18**

a) Tank in series model

b) C and E curve

c) Micro and macro mixing of fluids

d) Seggregation model

e) Dispersion flow model.

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T.E. (Chemical) (Semester II) Examination, 2011
TRANSPORT PHENOMENA
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION I

1. a) Explain time independent fluids and time dependent fluids. **6**

   b) Compute the mean molecular velocity $\bar{u}$ and mean free path λ of O_2 at 1 atm and 273° K. Assume d = 3 $\mathring{A}$. What is the ratio of the mean free path to the molecular diameter in this situation ? **6**

   c) An horizontal annulus is 27 ft long. The outside radius of inner cylinder is 0.495 inch. The inside radius of outside cylinder is 1.1 inch. The fluid density is 80.3 lb/ft^3 and viscosity is 136.8 lb.m/ft.s. What is the volume rate of flow, the impressed pressure drop is 5.39 Psi. **6**

OR

2. a) Derive the velocity profile and momentum profile for a Newtonian fluid through a circular pipe inclined at angle β. Find the ratio of maximum velocity to the average velocity. **12**

   b) What is Lennard Jones potential and what does it represents **6**

P.T.O.

3. a) Compare the friction factor for flow in tubes and flow around sphere. **8**

   b) A heavy oil with kinematic viscosity of 3.45×10^{-4} m^2/s is rest in a long vertical tube of radius 0.7 cm. The fluid is suddenly allowed to flow from the bottom of the tube by virtue of gravity. After what time will the velocity at the tube center will be 10% of its final value and what is the result, if water at 20° C is used, $\mu = 3.45\times10^{-3}$ kg/m.s. **8**

OR

4. a) Explain Buckingham's PI theorem. **8**

   b) Water at 20° C is being pumped from a tank to an elevated tank at rate 5×10^{-3} m^3/sec. All of the piping is 4 inch schedule 40; pump has an efficiency of 65%. What is the power in kW needed for the pump ?

   Data : $\rho = 998.2$ kg/m^3, $\mu = 1.005\times10^{-3}$ N.S/m^2

   D = 1.1023 m Cross sectional area = 8.219×10^{-3} m^2

   $e_{vi} = 0.45 + 2\times0.5 + 1.$ **8**

5. a) Deduce the relation for a temperature distribution and efficiency of straight rectangular fin of uniform cross section. **8**

   b) A copper wire has a radius of 2 mm and a length of 5 m. For what voltage drop would the temperature rise at the wire axis be 10° C, if the surface temperature of the wire is 20° C ? **8**

OR

6. a) Derive the expression for heat conduction with a chemical heat source. **8**

   b) A cold storage room is constructed of an inner layer of 12.7 mm of pipe, a middle layer of 101.6 mm of cork board and an outer layer of 76.2 mm of concrete. The wall surface temperature is 255.4 K inside the cold room and 297.1 K at the outer surface of the concrete. Use thermal conductivities for pipe, 0.151, for cork board; 0.0433; and for concrete; 0.762 W/mk. Calculate the heat loss in W for 1 m^2 and the temperature at the interface between wood and cork board. **8**

SECTION – II

7. a) What are time smoothing equations ? State its utility. **8**

   b) What are semiempirical expressions for turbulent energy flux and what are their applications ? **8**

OR

8. a) Give the physical significance of Brinkman number and explain when will the temperature become maximum. **8**

   b) State and explain comparison of forced and free convection in nonisothermal systems. **8**

9. a) What is diffusion and what factors may cause diffusion to occur ? **8**

   b) Estimate diffusivity of acetic acid in dilute aqueous solution at 12.5° C. The density of acetic acid at its normal boiling point is 0.937 gm cm^{-3}, $\Psi_{MB} = 2.6$, $M_B = 18.02$, $\mu = 1.22\ C_p$. **8**

OR

10. Show that $N_{AZ} / z = z_1 = \dfrac{CD_{AB}}{(z_2 - z_1)\, x_{Bln}} (x_{A_1} - x_{A_2})$. If the rate of mass transfer is related to a characteristic concentration driving force $x_{A1} - x_{A2}$ for diffusion through a stagnant gas film. **16**

11. a) Write analogies among mass heat and momentum transfer. **9**

    b) Explain diffusion in laminar falling film. **9**

OR

12. Write note on :

    a) Macroscopic and microscopic balance

    b) Chilton and Colburn J-factor analogy

    c) Co-relation of Binary mass transfer coefficients in one phase at low mass transfer rates. **18**

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