[3962] – 193

S.E. (Petrochemical/Petroleum/Polymer) Examination, 2011
CHEMICAL PROCESS CALCULATIONS
(2008 Course)

Time : 3 Hours   Max. 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, steam table is **allowed**.*
*4) Draw **neat** sketch **wherever** necessary.*

SECTION – I

1. a) A gas has the following composition in mole basis CO_2 = 10.5%; CO = 0.2%; O_2 = 8.6% and N_2 = 80.7%. Calculate its weight percentage; volume occupied by 0.5 kg gas at 30°C and 760 mm Hg; density of gas kg/m^3 and specific gravity of the gas mixture. **6**

b) The flow rate of water through a pipe is reported as 20 cubic feet per minute. Taking density of water as 1 g/cm^3. Calculate the mass flow rate in kg/s. **6**

c) Estimate the molar volume of CO_2 at 600 K and 110 bar using a) ideal gas law and b) the Van der waals equation. Van der waal constants are 0.364 N m^4/mol^2 and 4.267 * 10^{-5} m^3/mol. **6**

OR

2. a) Calculate the weight of NaCl that should be placed in a 2 litre volumetric flask to prepare a solution of 1.4 molality. Density of this solution is 1.08 g/cc. **6**

b) A gas is piped from the well at 300 K and 400 kPa. The gas is found to contain 83% methane, 14.5% ethane and the rest nitrogen in mole basis. Calculate :

a) the partial pressure of nitrogen

b) the pure component volume of ethane in 8 m^3 of the gas

c) density at standard conditions in kg/m^3

d) composition in weight percentage. **6**

c) Explain the role of material and energy balance in process industry. Give proper technical justification. **6**

3. a) State various unit operations in process industry. Give the overall and component balance for any two unit operations. **8**

b) An evaporator is fed continuously with 1000 kg/hr of a solution containing 15% NaOH, 15% NaCl and 70% water by weight. During the evaporation, water is boiled off and NaCl precipitates as crystals and removed from the remaining liquor. The concentrated liquor leaving the evaporator contains 60% NaOH, 2% NaCl and 38% water. **8**

Calculate :

a) kg of water evaporated per hour

b) kg of salt precipitated per hour and

c) kg of concentrated liquor produced per hour.

OR

4. a) A gas containing 4% NH_3, 26% N_2 and the rest H_2 is flowing in a pipe. To measure the flow rate an ammonia rich gas containing 86% NH_3, 13% H_2, and 1% N_2 is sent at a rate of 100 cc/min. the concentration of NH_3 in the down stream is 8%. Find the flow rate of gas inlet. **6**

b) Explain Bypass, Recycle and Purging operations with the help of block diagrams and define the terms associated with it. **10**

5. a) Define the following : Limiting reactant, Excess reactant, Percentage conversion, Yield. Give example of each. **8**

b) In manufacturing of chlorine, feed containing HCl gas and air are fed to oxidizer. The product gas leaving the oxidizer are found to contain 13.2% HCl, 6.3% O_2, 42.9% N_2, 30% Cl_2 and 7.6% H_2O (by volume). Calculate percentage excess of air used, composition in weight of gases entering the oxidizer and degree of completion of oxidation. **8**

OR

6. a) The gaseous reaction A 2B + C takes place isothermally in a constant pressure reactor. Starting with a mixture of 75% A and 25% inerts (by volume), in a specified time the volume doubles. Calculate the conversion achieved. **8**

b) In an oil quench process to manufacture acetylene pure oxygen and pure methane are fed to the burner. Cracked gas from the burner has the following composition : H_2 : 56.5%; CH_4 : 5.2%; C_2H_4 : 0.3%; C_2H_2 : 7.5%, C_3H_6 : 0.5%, CO : 25.8%, CO_2 : 4.0%, O_2 : 0.2% (on dry basis). For 100 kmol of cracked gas calculate : **8**

1) Methane and Oxygen requirement
2) Production of water
3) Conversion of methane and
4) Yield of Acetylene.

SECTION – II

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

- Bubble points and dew points of ideal mixtures
- Equation of states
- Flash calculations.

OR

8. a) Define Raoult's Law and Henry's Law. Calculate the total pressure and composition of the vapors in contact with the solution of benzene (35%), Toluene (40%) and Xylene (25%), by weight at 100°C. Vapor pressure at 100°C are as follows : Benzene : 1340 mm Hg; Toluene : 560 mm Hg; Xylene : 210 mm Hg. **10**

b) What is Clapeyron equation and give its applications. **4**

c) Give the procedure of estimate dew point pressure of an ideal solution. **4**

9. a) Explain the treatment required to solve conservation of mass and energy problems with respect to the steady and unsteady state process and batch and continuous processes. **8**

b) A square tank 6 m on a side and 9 m high is filled to the brine with water. Find the time required for it to empty through a drain at bottom of 7 cm^2 area. **8**

OR

10. a) The molal heat capacity of CO is given by $Cp = 26.586 + 7.582 * 10^{-3} T - 1.12 * 10^{-6}T^2$ where Cp is in kJ/kmol K and T is in K. a) Calculate the mean molal heat capacity in the temperature range of 500 – 1000 K b) CO enters a heat exchanger at a rate of 500 cubic meters per hour at STP. Calculate the heat to be supplied to the gas to raise its temperature from 500 to 1000 K. **8**

b) Define with expressions : **8**

a) Absolute saturation humidity b) Percent humidity

c) Humid heat d) Wet bulb temperature

11. a) Write a short note on enthalpy changes accompanying chemical reactions. **8**

b) In a commercial process, chlorine is manufactured by burning hydrogen chloride gas using air. For good conversion air is used in 35% excess of that theoretically required. Assume that the oxidation is 80% complete and the dry air and hydrogen chloride gas enter the burner at 298.15. Calculate a) the composition of dry gases leaving the burner and the adiabatic reaction temperature of the product gas stream. **8**

OR

12. Write a short note on **any two** : **16**

1) Thermo chemistry of mixing processes

2) Effect of temperature on heat of reaction

3) Significance of Adiabatic Flame temperature determination.

———————

S.E. (Civil) (Semester – II) Examination, 2011
BUILDING PLANNING AND BUILT ENVIRONMENT
(2003 Course)

Time : 4 Hours Max. Marks : 100

N.B. : i) *Answers to the **two** Sections should be written in **separate** answer books.*
ii) ***Neat** diagrams must be drawn **whenever** necessary.*
iii) *Figures to the **right** indicates **full** marks.*
iv) ***Suitable** data can be assumed if **required**.*
v) ***All** questions are **compulsory**.*

SECTION – I

1. a) What do you understand by principles of planning ? Explain any one in detail. **6**
   b) State the various principles of architectural design. Explain any one in detail. **6**
   c) Explain in brief, how the utility of living room is enhanced by proper interior decoration and planning. **6**

OR

2. a) Define habitable room ? State the NBC (National Building Code) recommendations for "Building with single habitable room" and Building with two habitable rooms" in terms of min. floor area, min. width and min. height. **6**
   b) Explain the terms : **6**
      i) Height of Building
      ii) Building bye laws.
   c) State the various factors, essential for designing the residential landscaping. **6**

P.T.O.

3. a) Discuss in brief :

i) Humidity control

ii) Temperature control

with reference to comfort air conditioning. **6**

b) Explain the following functional requirements of ventilation system in detail : **6**

i) Air changes

ii) Humidity.

c) State the general rules of natural ventilation as per IS : 3362 – 1965. **4**

OR

4. a) Discuss in brief the essentials of comfort air conditioning for an auditorium. **6**

b) Explain in detail "Internal reflected component". **4**

c) What do you understand by heat exchange of building ? **6**

5. a) What are the general fire safety requirements for buildings ? **6**

b) Explain with neat sketch, the following principles of acoustical design : **6**

i) Shape ii) Site selection and planning.

c) Explain with neat sketch, 'Intercepting chamber'. **4**

OR

6. a) Explain the following acoustical defects : **6**

i) Echo

ii) Dead spots.

b) State the guidelines to be followed while designing sanitary and water supply arrangements ? **6**

c) Explain in brief 'Thermal conductivity'. **4**

SECTION – II

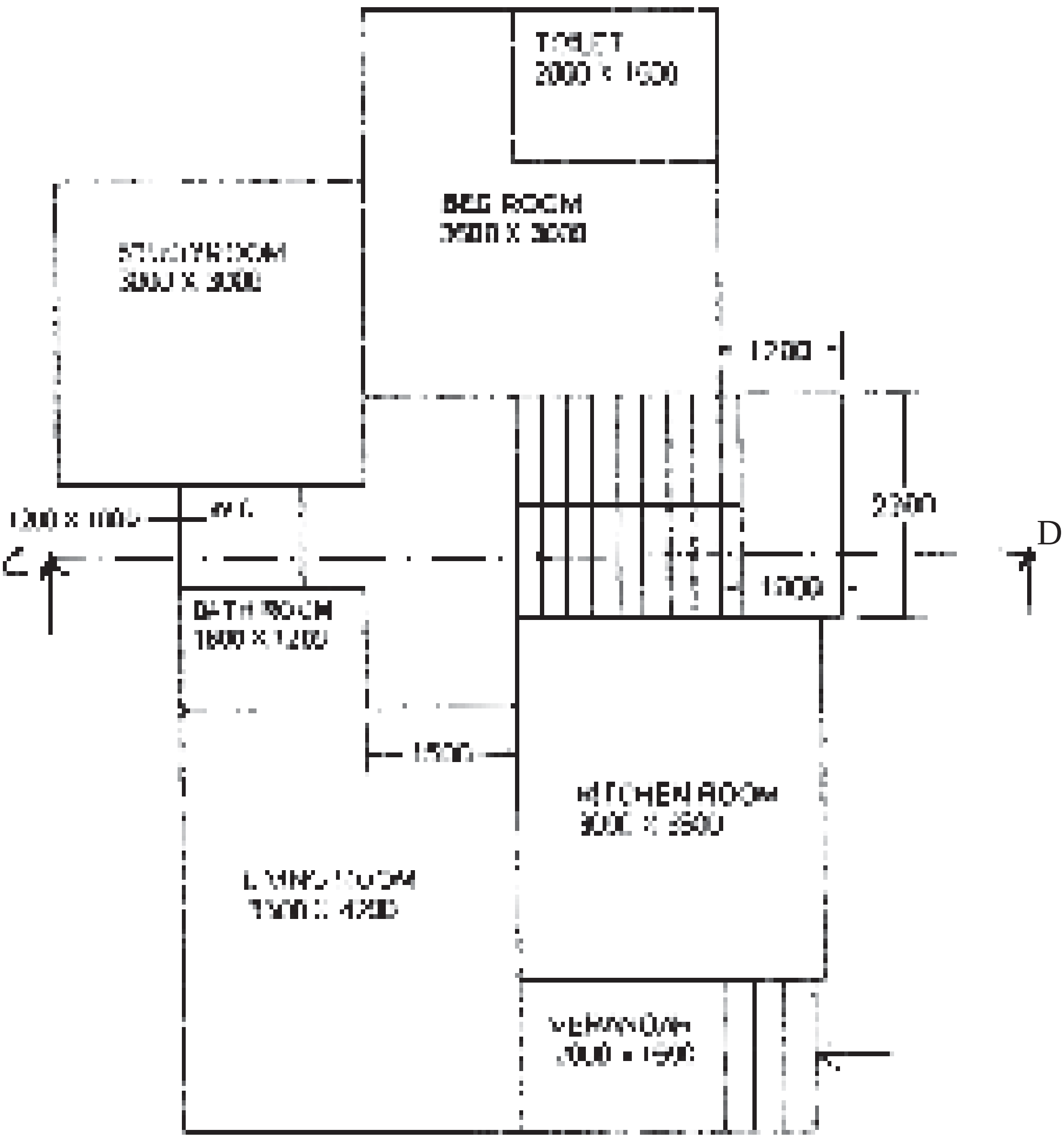
7. a) Fig. No. 1 indicates the line plan of a RCC framed structure residential building, draw detailed floor plan with scale 1 : 50 or suitable.

Data : i) Wall thickness – 230 mm.

ii) Walls marked by ‘X’ are 115 mm thick

iii) All dimensions are in mm.

iv) Plinth height 1000 mm above ground level. **10**



PLAN
FIG No 1

R 200 MM
T 300 MM

b) Draw a detailed sectional elevation along Section line CD for the line plan of Fig. No. 1, the depth of hard strata is 1.5 m below ground level ; show the details of plinth filling. **10**

OR

8. Design a hospital building for 100 bed capacity. The building is two storeyed and is RCC framed structure. Assume necessary units required for a hospital building. Use standard norms to finalize the dimensions of units.

Draw : i) Separate line plans for ground and first floor. **12**

ii) Show details of furniture arrangement for one general male ward. **8**

9. Design a vegetable market building for the following data :

Sr. No.	Stalls	Nos	Size in 'M'
1)	Open stalls for vegetable 'Ottas' to be provided at the central portion of the building.	30	2.5 × 1.2
2)	Closed stalls on periphery of market building.	20	2.5 × 3.0
3)	Passage	As required	Min 2.2 m wide.
4)	Staircase	03	Decide dimension

Draw : i) Line plan with scale 1:50 or suitable. **10**

ii) Sketch the diagram of the roofing system as per the span. **5**

OR

10. Design a shopping complex building with following data.

i) No of shops required – 100

ii) Structure – RCC framed, two storeyed

iii) Required additional units – store rooms, water tank, separate toilets for gents and ladies, staircase (2 nos), parking arrangement for two wheelers, four wheelers and ramp etc.

Suitable data can be assumed as per norms.

Draw :

i) Line plans (separate for ground and first floor) **10**

ii) A detailed dimensioned parking plan for four wheelers. **5**

11. a) Draw a one point perspective view (Fig. no. 2) to a scale 1:100 or suitable. Eye level is positioned at 1.8 m above ground level.

Retain all constructions lines. **10**

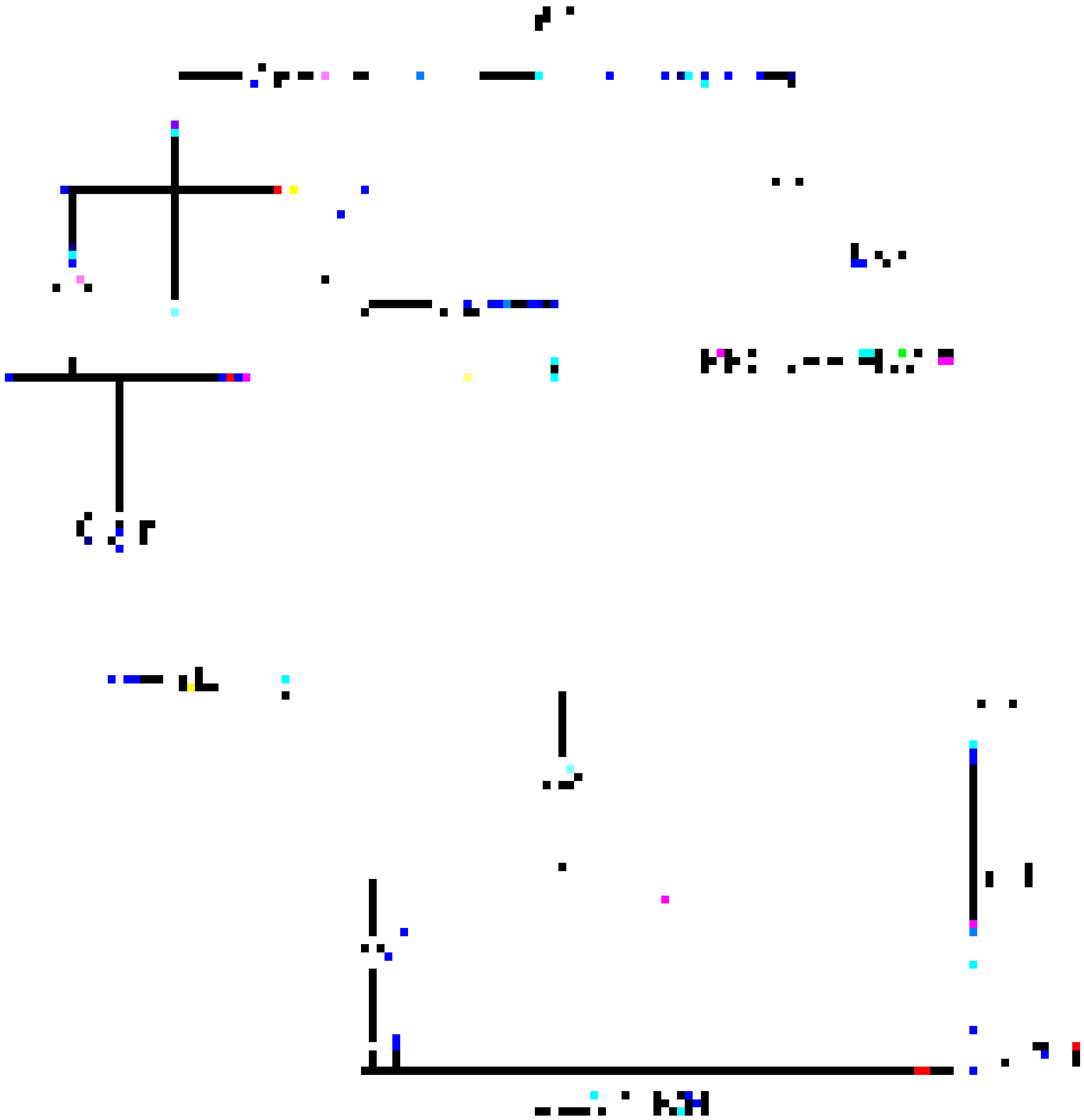


Fig. No. 2

b) Explain in brief 'Station point'. **5**

S.E. Civil (Semester – II) Examination, 2011
THEORY OF STRUCTURE – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Solve 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) 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) Your answers will be **valued** as a whole.*
*7) **Use** of electronic pocket calculator and steam tables is **allowed**.*
*8) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Explain skeletal structure, surface structure and solid structure in brief, giving one example of each. **6**

b) Define Kinematic degree of indeterminency. Find total degree of indeterminency (Static and Kinematic) for the structure shown in Fig. 1. **6**

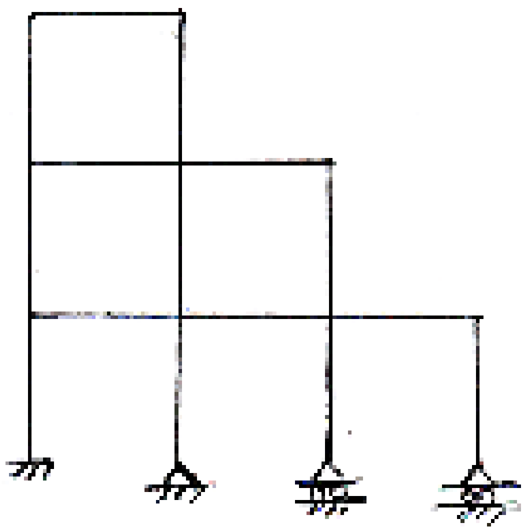


Fig. 1

c) A portal frame ABCD has shown in Fig. 2. Determine the horizontal deflection of roller at D under the load, P. Assume constant EI for all members. **6**

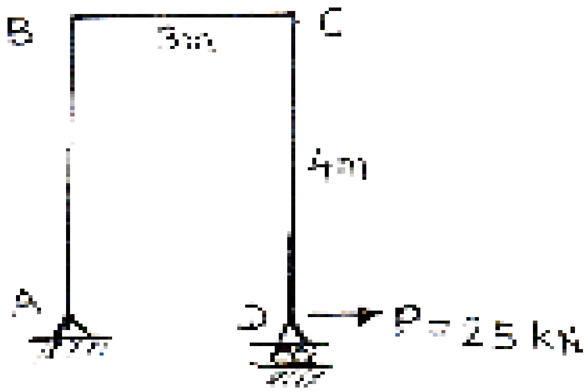


Fig. 2

OR

2. a) Define the following :

i) Plane frame and plane grid

ii) External stability and internal stability

iii) Indeterminate structure and deficient structure. **6**

b) Define external and internal static degree of indeterminency.

Find total degree of indeterminency (Static and Kinematic) for the structure shown in Fig. 3. **6**

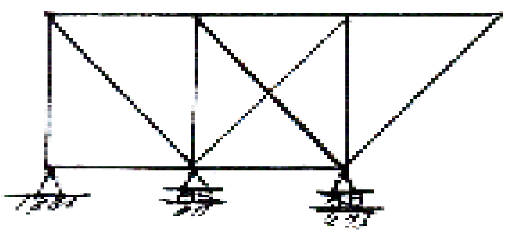


Fig. 3

c) A bend ABC is shown in Fig. 4. Find horizontal deflection of free end 'A', under the load, Q applied as shown in Fig. Assume constant EI for member AB and BC. **6**

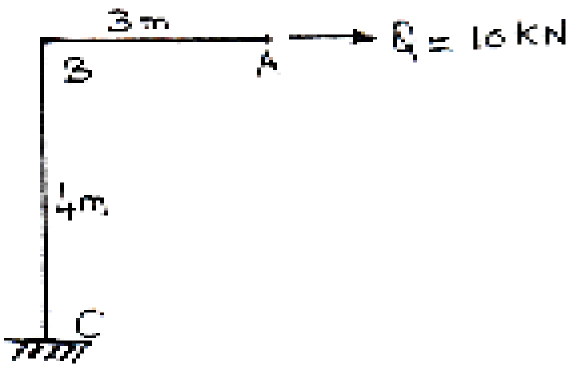


Fig. 4

3. a) Find the support reactions for beam shown in Fig. 5. Hence plot SFD and BMD for a beam loaded and supported as shown. Assume constant EI for all members. Use three moment theorem. **8**

Fig. 5

b) Determine the support reactions for the redundant plane frame loaded and supported as shown in Fig. 6. Assume constant EI for all members. Use Strain Energy Method. **8**

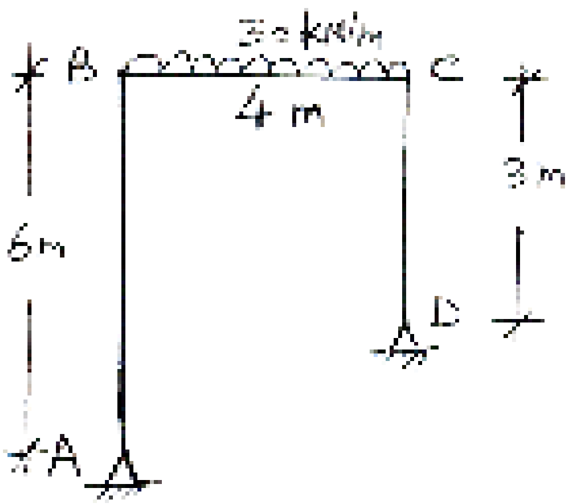


Fig. 6

OR

4. a) Using theorem of three moment, find support moment. Hence plot BMD for a uniform beam shown in Fig. 7. **8**

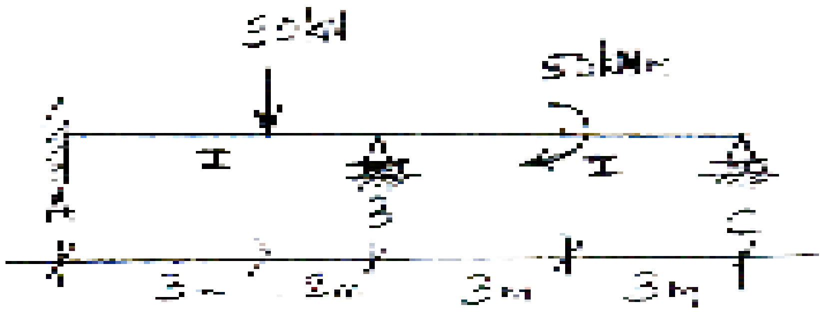


Fig. 7

b) Find fixed end moments for a beam shown in Fig. 8. Hence Plot S.F.D. **8**

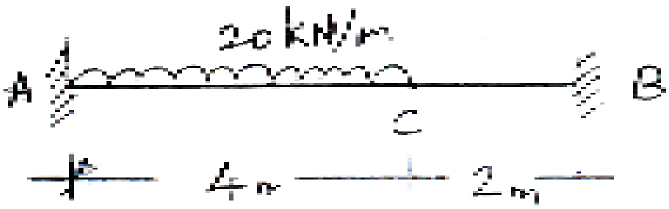


Fig. 8

5. a) Find the vertical deflection of point 'C' of the truss supported and loaded as shown in Fig. 9, using Costiglino's first theorem. Assume E = 200 GPa and cross-sectional area for all members = 1300 mm^2. **8**

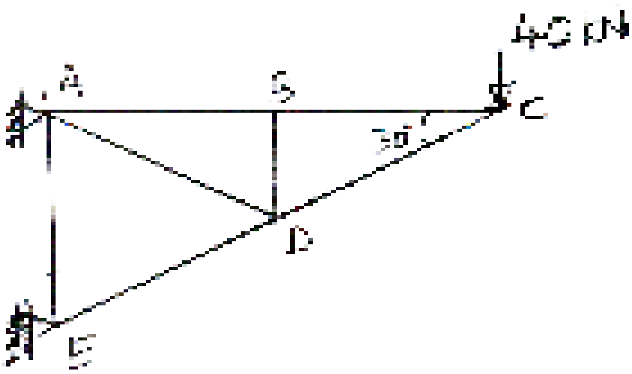


Fig. 9

b) Find the forces in the members AB, BF and AF, for the truss shown in Fig. 10. Assume constant area for all members and E = 210 GPa. **8**

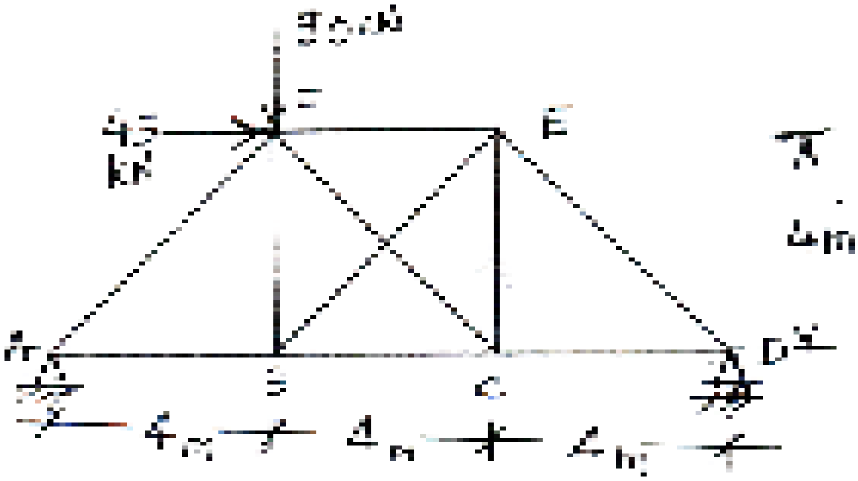


Fig. 10

OR

6. a) Determine the vertical deflection of joint 'G', under the load, W = 50 kN, for the truss shown in Fig. 11 using Costiglino's first theorem. Take E = 200 GPa, area for all members = 1200 mm^2. **8**

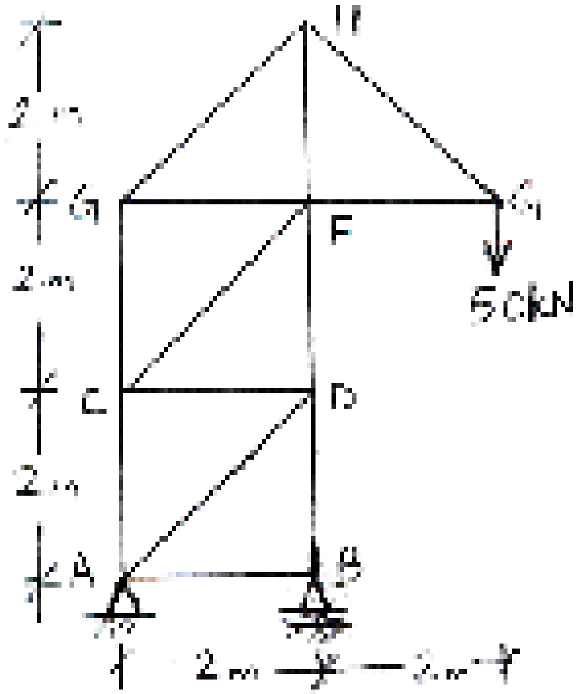


Fig. 11

b) Find the support reaction for redundant truss shown in Fig. 12. Assume, E = 2×10^5 N/mm^2 and Area, A = 1000 mm^2 for all members. **8**

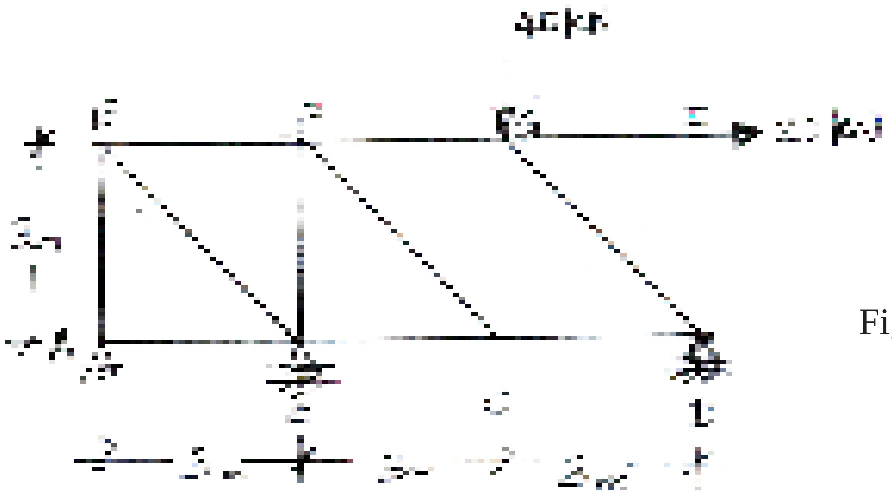


Fig. 12

SECTION – II

7. a) Plot BMD for the beam loaded and supported as shown in Fig. 13, using slope deflection method. **8**

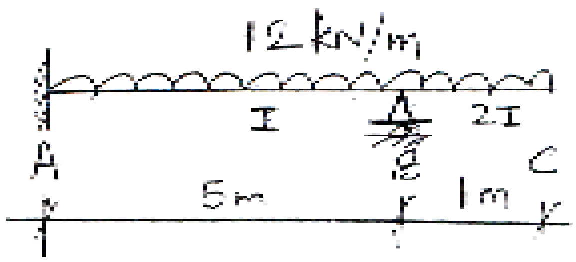


Fig. 13

b) Plot SFD for the plane frame loaded and supported as shown in Fig. 14. Use moment distribution method. **8**

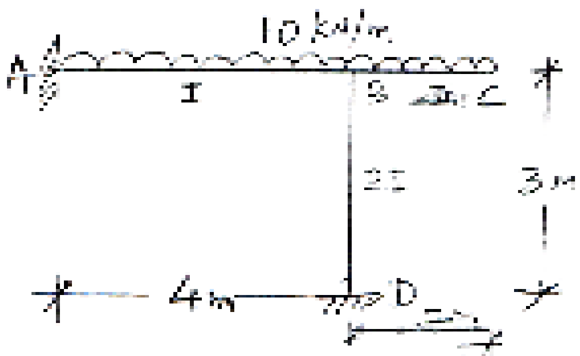


Fig. 14

OR

8. a) Plot SFD for the plane frame shown in Fig. 14 use slope deflection method E = 200 GPa. **8**

b) Plot BMD for the beam shown in Fig. 13 use moment distribution method E = 200 GPa. **8**

9. a) Two wheel load, 80 kN and 100 kN, spaced at 3 m apart are moving on simply supported girder, AB of span 13 m. Any wheel load can lead the other. Find the maximum positive and negative shear force at 5 m from support A. **8**

b) What do you mean by equivalent uniformly distributed loads ?

A girder of span 8 m is simply supported at both ends. A moving udl of span 5 m, having intensity, 30 kN/m is acting on it.

Find the maximum bending moment at 3 m. Also find equivalent udl for the same. **8**

OR

10. a) A beam structure is shown in the Fig. 17. Draw the ILD for following :

i) Shear force at mid span of AB

ii) Bending moment at mid span of AB

iii) Shear force at mid span of BC

iv) Bending moment at mid span of BC. **8**

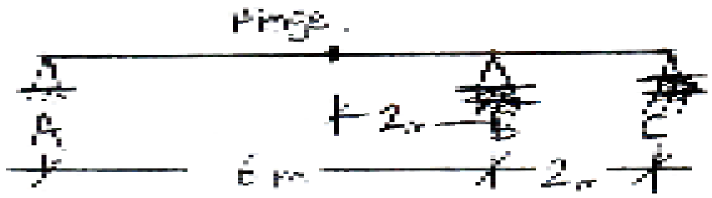


Fig. 17

b) Plot the ILD for the members cutting the section 1-1. Find the axial force in these members if udl of 10 kN/m of span 35 m carries over the truss. Refer Fig. 18. **8**

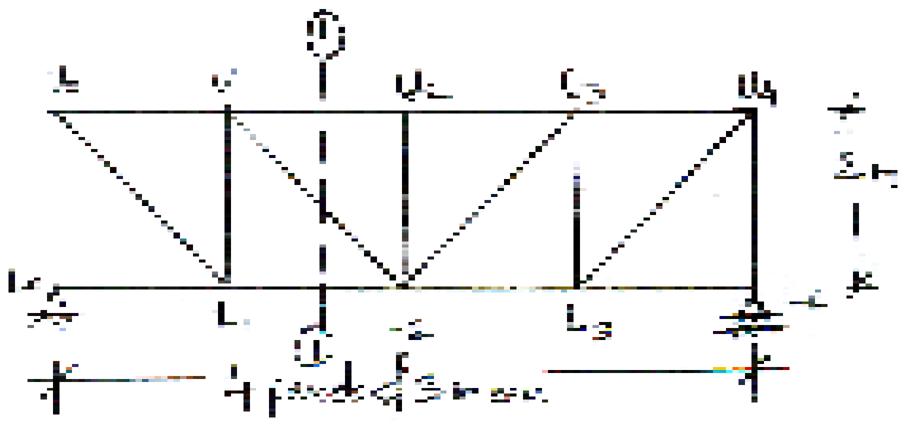


Fig. 18

11. a) A three hinged Parabolic Arch with hinges at A and B and at crown, C, is loaded as shown in Fig. 19.

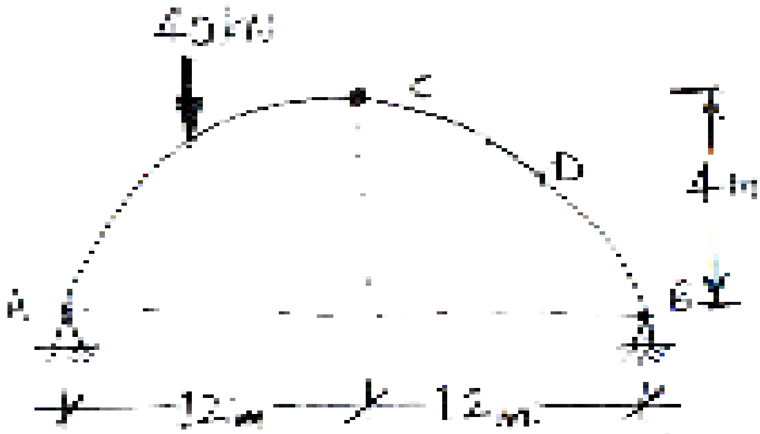


Fig. 19

If concentrated load, 40 kN acts at the centre of AC, calculate the support reactions. Also calculate bending moment at point 'D', which is a mid point of CB. **9**

b) For a two hinge Parabolic arch, with rise, h, span, l, and loaded with udl, w per meter run over the entire span, show that horizontal thrust is $\frac{wl^2}{8h}$ and BM at any section is zero. **9**

OR

12. a) A three hinged semi circular Arch of radius, R, carries a udl, 10 kN/m over the full span. Draw the bending moment diagram for this Arch. **9**

b) A two hinged Arch of span 20 m and rise 5 m, carries the concentrated load of 50 kN and 100 kN at 4.5 m and 9.0 m from support A.

Find the normal thrust and radial shear at 7 m from left support, A. **9**

[3962] – 261

S.E. (Mechanical) (Semester – I) Examination, 2011
APPLIED THERMODYNAMICS
(2003 Course)

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 books.*

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

iv) Figures to the ***right*** *indicates* ***full*** *marks.*

v) Use of logarithmic tables, slide rule, Mollier chart, steam tables, electronic pocket calculators are ***allowed****.*

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

SECTION – I

Unit – I

1. a) Explain the term "coefficient of performance" as related to a refrigerator and a heat pump. How are they related with one another ? **6**

b) Explain 'Principle of Increase of Entropy'. **4**

c) A heat pump is used to maintain an auditorium hall at 25 °C when the atmospheric temperature is 10 °C. The heat load of the hall is 1500 kJ/min. Calculate the power required to run the actual heat pump if the COP of the actual heat pump is 30% of the COP of Carnot heat pump working between the same temperature limits. **8**

OR

2. a) Prove that Kelvin Planck and Clausius statements are equivalent to one another. **6**

b) Show that, change in Entropy for polytropic process is given by,

$$S_2 - S_1 = \frac{\gamma - n}{1 - n} C_v \cdot \log_e\left(\frac{T_2}{T_1}\right)$$ **6**

c) 3 kg of air at a pressure of 15 bar and 250 °C expand reversibly in a polytropic process. The final pressure is 1.5 bar and index of expansion is 1.22. Find the change in entropy during the process. **6**

Unit – II

3. a) Derive an expression for thermal efficiency of air standard diesel cycle. **8**

b) One Kg of certain gas undergoes a thermodynamic constant pressure process whereby the volume changes from 1 m^3 to 1.8 m^3 while the temperature changes from 50 °C to 450 °C. The specific heat at constant pressure is given by, $C_p = \left(2.5 + \frac{40}{t + 20}\right)$ kJ/kg °C where t is in °C. Find i) Heat supplied ii) Work done iii) Change in internal energy iv) Change in enthalpy.

Take $\gamma = 1.4$. **8**

OR

4. a) For an air-standard otto cycle with fixed intake and maximum temperature, find the compression ratio for maximum work done per cycle and show that the maximum cycle efficiency is given by,

$$\eta_{max} = 1 - \left(\frac{T_{intake}}{T_{maximum}}\right)^{\frac{1}{2}}$$ **8**

b) An engine operating on ideal otto cycle for which the following information is available :

Max. temperature	=	1277 °C
Exhaust temperature	=	447 °C
Ambient temperature and pressure	=	37 °C and 1 bar
Air consumption	=	2 Kg/min

Estimate :

i) Compression ratio

ii) Air-standard efficiency

iii) Power output. **8**

Unit – III

5. a) Explain with neat sketch, the working of combined separating and throttling calorimeter. Also show that

$x = x_1 \cdot x_2$

where, x_1 = dryness fraction determined by separating calorimeter

x_2 = dryness fraction determined by throttling calorimeter. **8**

b) Combined separating and throttling calorimeter is used to find the dryness fraction of steam passing through a steam main at a pressure of 900 kN/m^2. The temperature and pressure after throttling were 115 °C and 0.11 MN/m^2 respectively. The mass of steam condensed after throttling was 1.8 Kg and mass of water collected in separator was 0.16 Kg. Estimate the dryness fraction of steam in the main. Take C_p for superheated steam 2.1 kJ/kgK. **8**

OR

6. a) Explain with T – S diagram, the factors affecting the performance of Rankine cycle. **6**

b) Define :

i) Specific Steam Consumption (SSC)

ii) Work Ratio. **2**

c) In a Rankine cycle, the steam at inlet to the turbine is dry-saturated at pressure of 35 bar and the exit pressure is 0.3 bar. Determine :

i) The pump work

ii) The turbine work

iii) Rankine efficiency

iv) Dryness at the end of expansion.

Assume, mass flow rate of steam as 12 Kg/sec. **8**

SECTION – II

Unit – IV

7. a) Draw P – V and T – S diagram for a single stage reciprocating air compressor, without clearance. Derive the expression for the work done when compression is :

a) Isothermal

b) Isentropic. **8**

b) Determine the size of the cylinder for a double acting air compressor of 40 kW indicated power, in which air is drawn in at 1 bar and 15 °C and compressed according to the law $PV^{1.2}$ = constant, to 6 bar. The compressor runs at 100 r.p.m. with average piston speed of 152.5 m/min. Neglect clearance. **8**

OR

8. a) Show that intermediate pressure in a two stage reciprocating air compressor is a geometric mean of suction and discharge pressures. **8**

b) A four stage compressor works between limits of 1 bar and 115 bar. The index of compression in each stage is 1.28. The temperature at the start of compression in each stage is 35 °C and intermediate pressure are so chosen that the work is divided equally amongst stages. Neglecting clearance, calculate

i) Pressures P_2, P_3 and P_4

ii) Isothermal efficiency

iii) Delivery temperature in each stage. **8**

Unit – V

9. a) Define terms :

i) Excess air

ii) Stoichiometric air fuel ratio. **4**

b) With the help of neat sketch, explain Bomb calorimeter used for determination of heating value. **4**

c) A bomb calorimeter was used to determine calorific value of coal sample having composition by mass as C = 85%, H_2 = 4.5%. The following readings were recorded

mass of coal	=	1.0 gm
mass of water in calorimeter	=	2.5 Kg
mass of fuse wire	=	0.02 gm
calorific value of fuse wire	=	1800 kJ/Kg

water equivalent of calorimeter	=	750 gm
temperature rise	=	2.61 °C
cooling correction	=	0.019 °C
partial pressure of water vapour	=	7 KPa

Determine HCL and LCV of coal. **8**

OR

10\. a) Sketch and explain use of orsat apparatus used in determining the percentage of flue gases. Does this help in controlling combustion ? **8**

b) A fuel has the following analysis by mass C 85%, H_2 12.5%, O_2 2% and the residue 0.5%. The dry flue has the following composition by volume CO_2 9%, CO 1%, O_2 7.77% and N_2 82.23%. Determine the air fuel ratio. **8**

Unit – VI

11\. a) Explain the function and working of the following :

i) Super heater

ii) Air preheater

iii) Spring loaded safety valve. **6**

b) Explain a water tube boiler with neat sketch. **6**

c) The following observations were recorded during a boiler trial of 1 hr duration. 700 Kg of coal of calorific value 30,000 kJ/Kg is used to produce 5,250 Kg of steam at a pressure of 12 bar. Dryness fraction of steam is 94%. Temperature of steam leaving the superheater is 250 °C and temperature of hot well is 45 °C. Calculate :

i) Equivalent evaporation

ii) Thermal efficiency of boiler

iii) Heat added in superheater. **6**

OR

12. a) What is the second law efficiency ? How does it differ from the first law efficiency ? **6**

b) Define the terms :

i) Available energy

ii) Irreversibility

iii) Unavailable energy. **6**

c) Calculate the decrease in available energy when 25 Kg of water at 95 °C mix with 35 Kg of water at 35 °C, the pressure being taken as constant and the temperature of the surrounding being 15 °C (Take C_p of water = 4.2 kJ/KgK). **6**

B/I/11/1,070

[3962] – 265

S.E. (Mechanical) (Semester – I) Examination, 2011
MANUFACTURING PROCESSES – 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) Write a detailed procedure for permeability test for moulding sand. **6**
   b) Describe the pattern making allowances. What is the use of contraction rule ? **6**
   c) What do you understand by core, core print and core box ? **4**

OR

2. a) Draw neat sketch of Cupola. Explain the heat zones with the chemistry. **6**
   b) Explain in brief "shell moulding process" and bring out its advantages and disadvantages. **10**

3. a) Explain the process of recovery, recrystallization and grain growth in hot working of metal. **6**
   b) What is impact extrusion ? Explain this process and state its specific applications. **6**
   c) Compare forging and casting process. **4**

OR

P.T.O.

4. a) Describe press forging process. How does it differ from drop forging ? **6**

b) Describe :

i) Shot peening

ii) Wire drawing. **6**

c) Differentiate between progressive die and compound die. **4**

5. a) State the principle and working of resistance welding process. Explain with neat sketches the following :

i) Resistance spot welding

ii) Resistance projection welding. **12**

b) Explain oxy-acetylene gas welding process. Explain characteristics and applications of the process. **6**

OR

6. a) What do you mean by "Adhesive Bonding" ? Explain. Name any four adhesive materials and state application. **6**

b) Compare AC and DC arc welding. **6**

c) Explain the principle of operation and advantages of the submerged arc welding. **6**

SECTION – II

7. a) Sketch and explain the construction and working of the tailstock of lathe. **6**

b) What is an all geared headstock ? Describe. **6**

c) Describe types of mandrels with their specific use. **6**

OR

8. a) Explain with neat sketches any four accessories used in lathe. **8**

b) Highlight the specification of lathe machine. **5**

c) Find the time required for machining of a work piece ϕ 60 mm in dia; 200 mm in length is turned all over in 6 passes. The tool approach length is 5 mm and over travel is 5 mm feed rate is 0.6 mm/revn and cutting speed used is 40 m/min. **5**

9. a) A cam profile having a fall of 20 mm in 100° of its angle has to be milled the table feed screw has 4 mm pitch calculate the angle of inclination of the indexing head with horizontal. **6**

b) Draw the sketch of sensitive drilling m/c. **4**

c) Explain following milling operation with sketch :

1) Plan milling

2) Form milling

3) Gear milling. **6**

OR

10. a) Explain following drilling operation with sketch :

1) Countersunk

2) Counterbore. **4**

b) Explain with sketch sleeve and socket drill holding device. **4**

c) What is Reaming ? Sketch a Reamer and show its different parts on it. Explain 'Hand of reamer'. **8**

11. a) Explain what do you understand 'Grain', Grit, Structure and Grade of grinding wheel. **8**

b) Explain with the help of suitable diagram diamond type dressing operation for grinding wheel. **4**

c) Difference between wheel loading and wheel glazing. **4**

OR

12. Write a short note on :

1) Honing and Lapping. **6**

2) Burnishing. **5**

3) Mounting of grinding wheel. **5**

S.E. (Mechanical) (Semester – II) Examination, 2011
ELECTRICAL TECHNOLOGY
(Common to Mech. S/W, Industrial, Production, Prod. S/W)
(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 electronic pocket calculator is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Draw sectional view of two pole d.c. machine (label the various parts). **6**

b) A shunt motor takes 20 A at 220 V and run at 1500 rpm. Motor has armature resistance $0.5\,\Omega$ and field resistance $110\,\Omega$. If machine has stray losses = 150 W. Calculate

i) Back emf

ii) Mechanical power develop

iii) Gross torque developed

iv) Loss torque

v) Net torque

vi) BHP. **8**

c) States the necessity of a starter in D.C. motors. **4**

OR

2. a) State the various speed control methods used for d.c. series motor. Explain any one of them with diagram. **6**

   b) A d.c. shunt motor runs at 1000 rpm by drawing 8 A current at no load from 250 V supply. If motor has armature and field winding resistances 0.2Ω and 250Ω respectively. Calculate the speed when motor takes 50 A. (Assume flux remains constant) **8**

   c) Draw only electrical and mechanical characteristics of d.c. shunt motor. **4**

3. a) The three phase power is measured by a two wattmeter method. The reading of wattmeters are W_1 = 2000 W and W_2 = 500 W. Calculate the total power and power factor when

   i) The readings are +ve

   ii) The second reading is obtained after reversing pressure coil terminals. **8**

   b) State and explain following factors in connection with illumination :

   i) Utilization factor

   ii) Space to height ratio

   iii) Depreciation factor

   iv) Beam factor. **8**

OR

4. a) Explain with the help of a neat circuit diagram how one wattmeter can be used for measurement of total three phase reactive power of three phase balanced circuit. Also draw the necessary phasor diagram. **8**

   b) State and explain requirements of good lighting scheme. **8**

5. a) Following tests are obtained when a 200 V/400 V, 5 KVA transformer is tested as follows :

   O.C. test – 200 V, 0.8 A, 72 W, (L.V. Side)

   S.C. test – 16 V, 20 A, 80 W (L.V. side)

   Calculate the efficiency and regulation at full load 0.8 p.f. lag. **8**

   b) With the help of neat circuit diagram explain procedure to determine regulation of three phase alternator by synchronous impedance method. **8**

OR

6. a) Three phase synchronous generator (alternator) has 10 poles, no. of slots = 60, conductor per slot = 4, coil span of 150° and flux per pole 0.12 Wb. If winding is sinusoidally distributed and star connected, determine line voltage generated if frequency is 50 Hz. **8**

   b) Write short note on 'current transformer' and 'potential transformer'. **8**

SECTION – B

7. a) From first principle, derive the expression for torque developed by induction motor. Also derive condition for maximum torque. And hence draw torque-slip characteristic of induction motor. **10**

   b) A three phase, six pole, 50 Hz induction motor develops 5 H.P. at 950 rpm. What is the stator input and efficiency of the motor if the stator losses are 300 W total. (Note neglect mechanical losses and take 1 HP = 735.5 Watt). **8**

OR

8. a) Draw the rotor construction diagram of slip ring motor and squirrel cage motor. Also state their merits, demerits and applications. **10**

   b) Explain with suitable diagram star-delta starter used for three phase induction motor. **8**

9. a) Why single phase motor is not self started ? With neat diagram explain construction, working, characteristic of capacitor slit phase induction single phase motor. **8**

   b) With the help of neat diagram explain construction, working and applications of a.c. servomotor. **8**

OR

10. a) Explain construction and working with the help of neat diagram of single phase split pole motor. State its merits, demerits and any two applications. **8**

    b) Universal motor – construction, working, applications and its characteristics. **8**

11. a) State and explain in details the various factors considered while selection of electrical drive for particular application. **8**

    b) State the properties of good heating element. Explain the procedure to design a strip type heating element used in resistance ovens. **8**

OR

12. a) State the merits, demerits and applications of group drive and individual drive system. **8**

    b) With the help of neat diagram explain construction and working of coreless induction heating furnace. **8**

S.E. (Mechanical Sandwich) (Semester – I) Examination, 2011
STRENGTH OF MACHINE ELEMENTS
(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) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

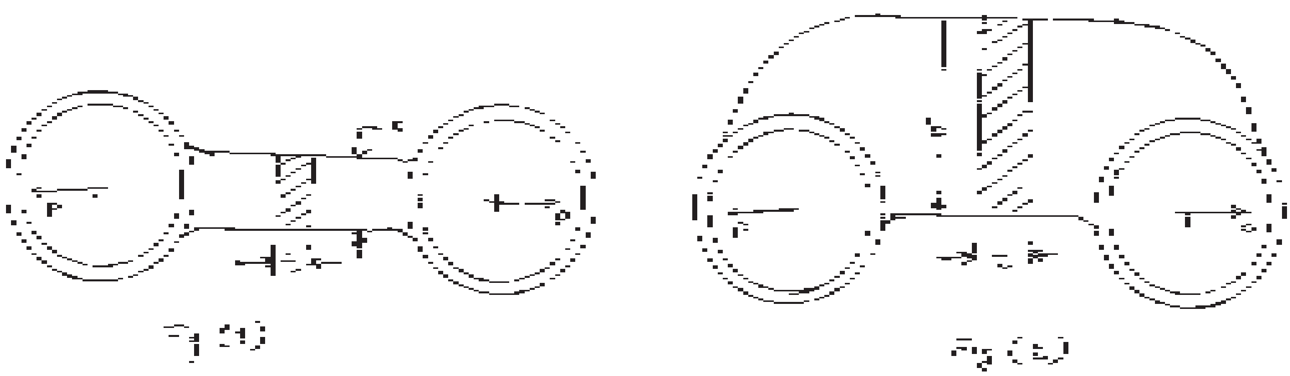
1. a) Give definitions of following : **4**
   i) Proportional limit　　ii) Modulus of rigidity
   iii) Poisson's ratio　　iv) Ultimate strength.
   b) Derive the relation between bulk modulus and Young's modulus. **8**
   c) Give the steps in drawing the typical Mohr's circle with its nomenclature. **4**

OR

2. a) Define factor of safety for ductile and brittle materials, give four points about how to select factor of safety. **4**
   b) Derive an expression for principal stresses on a two dimensional element subjected to bi-axial stresses and shear stress. **8**
   c) A point is subjected to a tensile stress of 60 N/mm^2 and compressive stress of 40 N/mm^2, acting on two mutually perpendicular planes and a shear stress of 10 N/mm^2 on these planes. Determine the principal stresses as well as maximum shear stress. Also find value of maximum shear stress. **4**

P.T.O.

3. a) A mild steel link as shown below in Fig. (1) transmits a pull of 80 kN. Find the dimensions b and t if b = 3t. Further if the original link is replaced by an unsymmetrical link as shown in Fig. (2) and having same thickness 't' find the new depth b_1 take permissible stress in tension 70 MPa. **8**



b) Derive the flexural formula and state its assumptions. **8**

OR

4. a) Two wooden planks 150 × 50 mm each are connected to form a T-section of a beam. If a moment of 3.4 kN-m is applied around horizontal neutral axis. Find the stresses at extreme fibers of the cross section. Also calculate the total tensile force on the cross-section. **8**

b) An I-section beam 350 mm × 200 mm has a web thickness of 11.5 mm and a flange thickness of 25 mm. It carries a shearing force of 20 tonnes at a section. Sketch the shear stress distribution across the section and mention stress values at all points of importance on the diagram. **8**

5. a) A cantilever beam of 1.5 m long is carrying a point load of 100 N each at a distance of 0.5 m, 1.0 m and 1.5 m from the fixed end. Draw the shear force and bending moment diagram for the cantilever beam. **8**

b) A simply supported beam 6 m long is carrying a uniformly distributed load of 2 ton/m over a length of 3 m from the right end. Draw the shear force and bending moment diagrams for the beam and also calculate the maximum bending moment on the section. **10**

OR

6. a) A simply supported beam 4 m long is subjected to two point loads of 2 kN and 4 kN each at a distance of 1.5 m and 3 m from the left end. Draw the shear force and bending moment diagrams for the beam. **8**

b) Shear force diagram for a loaded beam is shown in Fig. (3) below. Determine the loading on the beam and hence draw bending moment diagram. Locate the point of contraflexure, if any. All the values are in kN. **10**

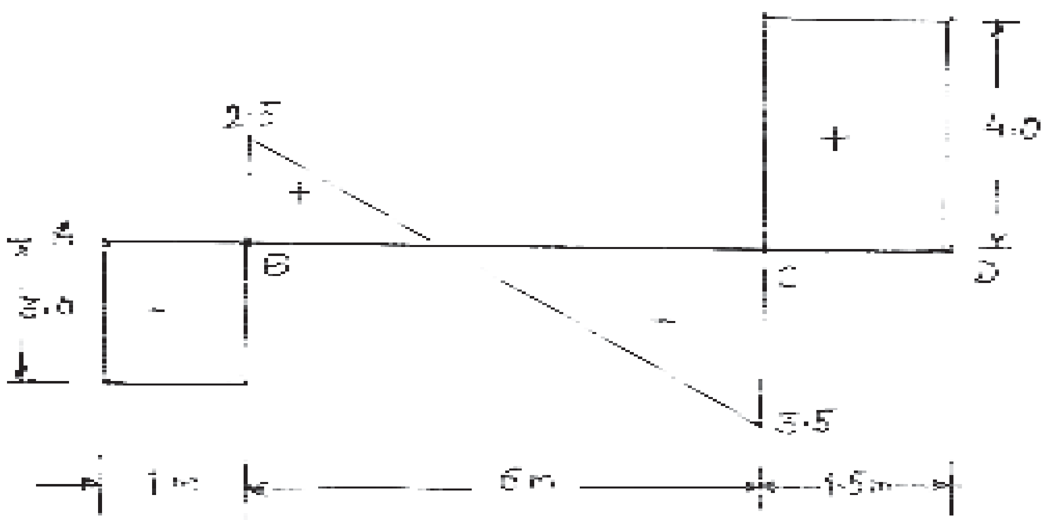


Fig. (3)

SECTION – II

7. a) A composite shaft consist of a steel rod 50 mm diameter surrounded by a closely fitted tube of brass fixed to it. Find outside diameter of tube so that when a torque is applied to the composite shaft. It will equally shared by the two materials take G_{steel} = 84 GPa and G_{brass} = 42 GPa if the torque is 8000 Nm find maximum shear stress in each material and angle of twist in a length of 4 m. **8**

b) A simply supported beam as shown in Fig. 04. Determine the slope at A and deflection under the heavier load. Take E = 200 GPa and I = 450 × 10^6 mm^4. **8**

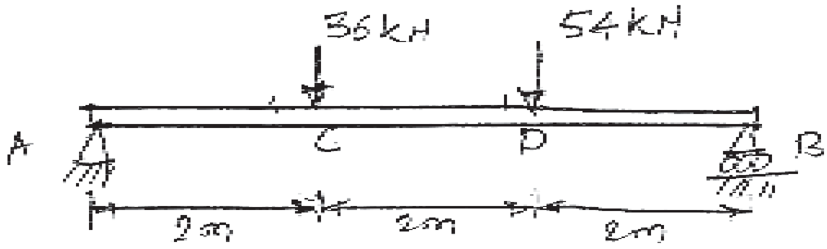


Fig. 04

OR

8\. a) Derive the torsional equation with usual notations as :

$$\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{l}$$ **8**

b) The simply supported beam AB is loaded as shown in Fig. 05 find the slope at 'B', 'C' and deflection at 'C' and 'D'. Assume E = 200 GPa and I = 2 × 10^8 mm^4. **8**

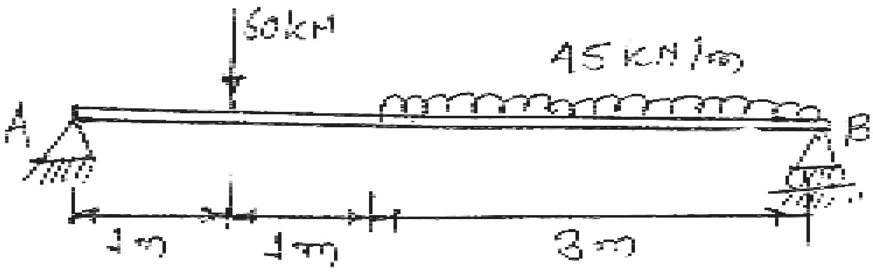


Fig. 05

9\. a) A thin walled steel cylinder has 2 m inner diameter and is subjected to 2.5 MPa pressure. Using factor of safety 2.0 and yield stress 400 MPa find wall thickness on the basis of

i) Maximum Shear Stress Theory

ii) Maximum Distortion Energy Theory. **6**

b) Define the following terms :

i) Brittleness ii) Toughness

iii) Resilience iv) Tenacity

v) Rigidity vi) Creep. **6**

c) Explain in brief the effect of following element on steel to get alloy steel.

i) Nickel ii) Chromium

iii) Tungston iv) Vanadium. **4**

OR

10\. a) An offset link subjected to a force of 25 kN is shown in Fig. 06. It is made of grey cast iron FG 300 and factor of safety is 3. Determine the dimensions of the cross-section of the link. **6**

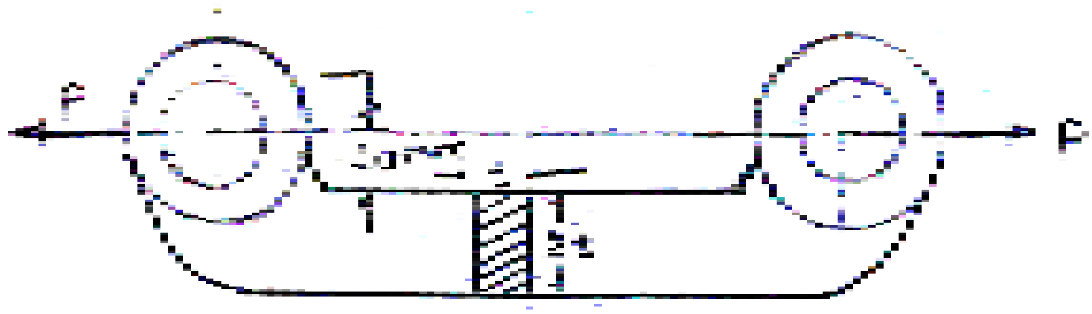


Fig. 06

b) Recommend suitable materials for following components giving reasons :

i) O-ring ii) Self lubricating bearings

iii) Connecting Rod iv) Machine tool spindle

v) Crane hook vi) Valve spring. **6**

c) What do you understand by the following designations of materials ?

i) 40C15S12 ii) 30Ni4Cr1

iii) FG400 iv) 65C6 **4**

11. a) A thin spherical vessel of 200 mm radius is to be designed for internal pressure of 20 MPa with factor of safety 2.5. Determine minimum wall thickness required if normal strain is not to exceed 1.2×10^{-3}. Assume yield strength in tension and shear to be 940 and 450 MPa respectively. Take E = 200 GPa and Poissons ratio = 0.28. **6**

b) A hollow rectangular section shown in Fig. 7 is provided for a 2 m long column with rigid flange at the top, carrying axial force P. Determine crippling load for it if it is used with

i) Both ends pinned

ii) Both ends fixed

Assume E = 200 GPa. Use Euler's formula for long columns. **6**

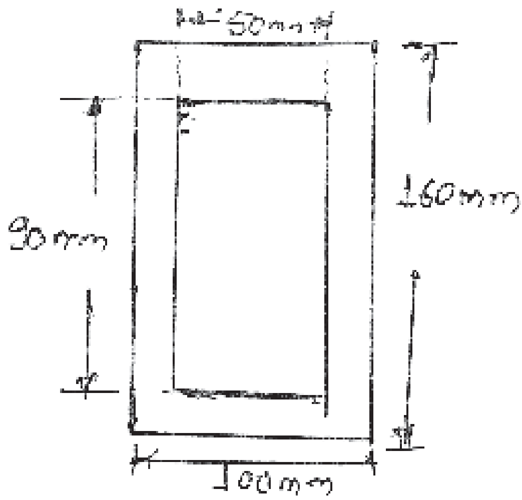


Fig. 7

c) Show that in a bar subjected to an axial load the instantaneous stress due to sudden application of a load is twice the stress caused by the gradual application of load. **6**

OR

12. a) Derive Euler's formula for buckling load for column with hinged ends. **6**

b) An unknown weight falls 10 mm on to a collar rigidly attached to the lower end of a vertical bar 4 m long and 30 mm in diameter. If the maximum instantaneous extension is known to be 4 mm. What is the corresponding stress and the value of the unknown weight. Take modulus of Elasticity = 2.05×10^5 N/mm^2. **6**

c) An oil container is 2 m long cylinder hearing 600 mm internal diameter with 20 mm wall thickness. Determine hoop stress, increase in length and increase in diameter for an internal pressure of 12 MPa. Assume E = 200 GPa and Poisson's ratio = 0.30. **6**

S.E. (Production and Industrial Engg.) (Semester – I) Examination, 2011
MANUFACTURING PROCESSES – I
(Common to Production S/W)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Attempt* ***one*** *question from* ***each*** *Unit from* ***each*** *Section –* ***I*** *and Section –* ***II****.*
2) Answers to the ***two*** *Sections should be written in* ***separate*** *books.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*
4) Neat diagrams must be drawn ***wherever*** *necessary.*
5) Assume suitable data, if ***necessary****.*

SECTION – I

Unit – I

1. a) Discuss various types of patterns with suitable sketches. **10**
   b) Explain working of cupola along with various zones. **8**

OR

2. a) Discuss various methods for testing of sand with suitable sketches. **10**
   b) Explain various types of cores along with sketches. **8**

Unit – II

3. a) Explain hot chamber die casting with suitable sketches. **8**
   b) Explain methods used for inspection and testing of casting. **8**

OR

4. a) Explain centrifugal casting with suitable sketches. **8**
   b) Discuss casting defects and also suggest remedies for such defects. **8**

Unit – III

5. a) Explain back gear mechanism with suitable sketches : **8**

   b) Write note on : **8**

      i) Taper turning attachment

      ii) Steady and follower rest.

OR

6. a) Explain thread cutting on lathe with neat sketch. **8**

   b) Write note on : **8**

      i) Type of chucks

      ii) Angle plate and Face plate.

SECTION – II

Unit – IV

7. a) Explain Sensitive and Radial drilling machine with neat sketch. **8**

   b) Discuss various types of drill with neat sketches. **10**

OR

8. a) Explain various operations performed on drilling machine with neat sketches. **8**

   b) Discuss various types of reamer with neat sketches. **10**

Unit – V

9. a) Explain working of universal dividing head with neat sketch. **8**

   b) Discuss various types of milling cutters with neat sketches. **8**

OR

10. a) Explain working of crank and slotted quick return mechanism of shaper with neat sketch. **8**

    b) With neat sketch explain column and knee type milling machine. **8**

Unit – VI

11. a) Explain guidelines used for selection of grinding wheels. **8**

    b) Explain types of broaching machines with suitable sketches. **8**

OR

12. Write note on : **16**

    i) Super-finishing

    ii) Honing

    iii) Buffing and Polishing.

S.E. (Production & Industrial Engg.) (Semester – II) Examination, 2011
ENGINEERING METALLURGY – I
(Common to Production S/W)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
2) Black figures to the ***right*** *indicate* ***full*** *marks.*
3) Assume suitable data, if ***necessary****.*
4) 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****.*

SECTION – I

1. a) Derive an expression for critical resolved shear stress of a single crystal. **4**

b) Show the following planes and directions in the cubic unit cell (any four) : **4**
(221), $(1\bar{1}0)$, (101), [110], [112].

c) Explain the following terms : **4**
Recovery, recrystallization, grain growth polygenization.

d) Write a note on defects in crystal. **4**

OR

2. a) Differentiate between the following : **8**
i) slip and tuinning
ii) cold working and hot working.

b) What is strain hardening ? Explain any one mechanism. **4**

c) What are classes of engineering materials other than metallic materials with example ? **4**

3. a) Draw self explanatory sketches for the following (**any four**) : **8**
i) Creep curve
ii) S – N curve for Aluminium
iii) Impact 'v' notch charpy specimen
iv) Rockwell dial of the machine
v) Stress-strain curve for steel.

b) Explain mechanism for fatigue type of failure. **2**

P.T.O.

c) State advantages and disadvantages of the following tests (**any four**) : **8**

i) Rockwell hardness test

ii) Ultrasonic NDT test

iii) Brinell hardness test

iv) Durometer

v) Moh's scale of hardness

vi) Shore's scleroscope.

OR

4. a) Suggest suitable hardness test (with scale, load if any) (**any four**) : **8**

i) High speed steel tool

ii) Milling cutter

iii) Flywheel

iv) White cast iron

v) Brass

vi) Aluminium.

b) Explain following test (**any five**) : **10**

i) Dye penetrant test

ii) Pulse echo method

iii) Longitudinal magnitisation using magnaflux

iv) Creep test

v) X-ray radiography.

5. a) What is coring ? Suggest suitable remedies to reduce it. **4**

b) Explain Hume Ruthery's rules of solid solubility. **4**

c) Find out degree of freedom (F) for the following cooling curve : **4**

Pure metal, Binary eutectic.

d) Differentiate between substitutional and interstitial solid solution. **4**

OR

6. a) Explain with microstructure cooling in ISO-morphous system. **4**

b) Derive Lever Rule. **4**

c) What is Gibb's phase rule ? Explain its importance. **4**

d) Explain with example cooling of 'Layer Type System'. **4**

SECTION – II

7. a) Explain the working of 'Resistance Pyrometer' with advantages and disadvantages. **6**

   b) Explain the requirements of Thermocouple. State at least two types of thermocouple composition with temp. **6**

   c) What is age hardening ? State conditions. Explain steps involve in age hardening. **6**

OR

8. a) Explain principle, working, application of disappearing type pyrometer. **6**

   b) Write formula of Hall-patch equation in grain refinement. Advantages of grain refinement over the other method. **6**

   c) What is martensitic transformation ? Explain. Write two metal/alloy which show martensitic transformation. **6**

9. a) Suggest suitable metals and production process in detail for the following : **8**

      i) Self lubricated bearing

      ii) Electrical contacts

      iii) Cermets.

   b) What is powder conditioning ? **4**

   c) State advantages and disadvantages of powder metallurgy method. **4**

OR

10. a) Which methods will you recommend for the manufacturing of powders of the following metals ? **4**

      i) Cu ii) Fe iii) Ni iv) W

   b) Explain 'Sintering'. **4**

   c) With flow chart explain following (**any two**) : **8**

      i) Cemented carbide

      ii) Electrical contact material

      iii) Diamond impregnated tool

      iv) Friction material.

11. a) Differentiate between the following : **12**

i) H_2 embrittlement and H_2 attack

ii) Dry corrosion and wet corrosion

iii) Cathodic and anodic inhibitors.

b) Write a note on 'Ion Implantation'. **4**

OR

12. a) Write note on (**any two**) : **8**

i) Anodising

ii) Thermal spray deposition

iii) Stress-corrosion cracking.

b) Explain physical vapour Deposition (PVD). **4**

c) Explain surface preparation techniques for plating or coating. **4**

———————

B/I/11/150

[3962] – 288

S.E. (Production and Industrial Engg.) (Semester – II) Examination, 2011
INDUSTRIAL ENGINEERING AND MANAGEMENT
(Common to Production 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) 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) Define Industrial Engineering. Write in brief history and development of Industrial Engineering. **8**

b) Explain contribution of F.W. Taylor and H.B. Maynard to the field of Industrial Engineering. **10**

OR

2. a) Draw and explain flow process chart of any one job done at your workshop. **10**

b) Define productivity, factor productivity and total productivity and explain land, machine manpower and materials productivity. **8**

Unit – II

3. a) Explain the term "Rating" in working measurement study. What are the different methods of Rating ? **8**

b) Define work sampling. Explain how the standard time is calculated using work sampling study ? **8**

OR

4. a) Explain the factors that affect performance rating. **8**

   b) What are the techniques used to reduce work content ? **8**

Unit – III

5. a) Explain job analysis in detail. **8**

   b) Explain what do you mean by "Anthropometry". **8**

OR

6. a) Explain, what are the different types of wages ? Explain the factors which influence the wage system. **8**

   b) What are the effects of light, noise and vibrations on human performance ? **8**

SECTION – II

Unit – IV

7. a) What are the 14 principles of management ? Explain any four in brief. **10**

   b) Define group dynamics, explain the characteristics and objectives of group dynamics. **8**

OR

8. a) Differentiate clearly between wide and narrow span of management. **8**

   b) Explain characteristics of Joint Stock Company with its advantages and disadvantages. **10**

Unit – V

9. a) Explain Porter and Lawler's motivation model in brief. **8**

   b) Explain how information flows in an organization. **8**

OR

10. a) Explain different leadership styles with block diagram. **8**

    b) Explain written, oral and non verbal communication with its advantages and disadvantages. **8**

Unit – VI

11. a) Explain different financial institutions in India and explain their role in industrial development. **8**

    b) Define utility. Distinguish between total utility and marginal utility. **8**

OR

12. a) Define cost. What are the different types of cost ? **8**

    b) Explain break even analysis in brief. **8**

———————

B/I/11/160

S.E. (Elex. and E and TC) (Semester – I) Examination, 2011
SEMICONDUCTOR DEVICES AND CIRCUITS
(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) A bar of n-type silicon has length of 4 cm and circular cross-section of 10 mm^2. When it is subjected to a voltage of 1 V applied across its length, the current flowing through it is 5 mA. Calculate :

i) Concentration of free electrons.

ii) Drift velocity of electrons.

Assume charge on one electron as 1.6×10^{-19} C, mobility of free electron as 1300 $cm^2/V - S$. **8**

b) The Ga As P system semiconductor is suitable for LED's. Justify. **8**

OR

2. a) Calculate the majority and minority carrier concentration in silicon at room temperature of 27°C, if

i) $N_A = 10^{17}/cm^3$

ii) $N_D = 5 \times 10^{15}/cm^3$. **8**

b) For a semiconductor, explain difference between :

i) Intrinsic and extrinsic semiconductor

ii) Diffusion and drift current. **8**

3. a) The voltage across a silicon diode at room temperature of 300° K is 0.71 V, when 2.5 mA current flows through it. If the voltage increases to 0.8 V, calculate the new diode current. **8**

b) Draw linear piecewise model of diode with

i) $R_F = 0$

ii) Finite R_F. **8**

OR

4. a) A step-graded Germanium P-N junction has $N_D = 10^3 N_A$ and N_A corresponds to 1 atom per 10^8 Germanium atoms. Calculate the junction potential.

Assume $h_i = 2.5 \times 10^3/cm^3$

Atom density of Ge = 4.4×10^{22} atoms/cm^3. **8**

b) Explain V-I characteristics of a rectifier diode and define dynamic and static resistance in forward bias condition. **8**

5. a) Data sheet for a JFET indicates that, I_{DSS} = 10 mA and $V_{GS(OFF)} = -4V$. Determine the drain current for

i) $V_{GS} = 0V$

ii) $V_{GS} = -1V$

iii) $V_{GS} = -4V$. **6**

b) Draw transfer and drain characteristics of JFET and define the following :

i) I_{DSS}

ii) V_P

iii) $V_{GS(OFF)}$. **6**

c) For the circuit shown in figure 1, JFET has I_{DSS} = 10 mA, $V_{GS(OFF)}$ = – 4 V. Calculate :

i) V_{GSQ}

ii) I_{DQ}

iii) V_{DSQ}. **6**

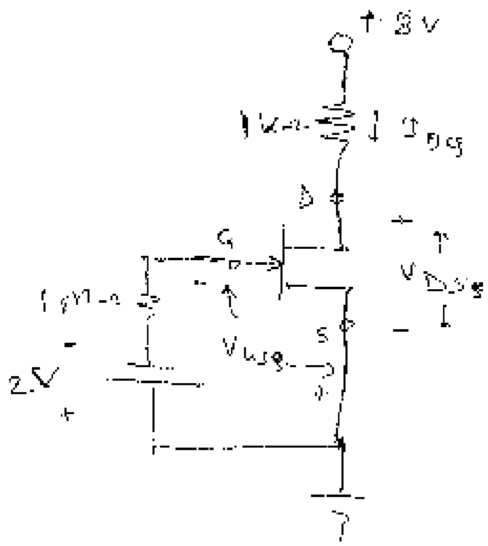


Figure 1

OR

6\. a) Draw drain characteristics of JFET and show different operating regions of it. State applications of JFET in these operating regions. **6**

b) For a JFET, if I_{DSS} = 20 mA, $V_{GS(OFF)}$ = – 5V and g_{mo} = 4 mA/V, determine g_m and I_D at V_{GS} = – 4V. **6**

c) For the circuit shown in figure 2, determine :

i) Z_i

ii) Z_o

iii) A_v.

For JFET gm = 2 mA/V, $r_d = 50\ k\Omega$. **6**

Figure 2

SECTION – II

7. a) Draw construction, transfer and drain characteristics of E-MOSFET and explain its operation. **8**

b) For the given circuit in figure 3

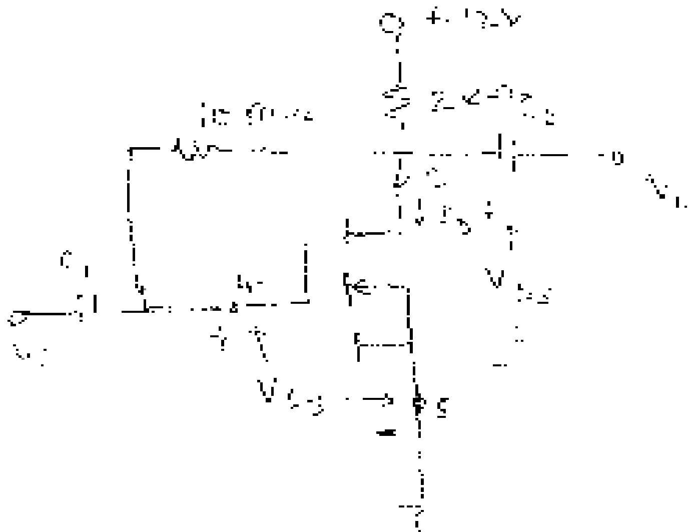


Figure 3

Calculate V_{GS}, I_D and V_{DS}. For MOSFET, assume $I_{D(ON)} = 6$ mA, $V_{GS(ON)} = 8$ V, $V_{GS(th)} = 3$ V. **8**

OR

8. a) Explain non-ideal current-voltage characteristics of E-MOSFET. **8**

b) For the circuit shown in Figure 4, calculate V_{GS}, I_D, V_{DS}. **8**

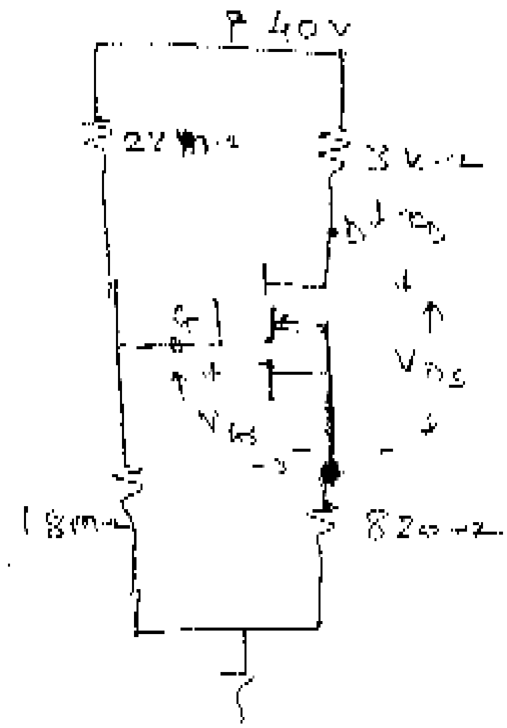


Figure 4

9. a) Draw small signal low frequency h-parameter model of BJT in CE configuration and explain significance of each parameter. **9**

b) Derive expressions of A_I R_i, A_V with the help of h-parameters model of BJT in CE configuration. **9**

OR

10. a) For the BJT circuit shown in figure 5, determine A_I, R_I, R_o and A_v. Assume for BJT, $h_{ie} = 1.1\ k\Omega$, $h_{fe} = 50$, $h_{re} = 25 \times 10^{-4}$, $h_{oe} = 2.5 \times 10^{-6}$ A/v. **9**

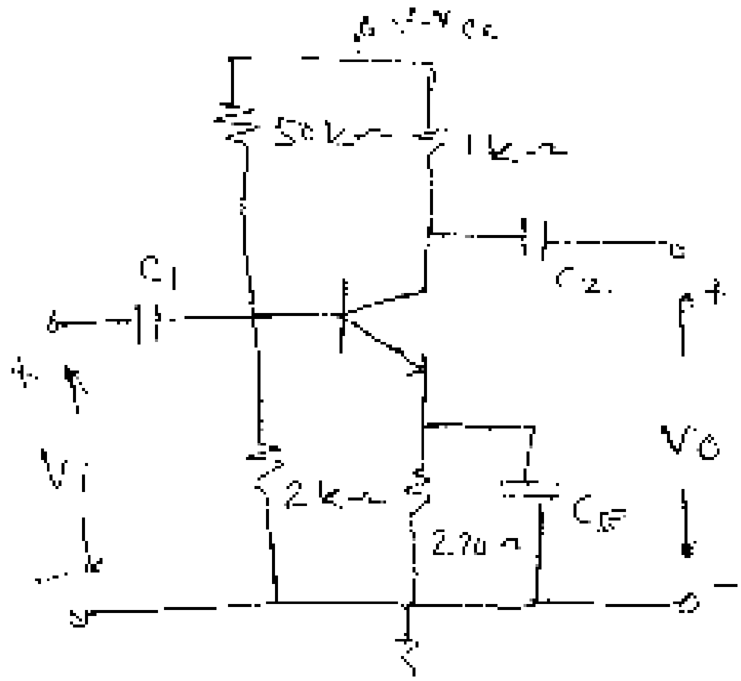


Figure 5

b) Compare CE, CB and CC configurations of BJT Amplifier w.r. to :

i) R_i

ii) R_o

iii) A_v

iv) A_I. **9**

11. a) Draw frequency response of a RC coupled BJT amplifier and define the following :

i) Lower cutoff frequency

ii) Higher cutoff frequency

iii) Bandwidth

iv) Gain-bandwidth product. **8**

b) For an amplifier, mid band gain is 100 and lower cutoff frequency is 1 kHz. Find gain at frequency of 20 Hz. **8**

OR

12. a) The following measurements were taken while testing an amplifier using square wave input :

i) For square wave input frequency of 5 kHz, the rise time of the output wave form $t_r = 20\ \mu$sec.

ii) For square wave input frequency of 100 Hz, there is a sag of 1 V in 2.5 V amplitude as observed on CRO. Determine bandwidth of the amplifier. **8**

b) Explain effects of coupling, emitter or source bypass and stray capacitors of frequency response of RC coupled BJT or JFET amplifier. **8**

S.E. (Elex. & E. & TC.) (Semester – II) Examination, 2011
ELECTRONIC CIRCUITS AND APPLICATIONS
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Solve Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section – **I***
*ii) And Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section – **II**.*
*iii) Answers to the **two** Sections should be written in **separate** books.*
*iv) **Neat** diagrams must be drawn **wherever** necessary.*
*v) Black figures to the **right** indicate **full** marks.*
*vi) Assume **suitable** data, **if necessary**.*
*vii) **Use** of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

1. a) A symmetrical 5 KHz square wave whose output varies between + 10 V and – 10 V is impressed upon the clipping circuit shown in Fig. (1), Assume $R_f = 0$ and $R_r = 2\ M\Omega$ and $V_r = 0$. Calculate V_o, sketch the steady state waveform. **8**

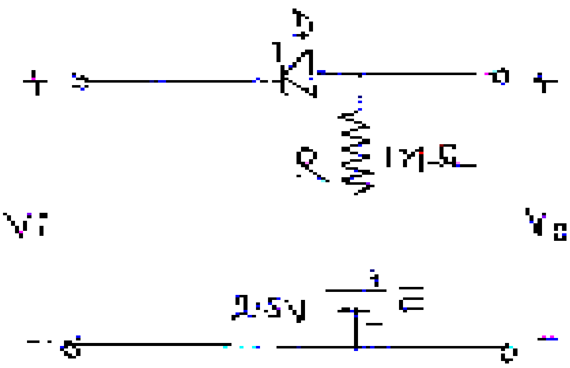


Fig. (1)

b) Discuss in detail 'Latch up' in CMOS circuits ? **8**

OR

2. a) For the circuit shown in Fig. (2) :

i) Analyze the circuit and find V_o in terms of voltage across each capacitor

ii) Sketch VC_1, VC_2 and V_o

iii) How this circuit is different from a half wave doubler ? **8**

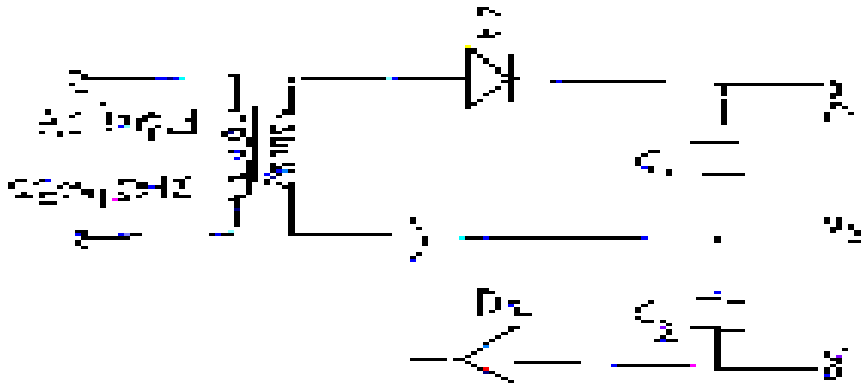


Fig. (2)

b) What do you understand by MOSFET scaling ? List the parameters being scaled, hence find scaling factor for : **8**

i) Gate area

ii) Gate capacitance

iii) Channel resistance.

3. a) Discuss the significance of following datasheet specifications of power BJT, **8**

i) T_{jmax} ; ii) SOA ; iii) θ_{jc} ; iv) P_{Dmax}

b) Explain the switching characteristics of a power MOSFET with neat diagram. **8**

OR

4. a) For the circuit shown in Fig. (3), calculate the value of R_1 and R_2max. The LED requires 20 mA current to glow 'ON'. Assume $\beta_{dc(min)} = 55$; $\beta_{dc(max)} = 100$; and $V_{CE(sat)} = 0.3$ V. **8**

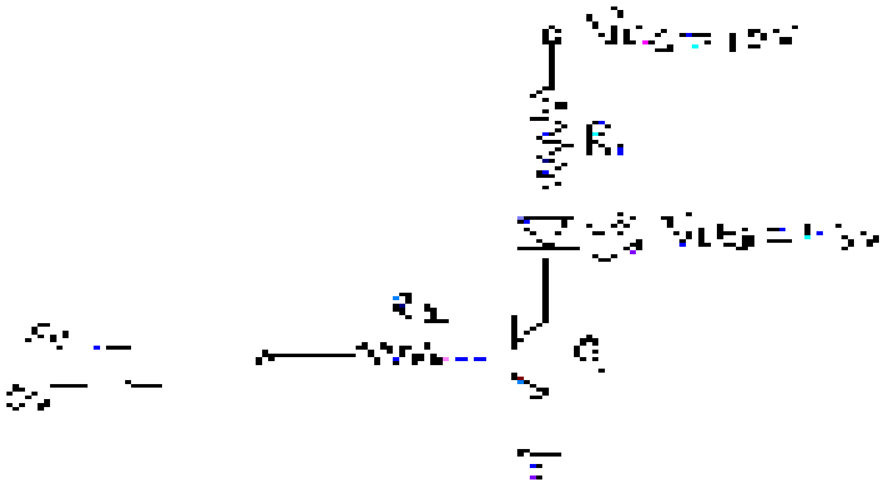


Fig. (3)

b) Compare power BJT and power MOSFET with respect to following parameters : **8**

i) Temperature coefficient ;

ii) On state voltage drop ;

iii) Control circuit ;

iv) Construction and symbol.

5. a) Discuss, with necessary diagram of class B push pull amplifier with driver and output transformer. **8**

i) Draw the waveform for $V_S, I_{B_1}, I_{B_2}, I_{C_1}, I_{C_2}$ and load voltage.

ii) Justify the name push-pull given to amplifier.

b) A class-A transformer coupled load produces harmonic amplitudes in the outputs as ; **10**

$B_0 = 1.5$ mA $\quad B_1 = 110$ mA $\quad B_2 = 8$ mA

$B_3 = 4$ mA $\quad B_4 = 2$ mA $\quad B_5 = 1$ mA

i) Determine the percentage total harmonic distortion.

ii) Assume second identical transistor is used along with a suitable transformer to provide push-pull operation. Use the same harmonic amplitudes to determine new THD.

OR

6. a) A transformer coupled class A amplifier drives a 16Ω speaker through a 3.87 : 1 transformer, using power supply of V_{CC} = 36 V, the circuit deivers 2 W to the load. **10**

Calculate :

i) P_{ac} across transformer primary ;

ii) V_L ac ;

iii) V_{ac} at transformer primary ;

iv) The rms value of load and primary current. ;

b) Draw and explain Quasi-complementary push-pull amplifier. **8**

SECTION – II

7. a) Explain following terms related with tuned amplifier : **10**

i) Resonant frequency ;

ii) Impedance of tuned circuit ;

iii) Frequency response ;

iv) Quality factor ;

v) Relation of Q and bandwidth.

b) A BJT has the following parameters $h_{ie} = 1K\Omega$ h_{fe} = 100, h_{re} and h_{oe} negligible C_C = 3 PF. The collector current is 10 mA at room temperature. The short circuit current gain is 10 at frequency 10 MHz. Calculate $f\alpha$, $f\beta$, f_T. **6**

OR

8. a) A FET having g_m = 6 mA/V has tuned anode load, consisting of a 400 μH inductance of 5Ω in parallel with a capacitor of 2500 pF. **8**

Find :

i) Resonant frequency ;

ii) Tuned circuit dynamic resistance ;

iii) Gain at resonance ;

iv) Band width.

b) Draw and explain Hybrid π – model of BJT. Explain each component of hybrid π model, with their typical values. **8**

9. a) For a feedback amplifier shown in Fig. (4); identify feedback topology with proper justification. The transistorS are identical calculate : **8**

i) A_{vf}

ii) R_{if}

iii) R_{of}

if, $h_{ie} = 2K\Omega$, $h_{re} = 10^{-4}$, $h_{oe} = 10^{-6}$ A/V, $h_{fe} = 200$.

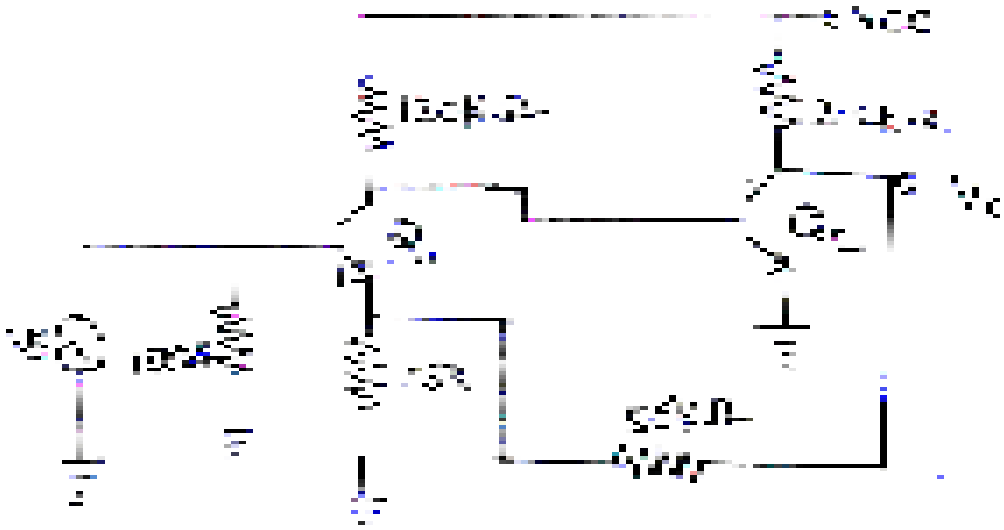


Fig. (4)

b) The frequency of oscillation of Colpitts oscillator is given by : **8**

$$f_o = \frac{1}{2\pi\sqrt{L\left[\frac{C_1C_2}{C_1 + C_2}\right]}}$$

Where L, C_1, C_2 are the frequency determining components such a circuit operates at 450 KHz with $C_1 = C_2$ what will be the oscillation frequency if the value of C_2 is doubled ?

OR

10. a) An amplifier without feedback gives a fundamental of output of 36 V with 7% second harmonic distortion when input is 0.028 V. **8**

i) If 1.2% output is fed back to input in a negative voltage series feedback, what is the output voltage ?

ii) If fundamental output is maintained at 36 V but the second harmonic distortion is reduced to 1% what is input voltage ?

b) A crystal has following parameters L = 0.33 H, C = 0.065 pf. CM = 1pF and R = 5.5KΩ find : **8**

i) The series resonant frequency ;

ii) Q factor of crystal.

11. a) Explain different types of regulator with its block schematic. Suggest suitable use of each regulator. **6**

b) Design the voltage regulator as shown in Fig. (5) to operate from a supply of 18 V to provide 12 V with a maximum load current of 50 mA.

i) Give selection of zener diode

ii) Assume calculation current 10% of I_L max find R_1, R_2, R_3, R_4. **8**

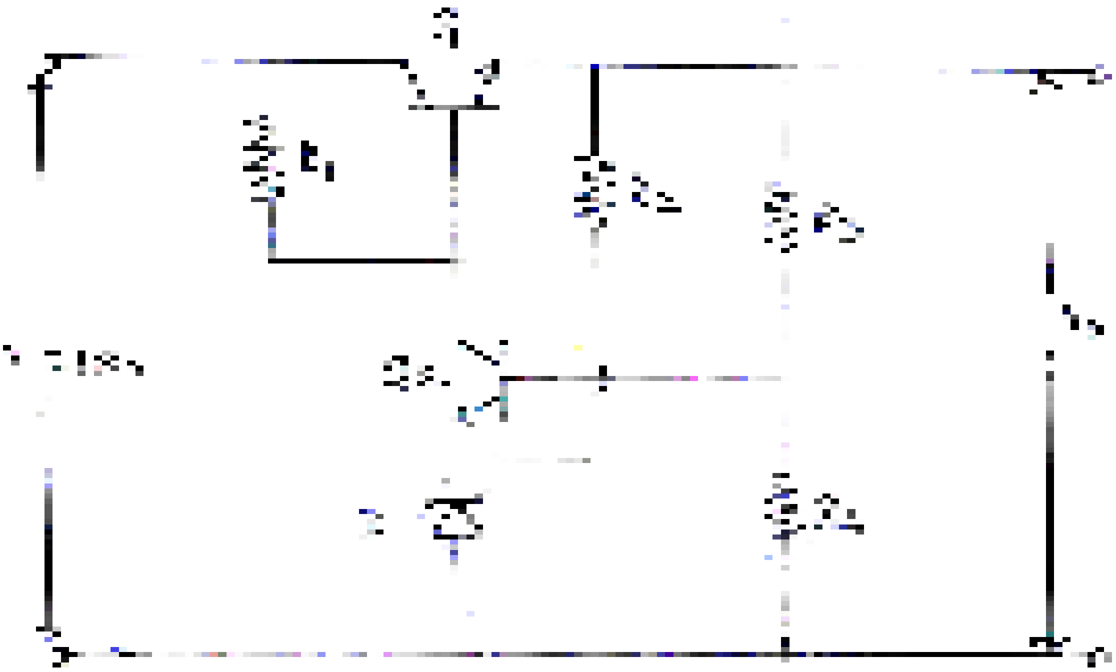


Fig. (5)

c) Explain foldback current limiting circuit in detail. **4**

OR

12. a) Design an adjustable regulator using LM337 which will satisfy the requirements as output 7 to 15 V, output current 1 A. Assume I_{adj} = 100 μA, $R_1 = 240\Omega$. **8**

b) The emitter follower regulator is to supply a load current of 500 mA at 10.3 V. The unregulated dc power supply varies from 15 – 20 V. Use zener of 11 V, which requires minimum base current 2 mA, for stable operation. The series pass transistor has parameters, h_{fe} = 50, V_{be} = 0.7 V, $r_z = 20\Omega$, $h_{ie} = 100\Omega$ Determine : **10**

i) Value of zener bias resistance

ii) Power dissipation at zener and transistor

iii) S_V : variation in V_0 for variation in V_{in} from 15 to 20 V at I_L = 500 mA constant

iv) Variation in V_o for load variation from 50 mA at V_{in} = 15 V constant.

———————

[3962] – 313

S.E. (Instrumentation and Control) (Semester – I) Examination, 2011
SENSORS AND TRANSDUCERS – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

*N.B.: 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** answerbooks.*

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

*iv) Figure to the **right** indicate **full** marks.*

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

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

SECTION – I

Unit – I

1. a) Draw and explain potentiometers for Linear and Angular displacement measurement. Also mention wire materials used. **10**

b) Explain the concept of loading effect on potentiometer. Also explain other characteristics of potentiometer. **8**

OR

2 a) Explain working and constructional details of types of strain gauges. **10**

b) A strain gauge is bonded to a beam 0.1 m long and has cross-sectional area 4 cm^2. Young's modulus for steel 207 GN/m^2. The strain gauge has an unstrained resistance of 240Ω and a gauge factor of 2.2. When a load is applied, the resistance of gauge changes by 0.013Ω .Calculate the change in length of the steel beam and the amount of force applied to the beam. **8**

P.T.O.

Unit – II

3. a) Draw and explain details of flapper-nozzle transducer for displacement measurement. **8**

   b) Draw and explain Translational and Rotary Encoders. **8**

OR

4. a) Draw and explain fibre-optic displacement measurement techniques. **8**

   b) Draw and explain working details of inductive and capacitive proximity sensors. **8**

Unit – III

5. a) With neat sketch, explain the details of the following manometers :

      i) U-tube manometer

      ii) Differential-pressure U-tube. **8**

   b) With neat sketch, explain Ring-balance type manometer. **8**

OR

6. a) Draw and explain in details high pressure measurement technique using Bridgeman's type. **8**

   b) Draw and explain high pressure measurement techniques using capacitance delta cell. **8**

SECTION – II

Unit – IV

7. a) With neat sketch, explain Low-pressure measurement using McLeod Gauge. **10**

   b) Draw and explain vacuum measurement using thermal conductivity gauges. **8**

OR

8. a) Explain in details temperature measurement using :

      i) Bimetallic thermometer

      ii) Fluid expansion type. **10**

   b) Explain in details errors in filled-in system thermometers. **8**

Unit – V

9. a) A platinum resistance thermometer has a resistance of 140.5Ω and 100Ω at 100 and 0° C respectively. If its resistance becomes 305.3Ω, when it is in contact with a hot gas. Determine the temperature of the gas. The temperature coefficient of platinum is 0.0039/°C. **8**

   b) Draw and explain different lead-wire compensation circuits for RTD. **8**

OR

10. a) Explain seebeck effect. Compare different types of thermocouples with metal-alloys used, range, sensitivity and accuracy. **8**

    b) Explain any one type of the non-contact type temperature measurement techniques. **8**

Unit – VI

11. a) What is SPL ? Explain sound-level meter. **8**

    b) Draw and explain capacitive microphone in details. **8**

OR

12. a) Explain in details torsion-bar type torque measurement techniques. **8**

    b) List out different miscellaneous sensors. Explain any two in details. **8**

———————

B/I/11/225

S.E. (Instrumentation and Control) (Semester – II) Examination, 2011
NETWORK THEORY
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Question Nos. **5** and **10** are **compulsory**. Out of **remaining** attempt **2** questions from Section **I** and **2** 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) Explain the following rules :
   i) Kirchhoff's voltage law **4**
   ii) Voltage division and current division. **4**

   b) Determine the reactance of a 50 μF capacitor in a d.c. supply and also in an a.c. supply of 100 Hz. **8**

OR

2. a) Determine the current through resistance R_3 in the circuit shown in Fig. 1. **8**

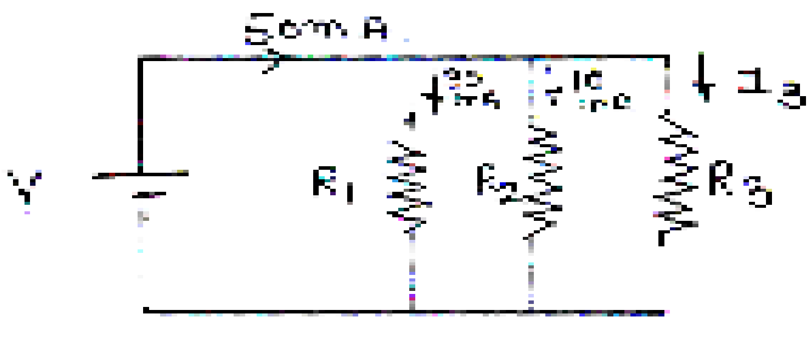


Fig 1

b) Determine the current in resistance of 10 Ω in the circuit and find V_s, as shown in Fig. 2. **8**

Fig. 2

3. a) Realise the following impedance function in first cauer forms of LC network. **8**

$$Z(s) = \frac{12s^4 + 10s^2 + 1}{3s^3 + 2s}$$

b) List properties of RC driving point impedance function. **8**

OR

4. a) List properties of RL driving point impedance function. **8**

b) An impedance function at the input of a network is represented by

$$Z(s) = \frac{s^2 + 5s + 4}{s^2 + 2s}$$

find first Foster RC form. **8**

5. a) State and prove Millman's Theorem. **8**

b) Determine the maximum power delivered to the load, as shown in Fig. 3. **10**

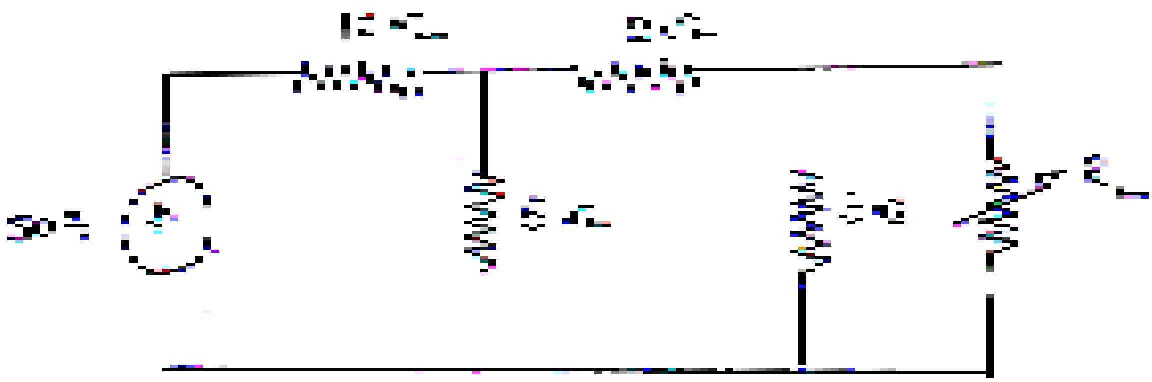


Fig. 3.

SECTION – II

6. a) Define the following functions of two port network.

i) Voltage Transfer Ratio **2**

ii) Current Transfer Ratio **2**

iii) Transfer Impedance **2**

iv) Transfer Admittance **2**

b) Find the driving point impedance of the circuit shown in Fig. 4. **8**

Fig. 4

OR

7. a) Draw the poles and zeros for **8**

$$V(s) = \frac{(s+1)(s+3)}{(s+2)(s+4)}$$

and evaluate V(t) by making use of pole-zero diagram.

b) Mention necessary conditions for

i) Driving point function **4**

ii) Transfer function. **4**

8. a) Write short note on :

   i) Transmission (ABCD) parameters **4**

   ii) Hybrid (H) parameters. **4**

   b) Draw and explain series and parallel connection of two port Networks. **8**

OR

9. a) Write short note on Y and Z parameters.

   i) Network Diagram **2**

   ii) Basic Equation **2**

   iii) Conditions of symmetry and reciprocity **2**

   iv) Relationship between Z and Y parameter. **2**

   b) Find the transmission parameters for the ckt shown in Fig. 5. **8**

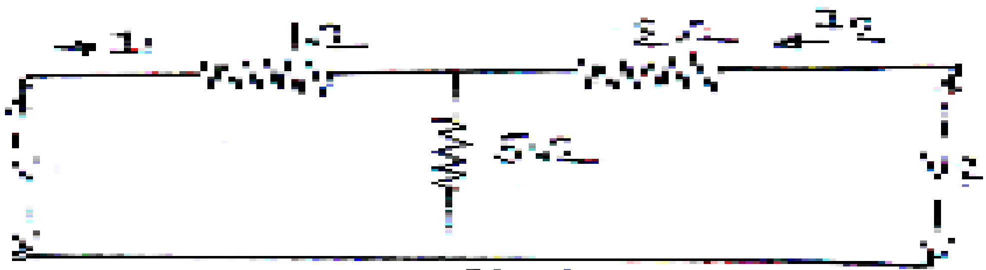


Fig. 5

10. a) Explain basic types of filters. **10**

   b) Write down the general procedure to find transfer function of Chebyshev filter by considering the following :

   i) 'E' calculations **1**

   ii) Order of filter n **2**

   iii) Design parameter BK **1**

   iv) Normalizing and multiplying factor **2**

   v) System function. **2**

———————

S.E. (Printing Engg. and Communi. Tech.) (Semester – II) Examination, 2011
TECHNOLOGY OF PRINTING MATERIALS
(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) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Black figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – 1

1. A) Explain the role of Aluminum as a image carrier in the Lithography. **8**
B) Describe the classification of Polymerization. **8**

OR

1. A) Explain the role of copper in printing. **8**
B) Explain various types of plastics used in packaging. **8**

2. A) Explain the procedure of making Negatives and Positives in brief. **8**
B) Explain the role of various ingredients used in photographic emulsion. **8**

OR

2. A) Explain the procedure of preparing the screen by photographic method. **8**
B) Explain the role of fountain solution in the lithography. **8**

3. A) Explain the type of ink used in Gravure printing process with properties. **9**
B) Explain the role of additives in printing ink along with suitable examples. **9**

OR

3. A) Explain the procedure of measuring the viscosity of the paste ink. **9**
B) Explain the different types of pigments used in printing inks. **9**

P.T.O.

SECTION – 2

4. A) Explain the light fastness and rub resistance properties of ink with suitable examples. **8**

B) Describe the procedure of determining moisture content in the paper. **8**

OR

4. A) Differentiate between process inks and Spot/Special inks. **8**

B) Write the importance of thickness of the paper with reference to the procedure of thickness gauge. **8**

5. A) Draw a neat diagram of Fourdrinier machine and name the parts. **8**

B) State the importance of the fillers in the paper. **8**

OR

5. A) Comment on **any two** : **8**

i) Beater ii) Conical refiner iii) Hydrapulper

B) Describe in detail the theory of internal sizing in the paper. **8**

6. A) Describe in short **any two** : **9**

i) Bursting strength

ii) Acidity and pH

iii) Brightness.

B) Write in detail the procedure of determining the grammage of paper. **9**

OR

6. A) Comment on **any two** : **9**

i) Tensile strength

ii) Dimensional stability

iii) Opacity

B) Describe in detail the procedure of determining the ash content in the paper and state the importance of ash content in paper with respect to printing. **9**

———————

S.E. (Chemical) (Semester – I) Examination, 2011
CHEMISTRY – I (2003 Course)
(Common to Bio-Tech)

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) What is hyper conjugation ? Explain relative stability of primary, secondary and tertiary carbonium ion. **6**

   b) Explain aromaticity of following compounds :

      i) Quinoline

      ii) Cyclopropenium cation

      iii) Cyclo heptatriene. **6**

   c) Write a short note on inductive effect. **4**

OR

2. a) Define and explain with suitable examples.

      i) Electrophile

      ii) Nucleophile

      iii) Heterolysis. **6**

   b) What is resonance effect ? Explain conditions necessary for resonance. **6**

   c) Write a note on tautomerism. **4**

3. a) Predict the products **(any three)** :

   i) Acetone $\xrightarrow{\text{warm NaOH}}$

   ii) Sodium ethonate $\xrightarrow{\text{electrolysis}}$

   iii) $CH_3 - CH_2 - \underset{\underset{Cl}{|}}{CH} - CH_3 \xrightarrow{\text{alc. NaOH}}$

   iv) Tertiary butyl alcohol $\xrightarrow[90°C]{20\%\ H_2SO_4}$ **6**

   b) What is Grignard reagent ? Discuss its reactions in preparation of primary, secondary and tertiary alcohols from aldehyde and ketone. **6**

   c) Write a short note on Aldol condensation. **4**

OR

4. a) What is SN' reaction ? Discuss its mechanism with suitable examples. Discuss any two factors affecting the same. **6**

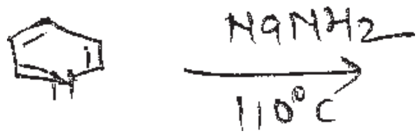
   b) Give the mechanisms for

   i) Kolbe synthesis ii) Sulphonation of benzene **6**

   c) Discuss mechanism of Favoraskii rearrangement. **4**

5. a) Predict the products. **6**

   i) 

   ii) 

   iii) Quinoline $\xrightarrow{HNO_3 + H_2SO_4}$

   b) What is conformational isomerism ? Discuss conformation of n-butane with energy profile diagram. **7**

   c) Give one method of preparation of each 1) Furan 2) Indole. **5**

OR

6. a) What is geometrical isomerism ? Explain it with suitable example. **6**

b) Assign R and S configuration. **4**

i) $\begin{array}{c} Br \\ | \\ HO-C-COOH \\ | \\ Cl \end{array}$

ii) $\begin{array}{c} CHO \\ | \\ H-C-COCH_3 \\ | \\ OH \end{array}$

c) Explain :

i) Pyridine is more basic than pyrrole.

ii) Furan is more reactive than benzene in electrophilic substitution.

iii) Electrophilic substitution in five membered heterocycles.

iv) Thiophene is more stable than furan and pyrrole. **8**

SECTION – II

7. a) Define surface tension of a liquid. Explain any one method for determination of surface tension. **6**

b) Write a short note on Bragg's equation. **6**

c) A first order reflection is obtained from an angle $10.4°$. Calculate the distance between the various plans $(\lambda = 1.54\,A°)$. **4**

OR

8. a) Explain viscosity of a liquid. Give experimental method for determination of a viscosity. **6**

b) What is vapor pressure of a liquid ? Explain one method for the determination of vapor pressure. **6**

c) Write a short note on Parachor. **4**

9. a) Derive kinetic gas equation. **6**

b) Derive the following terms from kinetic gas equation. **6**

i) Dalton's law ii) Boyle's law

c) Write a short note on Rault's law. **4**

OR

10. a) Derive the expressions for the critical constants in terms of Vander Waals constant 'a' and 'b'. **6**

b) What is meant by RMS velocity, average velocity and most probable velocity ? How they are related to each other ? **6**

c) Oxygen at 1 atm pressure and $0°C$ has a density of 1.4290 gm/lit. Find the RMS velocity of oxygen molecule. **4**

11. a) What is colligative property ? Show that elevation in a boiling point is a colligative property. **7**

b) Write a note on abnormal colligative properties of solution. **7**

c) A solution of an organic compound containing 20 gm per litre had an osmotic pressure 2.51 atm. at $27°C$. Calculate the molecular weight of the compound. **4**

OR

12. a) What is osmotic pressure of a liquid ? Give the method for determination of a osmotic pressure. **7**

b) Explain elevation in boiling point is a colligative property. **7**

c) A solution of 0.278 gm of an organic compound in 55.6 gm of acetate had its B.P. raised by 0.472 °C. Find the molecular weight of the compound. (Kb for 1000 gm solvent is 1.72). **4**

———————

B/I/11/210

S.E. (Chemical) (Semester – I) Examination, 2011
ENGINEERING MATHEMATICS – III
(Common to Printing/Polymer/Petrochem. /Petroleum/Bio. Tech.)
(2003 Course)

Time : 3 Hours   Max. Marks : 100

Instructions : *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 non programmable electronic pocket calculator is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Solve the following differential equations **(any three)** :

i) $(D^2 + 3D + 2)\,y = e^{e^x} + \cos(e^x)$

ii) $(D^4 + 2D^2 + 1)\,y = x^2 \cos x$

iii) $(D^2 + 1)\,y = \sec x$ [By variation of parameters]

iv) $x^2 \dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + 4y = \cos(\log x) + x\sin(\log x)$. **12**

b) Solve $\dfrac{dx}{1} = \dfrac{dy}{1} = \dfrac{dz}{(1 + 2xy + 3x^2y^2)\,(x + y)\,z}$. **5**

OR

2. a) Solve the following differential equations (**any three**) :

i) $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{p}(l - x)$

ii) $(D^2 - 2D + 1)\,y = xe^x \sin x$

iii) $\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$ [By variation of parameters]

iv) $(1+x)^2\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$. **12**

b) The acceleration components of a particle moving in a plane are given by

$$\frac{d^2x}{dt^2} = b\frac{dy}{dt} \text{ and } \frac{d^2y}{dt^2} = a - b\frac{dx}{dt}$$

where a, b are constants. If the particle is initially at rest at the origin, then show that the path of the particle is a cycloid. **5**

3. a) A horizontal tie-rod is freely pinned at each end. It carries a uniform load W kgs per unit length and has a horizontal pull P. Find the central deflection and maximum bending moment, taking the origin at one end. **8**

b) An elastic string is tightly stretched between two points, distance *l* apart. It is initially displaced so that it takes the shape of a parabola given by the equation $y(x,0) = k(lx - x^2)$. When in this position, it is released from rest. Find the subsequent motion of the string. **8**

OR

4. a) A bar of unit length, has its ends kept in melting ice. Heat is supplied at the centre, so that initial temperature distribution is

$$u(x,0) = \begin{cases} 2x & 0 \le x \le \frac{1}{2} \\ 2(1-x) & \frac{1}{2} \le x \le 1 \end{cases}$$

Find the subsequent temperature distribution. **9**

b) In a chemical transformation of certain substance following equations appear

$$\frac{dx}{dt} + lx = 0$$

$$\frac{dz}{dt} = my \quad \text{and} \quad x + y + z = n$$

where l, m, n are constants. Obtain solution for z, subject to the conditions

$z = \frac{dz}{dt} = 0$ at $t = 0$. **7**

5. a) Find the Fourier transform of

$$f(x) = \begin{cases} 1 - x^2, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$$

and hence evaluate

$$\int_0^\infty \left(\frac{x \cos x - \sin x}{x^3} \right) \cos \frac{x}{2} dx .$$ **6**

b) Find the Fourier cosine transform of the function

$$f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x > a \end{cases}$$ **5**

c) Solve the integral equation

$$\int_0^\infty f(x) \cos \lambda x \, dx = e^{-\lambda}, \lambda > 0$$ **6**

OR

6. a) Show that the Fourier transform of $e^{-x^2/2}$ is itself. **8**

b) Use Fourier transform to solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ $0 < x < \infty$, $t > 0$ subject to the following conditions

i) $u(0,t) = 0 \quad t > 0$

ii) $u(x,0) = 1, \quad 0 < x < 1$
$ = 0, \quad x > 1$

iii) $u(x,t)$ is bounded. **9**

SECTION – II

7. a) Find the Laplace transform of (**any two**) : **6**

i) $e^{-3t} \int_0^t \frac{\sin 2t}{t} dt$

ii) $F(t) = \begin{cases} e^{-4(t-3)} \sin 3(t-3), & t > 3 \\ 0, & t < 3 \end{cases}$

iii) $e^{-t} \sin t \, U(t - \pi) + \sin 2t \, \delta(t - \pi/4)$

b) Find the inverse Laplace transform of (**any two**) : **6**

i) $\log\left(\frac{s+3}{s+2}\right)$

ii) $\frac{1}{(s+1)(s^2+1)}$ (Use convolution theorem)

iii) $\frac{se^{-\pi s}}{s^2 + 4s + 29}$

c) Evaluate using Laplace transform **4**

$\int_0^\infty e^{-2t} \sin^3 t \, dt$

OR

8. a) Find the Laplace transform of (**any two**) : **6**

i) $\cosh t \int_0^t t \cosh t \, dt$

ii) $\frac{1-\cos t}{t}$

iii) $\sin\sqrt{t}$

b) Find the inverse Laplace transform of (**any two**) : **6**

i) $\cot^{-1}\left(\frac{s-2}{3}\right)$

ii) $\frac{6s-4}{s^2-4s+20}$

iii) $\frac{s}{s^3-6s^2+11s-6}$

c) Find the Laplace transform of following periodic function **4**

$$f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases} \text{ and } f(t+2\pi) = f(t)$$

9. a) Find the constants m and n such that the surface $mx^2 - 2nyz = (m+4)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at the point $(1, -1, 2)$. **5**

b) Show that $\overline{F} = (6xy + z^3)\overline{i} + (3x^2 - z)\overline{j} + (3xz^2 - y)\overline{k}$ is irrotational. Find the scalar ϕ such that $\overline{F} = \nabla\phi$. **6**

c) Using Stoke's theorem evaluate $\int_C 4ydx + 2zdy + 6ydz$ where C is the curve of intersection of $x^2 + y^2 + z^2 - 6z = 0$ and $z = x + 3$. **7**

OR

10. a) A particle is moving along a curve $\bar{r} = (t^3 - 4t)\,\bar{i} + (t^2 + 4t)\,\bar{j} + (8t^2 - 3t^3)\,\bar{k}$. Find the tangential and normal components of acceleration at $t = 2$. **4**

b) With usual notations establish the following **(any two)** : **8**

i) $\bar{a} \cdot \nabla \left[\bar{b} \cdot \nabla\left(\frac{1}{r}\right)\right] = \frac{3(\bar{a} \cdot \bar{r})\,(\bar{b} \cdot \bar{r})}{r^5} - \frac{(\bar{a} \cdot \bar{b})}{r^3}$

ii) $\nabla \cdot \left[r\,\nabla\left(\frac{1}{r^n}\right)\right] = \frac{n\,(n-2)}{r^{n+1}}$

iii) $\nabla \times \left[\bar{a} \times \left(\bar{b} \times \bar{r}\right)\right] = \bar{a} \times \bar{b}$

c) Using Divergence theorem evaluate $\iint_S \left(y^2z^2\bar{i} + z^2x^2\bar{j} + x^2y^2\bar{k}\right) \cdot d\bar{S}$ where S is the upper part of the sphere $x^2 + y^2 + z^2 = 9$ above the xoy – plane. **6**

11. a) Using Laplace transform solve $\frac{dy}{dt} + y(t) - 2\int_0^t y(t)\,dt = \frac{t}{2}$, $y(0) = 1$. **5**

b) Show that the velocity potential $\phi = \frac{1}{2}a\,(x^2 + y^2 - 2z^2)$ satisfies the Laplace's equation. Also determine the stream lines. **6**

c) The transfer function of an non-interacting system is given by **5**

$$G(s) = \frac{R_2}{(\mathfrak{I}_1 s + 1)(\mathfrak{I}_2 s + 1)}$$

Where R_2 is the process gain and $\mathfrak{I}_1, \mathfrak{I}_2$ are time constants. Derive the relationships for height level of the second tank with applying step change.

OR

12. a) Using Laplace transform solve **5**

$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + y(t) = te^{-t}; \quad y(0) = 1, \quad y'(0) = -2$$

b) Test whether the motion specified by $\bar{q} = \frac{K(x\bar{j} - y\bar{i})}{x^2 + y^2}$, K is constant is a possible motion for an incompressible fluid. If so determine the equations of stream lines. **6**

c) The transfer function of a second order system is given as **5**

$$G(s) = \frac{6}{s^2 + 1.8s + 1}$$

Determine overshoot, decay ratio, period of oscillation and $y(t)_{max}$.

———————

[3962] – 333

S.E. (Chemical) (Semester – I) Examination, 2011
FLUID FLOW OPERATIONS
(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****.*

SECTION – I

1. a) Write short notes on : **12**

i) Need and scope of fluid flow studies

ii) Viscosity of liquids and gases

iii) Continuum hypothesis.

b) Determine intensity of shear of an oil having velocity 1.2 Poise and is used for lubrication in the clearance between a 10 cm diameter shaft and its bearing. The clearance is 0.001 m and the shaft rotates at 200 rpm. **4**

OR

2. a) The place between two parallel plates 4 mm apart is filled with an oil of specific gravity 0.85. The upper plate of area 800 cm^2 is dragged with constant velocity 0.75 m/s by applying force of 0.2 N to it. Assume linear velocity distribution and calculate : **8**

i) Velocity gradient

ii) Dynamic viscosity of oil in CP

iii) Kinematic viscosity of oil in stokes

b) Define and explain the followings : **8**

i) Specific weight

ii) Vapour pressure

iii) Specific volume

iv) Specific gravity

P.T.O.

3. a) Derive the equation for hydrostatic equilibrium. **6**

   b) Describe advantages and disadvantages of manometers. **6**

   c) Find depth of a point below water surface in the sea where the pressure intensity is 100.55 kN/m^2. Specific gravity of sea water is 1.025. **4**

OR

4. a) Derive Euler's equation of motion. **6**

   b) Two tanks are filled with water of specific weight 9.81 kN/m^3. Bottoms of the tanks are connected to an inverted U tube manometer containing oil having specific weight 7.85 kN/m^3. Find the difference in pressure between two tanks when the manometer gives reading 0.8 m. **6**

   c) Write short notes on : **4**

      i) Streamline and equipotential line

      ii) Rotational and irrotational flow.

5. a) Derive Bernaulli equation of mechanical energy balance. **8**

   b) Water at 20°C is pumped at constant rate of 12 m^3 per hour from a large reservoir resting on the floor to open top of an experimental absorption tower. The point of discharge is 5 m above the floor and the frictional losses in the 100 mm diameter pipe from reservoir to the tower amount to 2.5 J/kg. At what height in the reservoir must be the water level kept if the pump can deliver only 1 kW ? **10**

OR

6. a) Sulphuric acid of specific gravity 1.3 is flowing through a pipe of 5 cm internal diameter. A thin tipped orifice of 1 cm diameter is fitted in the pipe and the differential pressure shown by the mercury manometer is 10 cm. Calculate weight of acid flowing per hour. Assume the coefficient of discharge as 0.61. Density of mercury is 13600 kg/m^3. **8**

   b) What is Pitot tube ? How is it used to measure velocity of flow at any point in pipe or channel ? **6**

   c) Justify the following statements : **4**

      i) Coefficient of discharge of an orificemeter is much smaller than that of venturimeter.

      ii) Ratio of throat diameter to inlet diameter of venturimeter ranges generally between 0.25 to 0.75.

SECTION – II

7. a) The resistance R experienced by a partially submerged body depends upon the velocity u, length of the body L, viscosity of the liquid μ, density of the liquid ρ and acceleration due to gravity g. Establish a suitable relation involving dimensionless groups. **9**

b) For laminar flow of Newtonian fluid through inclined pipe obtain the equation for velocity distribution and prove that,

$$\frac{u}{u_{max}} = \left[1 - \left(\frac{\gamma}{\gamma_\omega}\right)^2\right]$$

where all notations are usual. **9**

OR

8. a) Write short note on : **6**

i) Kinematic similarity

ii) Dynamic similarity.

b) Derive Hagen-Poisseuilli equation for steady laminar flow through circular conduit. **6**

c) A 600 mm diameter pipe carries liquid of density 1000 kg/m^3 at a rate of 600 LPM. Length of the pipe is 3.5 km and viscosity of the liquid initially is 0.015 stokes. Calculate power required for pumping. Now if the viscosity of the liquid changes by factor 10 due to increased temperature, compute new power required for pumping. Assume other conditions to be exactly same. Use fanning friction factor $f = \frac{0.316}{Re^{0.2}}$ for turbulent flow if necessary. **6**

9. a) What is hydrodynamic boundary layer ? Describe growth of boundary layer over a flat plate. **8**

b) Derive expressions for the following : **8**

i) Displacement thickness

ii) Momentum thickness.

OR

10. a) If the velocity distribution in laminar flow is given by **8**

$$u = 2\left(\frac{u_\infty}{\delta}\right)y - \left(\frac{u_\infty}{\delta^2}\right)y^2$$

where all notations are usual.

Find out displacement thickness δ^* and momentum thickness θ.

b) Discuss importance of boundary layer in Heat and Mass transfer. **6**

c) Define : **2**

i) Laminar boundary layer

ii) Turbulent boundary layer

11. a) Explain the following terms in the operation of centrifugal pump. **6**

i) Cavitation

ii) NPSH

iii) Priming

b) The discharge through a pipe is 200 lpm. Find the loss of head in the pipe when it is suddenly enlarged from 150 to 300 mm diameter. **4**

c) In a pipe of diameter 300 mm and length 75 m water is flowing at a velocity of 2.8 m/s. Find head loss due to friction.

Take kinematic viscosity of water $\gamma = 0.012$ stokes. **6**

OR

12. a) Describe different minor losses in pipe fittings. **6**

b) Two reservoirs with a difference in elevation of 15 m are connected by three pipes in series. The pipes are 300 m long of diameter 30 cm, 150 m long of diameter 20 cm and 200 m long of diameter 25 cm respectively. The friction factor 'f' in the relation : **10**

$$H_f = \frac{fLV^2}{2.g.d}$$

For the three pipes are 0.018, 0.020 and 0.019 respectively which account for friction and all losses. Further the contraction and expansion are sudden. The loss coefficient for sudden contraction from 30 to 20 cm is 0.24. Determine the flow rate in lps.

[3962] – 347

S.E. (Petroleum/Petrochemical/Polymer) (Semester – II) Examination, 2011
HEAT TRANSFER
(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) Explain the followings : **16**
   i) Thermal Diffusivity
   ii) Newton's Law of Cooling
   iii) Stefan-Boltzmann Law of Radiation
   iv) Thermal Resistance
   v) Fourier's Law of Heat Conduction
   vi) Thermal Conductivity.

OR

2. a) A plane wall is 150 mm thick and its wall area is 4.5 m^2. If its thermal conductivity is 9.35 W/m °C and the surface temperatures are steady at 150 °C and 45 °C, determine i) Heat flow across the plane wall; ii) Temperature gradient in flow direction. **8**

   b) An Aluminium plate 50 mm thick whose one face is maintained at 250 °C and other face at 50 °C. Thermal conductivity $k_{(Al)}$ = 225 W/m °C, calculate the rate of the heat transfer per unit area through the given plate. **4**

   c) Calculate the rate of the heat transfer per unit area through a copper plate 45 mm thick whose one face is maintained at 350 °C and other face at 50 °C. Thermal conductivity $k_{(Copper)}$ = 370 W/m °C. **4**

3. a) Explain with the necessary expression the term "Logarithmic mean area for the hollow cylinder". **9**

b) Derive the necessary expression for the heat conduction through a hollow cylinder under the following cases i) Uniform thermal conductivity K and ii) Variable thermal conductivity given by the equation $K = K_0 (1 + \beta T)$. **9**

OR

4. a) A wall of a furnace is made up of inside layer of silica brick 120 mm thick covered with a layer of magnesite brick 240 mm the temperature at the inside surface of silica brick wall and outside surface of magnesite brick wall are at 725 °C and 110 °C respectively. The contact thermal resistance between the two walls at the interface is 0.0035 °C/w per unit wall area. Estimate the rate of the heat loss per unit are and temperature drop at the interface.

Thermal conductivity $k_{\text{Silica Brick}}$ = 1.7 W/m °C

Thermal conductivity $k_{\text{Magnesite Brick}}$ = 5.8 W/m °C. **10**

b) Write a note on critical thickness of insulation. **8**

5. a) Write a note on heat transfer by Natural Convection. Differentiate between Natural Convection Vs Forced Convection. **12**

b) Write a note on thermal boundary layer. **4**

OR

6. a) Write a note on Overall Heat Transfer Coefficient. **6**

b) Discuss any five dimensionless by numbers used in heat transfer studies. **10**

SECTION – II

7. a) Discuss the concept of Black Body with neat diagram. **6**

b) Prove that the total Emissive Power of diffuse surface is equal to π times its Intensity of Radiation. **10**

OR

8. a) Write a note on Absorptivity, Reflectivity and Transmissivity of radiation and based on above define the followings : Black Body, White Body and Opaque Body. **10**

b) Discuss in detail Kirchhoff's law. **6**

9. a) Discuss in detail Parallel, Counter flow and Cross flow heat exchangers with neat diagrams. **9**

b) Discuss with neat diagram Direct and Indirect Contact Type Heat Exchangers. **9**

OR

10. a) Define the term "Logarithmic Mean Temperature Difference". Derive the necessary equation for the LMTD for parallel type heat exchanger. **14**

b) It is desired to heat 4450 kg/h of cold benzene from 27 °C to 49 °C by using hot toluene which is cooled from 71 °C to 38 °C. Benzene flows through the inner pipe in counter current manner to toluene. Find the log mean temperature difference for the given case. **4**

11. Explain the following terms in detail : Evaporator Capacity, Evaporator Economy, Boiling Point Elevation, Material and Enthalpy balances for single effect evaporator. **16**

OR

12. Define evaporation with its the importance and state the classification of evaporators and explain any one evaporator in detail. **16**

[3962] – 356

S.E. (Computer Engg.) (Semester – II) Examination, 2011
MICROPROCESSORS AND INTERFACING TECHNIQUES
(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) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw and explain the internal architecture of 8086 μp. **8**

   b) Explain 8086 minimum system configuration with suitable diagram. **8**

OR

2. a) Differentiate between memory mapped I/O and I/O mapped I/O. **8**

   b) What is memory segmentation in 8086 ? Explain it with a suitable diagram. **8**

3. a) Differentiate between assembler directives and instructions. Give two examples of each. **8**

   b) What is addressing modes of 8086 ? Explain it with any one example. **8**

OR

4. a) Write a ALP to calculate the length of the any string. Write appropriate comments. **8**

   b) Explain the following instruction with one examples of each : **8**

      i) Call

      ii) RET

      iii) RCR

      iv) MOVSB.

P.T.O.

5. a) Explain the initialisation sequence of 8259 PIC. **8**

b) Draw and explain internal architecture of 8253. Explain any two operation mode of 8253. **10**

OR

6. a) Explain the following terms : **8**

i) Cascading

ii) Polling

iii) Buffered mode

iv) Automatic EOI.

b) Give the control word format for 8253/54 write a program to initialise counter 2 in mode 0 with a count of C038H. Assume address for control word register = 0BH, counter 0 = 08H, Counter 1 = 09H and counter 2 = 0AH. **10**

SECTION – II

7. a) Explain in brief the I/O ports of 8255 PPI. **8**

b) What is handshaking ? Draw and explain the centronix type interfacing to interface the printer to 8255. **8**

OR

8. a) Explain the following signal functions of 8279 : **8**

i) SL_0-SL_3

ii) $\overline{BD}$

iii) IRQ

iv) STB

b) Draw and explain in brief 8251. **8**

9. a) What is D/A converter ? Explain the different sources of errors in DAC. **8**

   b) Write a short note **(any two)** : **8**

      i) Data acquisition system

      ii) LVDT

      iii) Flow sensor.

OR

10. a) Explain the working of any one temperature transducer. **8**

    b) Explain the different conversion technique of ADC. **8**

11. a) What is POST ? Enlist the different steps of POST process. **10**

    b) What is PSP ? Draw the structure of PSP. **8**

OR

12. a) What is a TSR ? Write a TSR program to give a beep sound, when any key is pressed. **10**

    b) What is the use of ·Com file ? Differential between ·Com and ·EXE file. **8**

———————

B/I/11/890

[3962] – 251

S.E. (Civil) (Semester – I) Examination, 2011
ENGINEERING MATHEMATICS – III
(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) Figures to the ***right*** *indicates* ***full*** *marks.*

v) ***Use*** *of electronic pocket calculator is* ***allowed****.*

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

SECTION – I

1. a) Solve the following differential equations (**any three**) : **12**

i) $(D^2 - 1)\, y = \bar{e}^{x} \sin \bar{e}^{x} + \cos \bar{e}^{x}$

ii) $(D^2 + 4)\, y = x \sin x$

iii) $(D^3 + 8)\, y = x^4 + 2x + 1$

iv) $(D^2 + 1)\, y = \operatorname{cosec} x$ (By variation of parameters)

v) $x^2 \dfrac{d^2y}{dx^2} - 3\dfrac{dy}{dx} + 5y = x^2 \operatorname{Log} x$

b) Solve : **5**

$$4\frac{du}{dx} = v - u = 2\frac{dv}{dx}$$

given $u = 20$ & $v = 100$ when $x = 0$.

OR

P.T.O.

2. a) Solve the following differential equations (**any three**) : **12**

i) $(1+x)^2 \dfrac{d^2y}{dx^2} + (1+x)\dfrac{dy}{dx} + y = 2\sin\ \text{Log}\ (1 + x)$

ii) $\left(\dfrac{d^2y}{dx^2} - 6\dfrac{dy}{dx} + 9\right)y = \dfrac{e^{3x}}{x^2}$ (By variation of parameters)

iii) $(D^3 - 1)\ y = (e^x + 1)^2$

iv) $(D^2 + 3D + 2)\ y = e^{e^x}$

v) $(D^3 + 4D)\ y = \sin 2x$

b) Solve : $\dfrac{dx}{3z-4y} = \dfrac{dy}{4x-2z} = \dfrac{dz}{2y-3x}$ **5**

3. a) For a strut of length L freely hinged at each end, the differential equation is

$$EI\frac{d^2y}{dx^2} + Py = \frac{-WL^2}{8}\sin\left(\frac{\pi x}{L}\right)$$

Prove that the deflection at the centre of the beam is $\dfrac{WL^2}{8(Q-P)}$ and the bending moment is $\dfrac{-WL^2Q}{8(Q-P)}$, where $Q = \dfrac{EI\pi^2}{L^2}$. **8**

b) A string is stretched and fastened to two points L apart. Motion is started by replacing the string in the form $u = a\sin\dfrac{\pi x}{L}$ from which it is released at time $t = 0$. Find the displacement u (x, t) from one end.

$\left(\text{Use wave equation } : \dfrac{\partial^2 u}{\partial t^2} = \dfrac{c^2\partial^2 u}{\partial x^2}\right)$ **8**

OR

4. a) Solve $\frac{\partial v}{\partial t} = K \frac{\partial^2 v}{\partial x^2}$ if

i) $v \neq \infty$ at $t \to \infty$

ii) $\left(\frac{\partial v}{\partial x}\right)_{x=0} = 0, \forall t$

iii) $V(l, t) = 0, \forall t$

iv) $V(x, 0) = V\,0, \; 0 < x < l$. **8**

b) A weight of 3 kg stretches a spring to 15 cm. If this weight is pulled down 10 cm below the equilibrium position and given a downward velocity 60 cm/sec. Determine the amplitude, period and frequency of the motion. **8**

5. a) Solve the following system by Cholesky's method. **9**

$4x_1 + 2x_2 + 14x_3 = 14$

$2x_1 + 17x_2 - 5x_3 = -101$

$14x_1 - 5x_2 + 83x_3 = 155$

b) Compute y (0.1) and y (0.2) by Runge Kutta method of 4^{th} order for the differential equation

$\frac{dy}{dx} = xy + y^2, \; y(0) = 1$. **8**

OR

6. a) 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 correct up to three decimals taking h = 0.2 **8**

b) Solve the following system of equations by Gauss - Seidal Method

$27x_1 + 6x_2 - x_3 = 85$

$6x_1 + 15x_2 + 2x_3 = 72$

$x_1 + x_2 + 54x_3 = 110.$ **9**

SECTION – II

7. a) The first four moments about the working mean 25 of a distribution are –1.1, 89, –110 and 23300. Find the first four central moments, coefficient of skewness and kurtosis. **5**

b) The probabilities of A, B and C of hitting the target are $\frac{1}{4}, \frac{2}{3}$ and $\frac{3}{4}$ respectively. Find the probability that at least two hit the target. **4**

c) Obtain the regression lines for the following data. **7**

x	7	2	11	4	6
y	9	10	06	8	7

OR

8. a) Obtain the correlation coefficient for the following data **6**

x	1	4	3	6	2
y	0.2	0.8	0.6	1.1	0

b) Number of road accidents on a highway during a month follows a Poisson distribution with mean 5. Find the probability that in a certain month number of accidents on the highway will be

i) greater than 3

ii) less than 3. **5**

c) In a preliminary examination 2000 students appeared in Engg. Maths III. Average marks obtained were 50% with standard deviation 5%. How many students do you expect to obtain at least 60% of marks , supposing that marks are distributed normally ?

Given Area corresponding to 3 = 2 is 0.4772. **5**

9. a) Find the magnitude of tangential and normal components of acceleration for a particle moving along the curve $x = t^2 + 1, y = 4t - 3, z = 2t^2 - 6t$ at $t = 2$. **6**

b) Find the directional derivative of $\phi = e^{2x} \cos yz$ at (0, 0, 0) in the direction of the tangent to the curve $x = a \sin t, y = a \cos t, z = at$ at $t = \dfrac{\pi}{4}$. **5**

c) Prove. (**any two**) **6**

i) $\nabla \times \left(\dfrac{\bar{a} \times \bar{r}}{r^2}\right) = \dfrac{2}{r^4} (\bar{a}.\bar{r}) \bar{r}$

ii) $\nabla . \left(\dfrac{\bar{a} \times \bar{r}}{r^2}\right) = 0$

iii) $\nabla . \left(r \nabla \dfrac{1}{r^4}\right) = \dfrac{8}{r^5}$

OR

10. a) Show that the Vector field given by

$\bar{F} = (2xz^3 + 6y)\,\bar{i} + (6x - 2yz)\,\bar{j} + (3x^2z^2 - y^2)\,\bar{k}$ is irrotational . Find the scalar function ϕ such that $\bar{F} = \nabla \phi$. **6**

b) Prove that

$\nabla^4 (e^r) = e^r + \dfrac{4}{r} e^r$. **4**

c) Show that the vector field $\bar{F} = f(r)\,\bar{r}$ is always irrotational. Determine f(r) such that $\nabla^2 f(r) = 0$. **7**

11. a) Find the work done in moving a particle along the curve given by $x^2 = 4y$ and $3x^3 = 8z$ from x = 0 to x = 2 under the field of force given by
$\bar{F} = 3x^2\,\bar{i} + (2xz - y)\,\bar{j} + z\,\bar{k}$ **5**

b) Verify Green's theorem for the field $\bar{F} = x^2 i + xy\,\bar{j}$ over the region R enclosed by $y = x^2$ and $y^2 = x$. **6**

c) Evaluate $\iint_S \left(x^3\,\bar{i} + y^3\bar{j} + z^3\bar{k}\right).d\bar{S}$ where S is the surface of the sphere
$x^2 + y^2 + z^2 = 1$ **6**

OR

12. a) Evaluate $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = (2x + y)\,\bar{i} + (3y - x)\,\bar{j}$ and C is the straight line segment joining points A (0, 0) and B(3, 2). **5**

b) Evaluate the surface integral $\iint_S \left(xi + yj - 2z\bar{k}\right).d\bar{S}$ where S is the curved surfaceof the cylinder $x^2 + y^2 = 4$ bounded by z =0 and z = 2. **6**

c) Use Stoke's theorem to evaluate $\iint_S (\nabla \times \bar{F}).d\bar{S}$
where $\bar{F} = (x^3 - y^3)\,\bar{i} - xyz\,\bar{j} + y^3\,\bar{k}$ and S is the surface $x^2 + 4y^2 + z^2 - 2x = 4$ above the plane x = 0. **6**

———————

S.E. (Civil) (Sem. – I) Examination, 2011
STRENGTH OF MATERIALS
(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 electronic pocket calculator is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Draw and explain typical stress-strain diagram for ductile material. **4**

b) Derive the expression for change in length of a tapered circular rod. **4**

c) A steel tube 2.4 cm external diameter and 1.8 cm internal diameter encloses a copper rod 1.5 cm diameter to which it is rigidly connected at the two ends. If at a temperature of 10°C, there is no longitudinal stress, calculate stresses in the rod and tube when the temperature is dropped to – 200°C. Assume **8**

$E_{cu} = 1\times10^5$ N/mm^2 $E_{st} = 2.1\times10^5$ N/mm^2

$\alpha_{cu} = 18\times10^{-6}/°C$ $\alpha_{st} = 11\times10^{-6}/°C$

OR

2. a) A copper sleeve, 21 mm internal and 27 mm external diameter, surrounds a 20 mm steel bolt. One end of sleeve being in contact with the shoulder of the bolt. The sleeve is 60 mm long. After putting a rigid washer on the other end of sleeve, a nut is screwed on the bolt through 10°. If the pitch of the threads is 2.5 mm, find the stresses induced in the copper sleeve and steel bolt. Take E_{st} = 200 GN/mm^2 and E_{cu} = 90 GN/mm^2. **8**

b) A steel rod is 15 m long and is at a temperature of 15°C. Find free expansion of the length when the temperature is raised to 65°C. Find the temperature stress produced when

i) The expansion of the rod is prevented.

ii) The rod is permitted to expand by 6 mm.

Take $\alpha = 12 \times 10^{-6} / {}^{\circ}C$ and E = 200 GN/mm^2. **8**

3. a) Sketch the shear force and bending moment diagrams showing salient values for the beam loaded as shown in Fig. 3.1 **8**

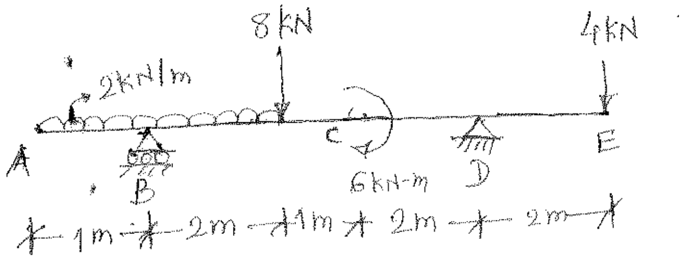


Fig. 3.1

b) Three beams have the same length, the same allowable stress and same bending moment. The cross sections of the beams are a square, a rectangular with depth twice the width and a circle. Determine the ratios of weights of the circular and rectangular beams with respect to the square c/s beam. **8**

OR

4. a) Shear force diagram for a loaded beam is as shown in Figure 4.1. Determine the loading and draw bending moment diagram showing all salient points. **8**

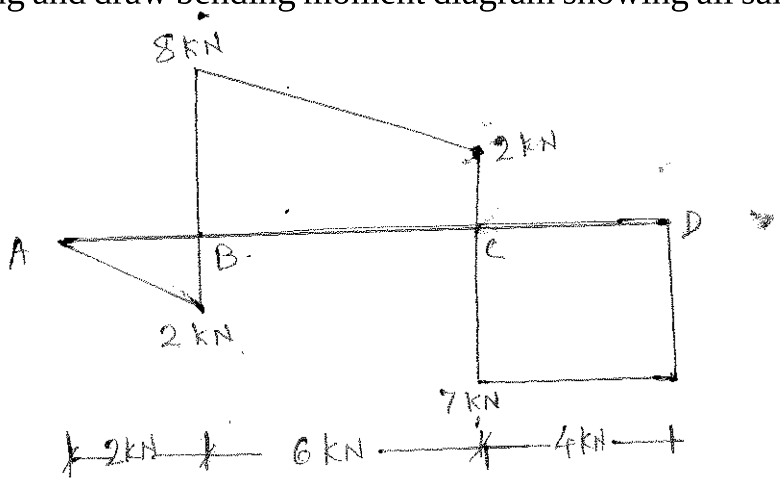


Fig. 4.1

b) A timber beam 16 cm wide and 20 cm deep is to be reinforced by bolting on two steel flitches each 16 cm×1cm in section. Find moment of resistance when

i) the flitches are attached symmetrically at the top and bottom.

ii) the flitches are attached symmetrically on the left and right sides.

Allowable stress in timber is 6 MN/mm^2. What is the maximum stress in steel in each case ? Take E_{st} = 20 $E_{timber.}$ **8**

5. a) A simply supported beam carries UDL of intensity 10 kN/m over its entire span of 5m. The cross section of the beam is as shown in figure 5.1. Draw the shear stress distribution diagram and calculate ratio of average shear stress to maximum shear stress. **10**

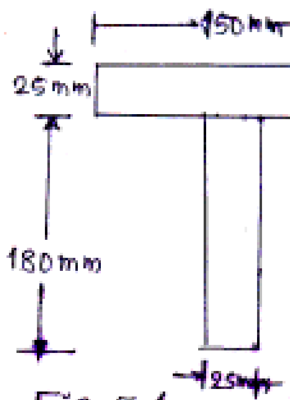


Fig. 5.1

b) A steel shaft ABCD is subjected to torques as shown in figure 5.2.

i) Determine relative torques at fixed end

ii) Draw torsional moment diagram

iii) Find maximum shear stress and angle of twist.

Take G = 80 GPa. **8**

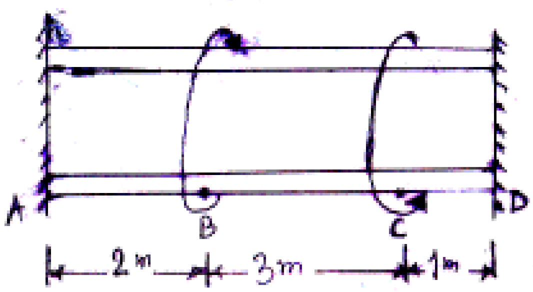


Fig. 5.2

OR

6. a) A beam is constructed of two 50 mm×250 mm in cross section that are attached by 25 mm×300 mm boards as shown in Fig. 6.1. The boards are nailed to the beams at a longitudinal spacing of 110 mm. If each nail has an allowable shear force of 1350 N, what is the maximum permissible shear force 'V' ? **10**

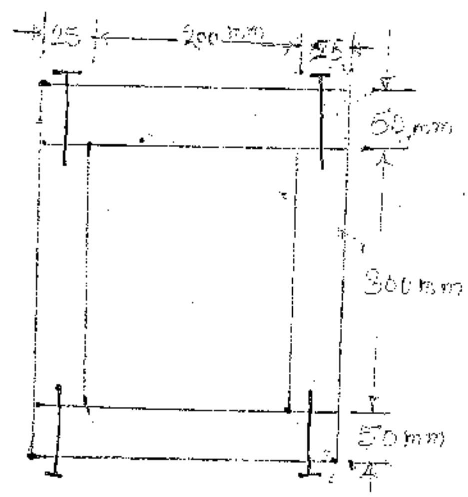


Fig. 6.1

b) A circular solid shaft transmits 115 kW at 300 rpm. If permissible shear stress is 75 N/mm^2 and allowable twist is 1.5° in a length of 3 m, determine diameter of shaft.

Take G = 80×10^9 N/m^2. **8**

SECTION – II

7. a) At a point in a piece of material, there is a tensile stress of 90 MN/m^2 upon the horizontal plane and compressive stress of 45 MN/m^2 upon vertical plane along with shear stress of 45 MN/m^2 on each plane. Determine

i) Principal stresses and ii) respective planes. **8**

b) A solid shaft is subjected to bending moment of 2.3 kN.m and a twisting moment of 3.45 kN.m. Find the diameter of the shaft if the permissible tensile and shear stresses for the material of the shaft are limited to 703 MPa and 421.8 MPa respectively. **8**

OR

8. a) At a point in a strained material the principal stresses are 100 MN//m^2 (Tensile) and 50 MN/m^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 50° to the axis of major principle stress. **8**

b) Figure 8.1 shows the state of stress of a point in two dimensional stress body. Determine magnitudes and directions of

i) Principle stresses

ii) Maximum shear stress. **8**

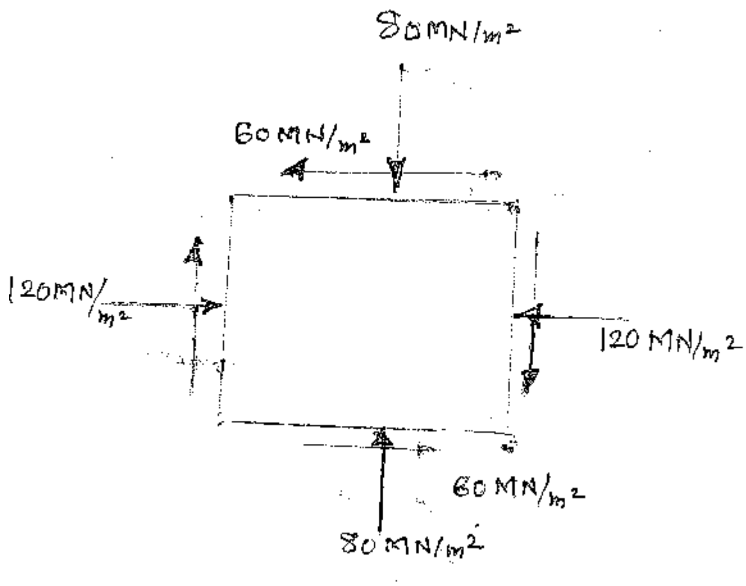


Fig. 8.1

9. a) A masonry chimney 25 m high of uniform circular cross section, 4 m external and 2 m internal diameter is subjected to horizontal wind pressure of 1.2 kN/m^2 of projected area. Find the maximum and minimum stress intensities at the base if the specific weight of masonry is 22 kN/m^2. **8**

b) Derive an expression for Euler's critical load for a column having one end hinge and other fixed. **8**

OR

10. a) A rectangular pier is subjected to a compressive load of 450 kN as shown in fig. 10.1. Find stress intensities on all the four corners of the pier. **8**

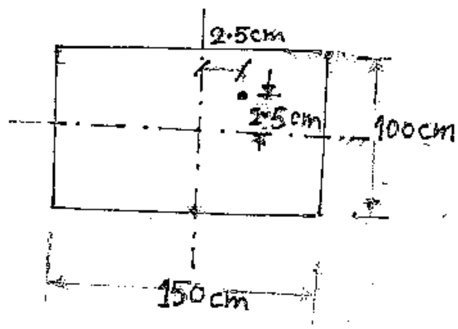


Fig. 10.1

b) Find Euler's crushing load for a hollow cylinder cast-iron column 200 mm external diameter, 25 mm thick, 6 m long and hinged at both ends. If E = 120 GN/m^2, compare the load with crushing load given by Rankine's formula assuming σ_c = 550 MPa and a = $\frac{1}{1600}$. For what length of column would these formulae give the same crushing load ? **8**

11. a) A beam 6 m long is loaded as shown in figure 11.1. If the flexural rigidity of the beam is 8×10^4 kN/m^2, find

   i) Deflections at 'B' and 'C'.

   ii) Slope at 'A' and 'D'. **9**

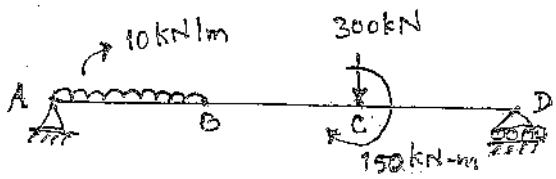


Fig. 11.1

b) A simply supported beam 5 m long carries concentrated loads of 10 kN each at points 1 m from each end.

Calculate:

   i) Maximum slope and max. deflection

   ii) Slope and deflection under the point loads.

Take EI = 1.2×10^4 kN/m^2.

Use Moment Area Method. **9**

OR

12. a) A simply supported beam of 4 m span is carrying a point load of 40 kN at a distance of 3 m from the left end. Calculate slope at the two supports and deflection under the load. Also calculate maximum deflection.

Take EI = 2.6×10^7 N - m^2 **9**

b) For the beam shown in figure 12.1, using conjugate beam method, determine :

i) Slope at end 'A'

ii) Deflection at point 'B'

iii) Maximum deflection. **9**

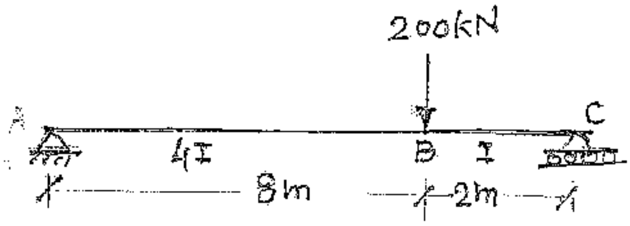


Fig. 12.1

B/I/11/500

[3962] – 254

S.E. (Civil) (Semester – I) Examination, 2011
ENGINEERING GEOLOGY
(2003 Course)

Time : 3 Hours   Max. Marks : 100

Instructions : *1)* ***All*** *questions are* ***compulsory.***
2) Answers to the ***two*** *Sections should be written on* ***separate*** *answer books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) Figures to the ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) What is metamorphism ? What are the agents of metamorphism ? Explain the role of metamorphism. Describe the types of metamorphism. **12**

   b) Write a note on weathering. **4**

OR

   a) Write detailed notes on :
      i) Structures of Sedimentary rocks. **5**
      ii) Classification of Igneous rocks based on SiO_2 %. **5**

   b) Write notes on (**any two**) :
      i) Clastic Texture. **3**
      ii) Organic Deposits. **3**
      iii) Sub Divisions of Geology. **3**

2. a) Define a fault. Describe the parts of fault and their types. What is the engineering significance of fault ? **12**

   b) Note on Recumbent fold. **4**

OR

2. Write briefly on :
   a) Concordant and discordant Igneous intrusions. **8**
   b) Strike and dip. **4**
   c) Horst and Graben. **4**

P.T.O.

3. a) Write an essay on varieties and distribution with origin of Deccan Trap Basalt. **10**

b) Write notes on (**any two**) :

- Gondwana System. **4**
- Products of Volcanoes. **4**
- Vindhyan Building Stones. **4**
- Internal Structure of Earth. **4**

OR

3. a) Write notes on :

- Name the types of Iandslides. **3**
- Isoseismal lines. **3**

b) Write in short about Physiographic divisions of India. **4**

c) Write an explanation of orogenic and epirogenic mountains. **4**

d) Quartz and Calcite look alike. What physical property distinguishes quartz and calcite ? **4**

SECTION – II

4. Write notes on : **4 each**

a) Importance of length and number of core pieces during drilling.

b) Limitations of drilling.

c) Image Interpretation.

d) Storage and indexing of core pieces.

OR

4. a) G.I.S. and applications of it in Civil Engineering. **6**

b) What are the observations and precautions to be taken during drilling at a project site ? Explain with suitable examples. **10**

5. Write briefly on with sketches if any :

   a) Cone of depression and Radius of influence. **6**

   b) Requirement of Good building stone. **6**

   c) Contact springs in Deccan trap area. **4**

OR

5. a) What are artesian wells ? Explain various conditions leading to formation of it with neat sketches. **8**

   b) What are mass movements ? How can we minimise / prevent it ? **8**

6. a) Discuss Geological conditions suitable for reservoir sites. **6**

   b) Influence of divisional planes on tunnelling work. **6**

   c) Treatment to dykes and features crossing dam alignment. **6**

OR

6. a) Under what conditions leakage occurs below the dam ? Explain with suitable examples. **6**

   b) Feasibility of tunnelling through tectonic areas. **6**

   c) Importance of surface survey in the selection of a dam site. **6**

———————

S.E. (Civil) (Semester – I) Examination, 2011
ENGINEERING ECONOMICS & MANAGEMENT
(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) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Give the definition of Demand and Supply. Explain with the help of suitable example, how to calculate equilibrium price with the variable demand and supply. **6**

   b) Explain in detail law of Substitution. **6**

   c) Explain the term : Marginal Utility with the help of suitable example. **6**

OR

2. a) Give definitions of following: **6**
   1) Assets
   2) Liabilities
   3) Cost
   4) Value
   5) Price
   6) Investment.

   b) Explain the Elasticity of Supply and Elasticity of Demand. **6**

   c) What are the basic assumptions made for the study of Law of Demand and Law of Supply ? **6**

3. a) Explain the life cycle of a product with the help of suitable examples and with neat diagram. **8**

   b) What are the characteristics of perfect competition ? Give one example to elaborate your points. **8**

OR

4. a) Give advantages and disadvantages of small scale industry. **8**

   b) Explain the terms GNP and GDP. **8**

5. a) Write a detail note on SEBI. **8**

   b) What are the types of capital ? What are the differences between them ? **8**

OR

6. a) Explain in detail BOT system of contracting. **8**

   b) Explain the term Annuity. How it is calculated ? **8**

SECTION – II

7. a) Write in detail the working of Cooperative Society. **6**

   b) What is the meaning of Delegation of Authority ? Explain with suitable example. **6**

   c) What is meant by Scientific Management ? **6**

OR

8. a) Write down the contributions by Fayol in the development of Management. **6**

   b) What are advantages and disadvantages of partnership ? **6**

   c) Explain in detail any two principles of Management. **6**

9. a) Explain the use of Decision tree. **8**

   b) What is the importance of training ? Give advantages and disadvantages of the same. **8**

OR

10. a) What are the different leadership styles ? Explain with suitable example. **8**

    b) Explain benefit cost analysis with following considerations **8**

    1) Concept 2) Implementation

    3) Advantages 4) Disadvantages.

11. a) Explain theory X and theory Y. **8**

    b) Explain the implementation of M/S for Construction industry. **8**

OR

12. a) What are the Deming's 14 Principles ? Explain any one in short. **8**

    b) What are the advantages and disadvantages of Trade Unions ? **8**

———————

[3962] – 256

S.E. (Civil) (Semester – II) Examination, 2011
FLUID MECHANICS – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions: *i) Answer **three** question from Section **I** and **three** questions from Section **II**.*
*ii) Answer to the **two** Sections should be written in **separate** answer booklet.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Black figures to the **righ**t indicate **full** marks.*
v) Your answer will be valued as a whole.
*vi) **Use** of electronic pocket calculator **is allowed**.*
*vii) Assume suitable data **if necessary**.*

SECTION – I

1. a) A skater weighing 800 N skates at 54 km/hr on ice at zero degree centigrade. The average skating area supporting him is 10 cm^2 and the effective dynamic co-efficient of friction between the skates and ice ins 0.02. If there is actually a thin film of water between the skates and the ice, determine its average thickness. **9**

b) What is surface Tension ? What is the unit of it ? Do you think it's a line force ? Derive the expression of pressure intensity for a droplet and sphere. **9**

2. a) Derive the hydrostatic law showing pressure at any point below free surface is given by p = Yh. **4**

b) Draw the neat sketch of a Micro Manometer. **4**

c) Derive the Continuity Equation in three dimensions in Cartesian co-ordinate. **8**

3. a) What is flow net ? Prove that in any flow net the stream lines and equipotential lines are orthogonal to each other. **4**

b) Write in detail about Siphon along with necessary equations. **4**

c) Derive the expression of Discharge for a 'V' notch. Is end contraction applicable to 'V' notches ? Do you think velocity of approach can be considered in 'V' notch ? **8**

4. a) Define orifice and state what is Vena Contracta ? Derive that coefficient of velocity is equal to $x/(4hy)^{0.5}$, where x and y are the co-ordinates and 'h' is the head for the flow ? **8**

   b) Draw the neat sketch of a Venturimeter and show all the parts. **4**

   c) Draw the neat sketch of a Pitot Tube and state the importance of it. What do you mean by stagnation point ? **4**

5. a) A solid circular cylinder of radius 'r' and height 'h' is floating in water. The specific gravity of the material of the cylinder is 0.64. Find the minimum ratio r/h for which the cylinder will float in water with its axis vertical and it will be just stable. **8**

   b) A plane flow has velocity components u = x/T, v = –y/T and w = 0, where T is the constant having the dimension of time. Is the flow incompressible ? **8**

SECTION – II

6. a) Write in details about Buckingham-π Theorem. **6**

   b) Discuss about Reynold's Model Law. **6**

   c) The discharge over a hydraulic structure is a function of velocity, head of water, depth and acceleration due to gravity. Find the 'π' terms. How many repeating variables will be there ? **6**

7. a) Discuss in detail about the flow between two parallel plates, (both the plates are at rest). Give your comment about the shear stresses at the lower and upper plate. Find the relation between the maximum velocity and the average velocity. **8**

   b) An oil of mass density 950 kg/m^3 and dynamic viscosity 1.5 poise is pumped through a 100 mm diameter pipe. The length of the pipe is 600 m. The flow rate is 0.01 m^3/s.

   Calculate the Reynolds Number of the flow. What would be the power input if the overall efficiency of the pump is 75% ? **8**

8. a) Velocity distribution in a turbulent flow of water through a 60 cm diameter pipe is given by [$v = 3 + (1/3) \log_e y$] where ‘V’ is the velocity at a distance ‘y’ normal to the pipe boundary. The shear stress at a point 12 cm from the boundary is 25 N/cm^2. Calculate the Prandtl’s Mixing Length coefficient. **8**

b) Prove that for Turbulent flow the velocity distribution in rough pipes the expression is

$$V/V_{*} = 5.75 \log_{10} (y/k) + 8.5$$

The symbols stand for their usual meanings. **8**

9. a) $u/U = \sin(\Pi y / 2\delta)$. Determine the energy thickness δ^{**}. **8**

b) What do you mean by separation of Boundary Layer ? Describe it with the help of a diagram. What do you mean by adverse pressure gradient ? Is it good for fluid flow ? **8**

10. a) Derive Hagen-Poiseuille Equation for laminar flow through a circular pipe. Express it in terms of both discharge and average velocity. **8**

b) Explain Prandtl’s Mixing length theory along with diagram. **4**

c) Explain in detail about Moody’s diagram. Do you think for higher Reynolds number the friction factor is not dependent on ‘Re’ ? Give your answer with valid logic. **4**

S.E. Civil (Semester – II) Examination, 2011
SURVEYING – I
(2003 Course)

Time : 3 Hours　　　　Max. Marks : 100

SECTION – I

1. a) Describe the collimation method of reducing the levels, compare the collimation method with the rise and fall method. **6**

b) The following notes refer to the reciprocal levels taken with a dumpy level : **6**

Instrument station	**Staff readings on A**	**B**	**Remarks**
A	1.03	1.630	AB = 800 m
B	0.95	1.540	R.L. of A = 450 m

Find

i) True R.L. of B

ii) Combined correction for curvature and refraction

iii) The error in collimation adjustment of the instrument.

c) Find the height of Tee-beam above the floor level. The R.L. of the floor is 100.855 m, and the staff reading on the floor is 2.055. The reading on the staff held upside down against the underside of the beam is 3.565 m. **6**

OR

2. a) Explain fully the process of reciprocal levelling and state its advantage. **6**

b) State and explain the various axes of dumpy level. **6**

c) Define following terms : **6**

i) Height of Instrument　　ii) Parallax

iii) Line of sight　　iv) Back sight reading.

3. a) Give list of temporary and permanent adjustments of a Transit Theodolite. **6**

b) Explain how would you measure with theodolite a vertical angle. **4**

c) What is meant by face left and face right of theodolite ? How would you change the face ? What instrumental errors are eliminated by face left and face right observations. **6**

OR

4. a) What do you understand by Gales traverse system ? How are the calculations are made ? **4**

b) Following are the lengths and bearings of traverse ABCD : **8**

Line	**Length, m**	**Bearings**
AB	248.00	30°
BC	320.00	140°
CD	180.00	210°

Calculate the length and bearing of the line DA.

c) Define traverse. Draw a neat sketch of open and closed Traverse ? Also state the circumstance under which you would prefer open and closed traverse. **4**

5. a) How would you determine the multipling and additive constants of a tacheometer ? **6**

b) State any four advantages of Tacheometric survey. **4**

c) Determine the distance between the instrument station P and the staff station Q from the following data : **6**

R.L. of the instrument axis = 200.150 m

vertical Angle = 3° 45′

staff readings = 1.450, 0.900, 0.350

Also determine R.L. of Q, Take M = 100 and C = 0.0.

OR

6. a) State any four characteristics of contour lines. **4**

b) Define contour. State various uses of contour maps. **6**

c) A tacheometer is used to obtain the difference of levels between two points A and B. The instrument is set up at another station C, and the following observations were made **6**

Staff at	**Vertical Angle**	**Stadia Readings**
A	$-6°30'$	3.500, 2.815, 2.130
B	$-8°30'$	1.870, 0.990, 0.110

If the R.L. of A is 100.00, determine the R.L. of B. Also determine the horizontal distance of A from C. Take M = 50.00 and C = 0.50.

SECTION – II

7. a) What are the different types of horizontal circular curves ? How would you select most suitable type for a particular site ? **4**

b) Explain the following : **6**

i) Tangent point and point of curve

ii) Deflection angle and angle of intersection

iii) Normal chord and sub chord

c) List the various methods of setting out a simple circular curve. Explain briefly the Rankine method of deflection angles. **6**

OR

8. a) Two tangents intersect at the chainage 2000 m, deflection angle being 30°. Calculate the length of first and last subchord. Take peg interval = 30 m and Radius of curve = 300 m. **6**

b) Draw a neat sketch of compound curve and show its various elements. **6**

c) Draw a neat sketch of reverse curve and discuss the merits and demerits of reverse curve. **4**

9. a) A road bend which deflects 85° is to be designed for a maximum speed of 80 km per hour with a curve consisting of a circular arc combined with two cubic spirals. If the maximum centrifugal ratio is $\frac{1}{4}$ and the maximum rate of change of radial acceleration is 0.3 m/sec^2/sec, **6**

calculate :

i) the radius of circular curve

ii) the length of transition curve

iii) shift of curve.

b) Describe the procedure of setting out a simple circular curve by Rankine's method of deflection angles. **6**

c) Write a short note on Transition curve. **4**

OR

10. a) A transition curve is to be designed for a road curve, which deflects 85°. Maximum allowable speed on circular curve is 80 km per hour. If the maximum centrifugal ratio is $\frac{1}{4}$ and the maximum rate of change of radial acceleration is 0.3 m/sec^3, calculate : **6**

i) The radius of circular curve

ii) The length of transition curve

iii) Shift of curve.

b) How would you decide the length of transition curve ? Discuss the various methods. **6**

c) Write a short note on vertical curves. **4**

11. a) Discuss in brief the advantages and disadvantages of plane table surveying. **6**

b) State three point problem. Explain, how it is solved by the graphical method. **6**

c) Discuss in brief direct and indirect method of contouring. **6**

OR

12. a) Write a short note on uses of contour Maps for engineering purpose. **6**

b) State the use of various accessories required for plane table surveying. **6**

c) Write short notes on Radiation method of plane table survey. **6**

[3962] – 259

S.E. (Civil) (Semester – II) Examination, 2011
CONCRETE 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.*
*5) **Use** of electronic pocket calculator is **allowed**.*
*6) Assume suitable data, **if necessary**.*
*7) 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) Write a short note on Hydration of cement. **6**

b) Write short notes on :

i) Hydrophobic cement ii) Oil well cement. **6**

c) What is bulking of sand ? Explain the field test to determine the extent of bulking of sand. **6**

OR

2. a) State the Bogue's compound along with their percentage by mass of cement and function of each. **6**

b) What is fineness modulus of aggregate ? How will you find Fineness modulus of coarse aggregate in laboratory ? **6**

c) Explain the classification of aggregates in the basis of

i) Origin ii) Shape iii) Unit weight. **6**

P.T.O.

3. a) Enlist the properties of concrete in plastic state and hardened state. **4**

b) Define workability of concrete and explain slump test in brief. **6**

c) Write a brief note on creep of concrete. **6**

OR

4. a) Draw and explain the compressive stress-strain curve of concrete. **4**

b) Describe the types of vibrator used for compaction of concrete. **6**

c) Write a short note on :

i) Shrinkage ii) Swelling of concrete. **6**

5. a) Discuss the importance of mix-design. **4**

b) What do you mean by nominal mix, standard mix and design mix ? **6**

c) Briefly outline the D.O.E. method of concrete mix design. **6**

OR

6. a) What do you mean by **4**

i) Mean strength ii) Variance

iii) Standard deviation iv) Coefficient of variation ?

b) Briefly outline the I.S. Code method of concrete mix-design. **6**

c) What are the factors which influences the choice of mix proportion ? **6**

SECTION – II

7. a) What is prepacked concrete ? **4**

b) Explain the effect of cold weather concreting. **6**

c) Explain three types of polymer concrete. **6**

OR

8. a) Explain how high performance concrete differs from high performance concrete. **4**

b) Write a short notes of light weight concrete and its advantages. **6**

c) State and explain three types of self-compacting concrete. **6**

9. a) Write any eight functions of admixtures. **4**

b) Write a short note on pozzolanic admixtures. **6**

c) Write a short note on indirect tension test. **6**

OR

10. a) Write a short note on impact echo test. **4**

b) Write a short note on analysis of fresh concrete. **6**

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

i) pull out test ii) Effect of sea water on concrete.

11. a) Write a short notes on : **6**

i) Chloride attack ii) Evaluation of cracks.

b) Explain in detail-permeability and factors affecting permeability of the concrete. **6**

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

i) shotcrete ii) repair by stitching

OR

12. a) Write a detailed note on carbonation of concrete. **9**

Write short note on

b) Sulphate attack. **4**

c) Corrosion of reinforcement. **5**

[3962] – 262

S.E. (Mechanical) (Semester – I) Examination, 2011
STRENGTH OF MACHINE ELEMENTS
(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, electronics pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1\. a) Derive the expression for volumetric strain of a cylindrical rod subjected to axial force. **8**

b) Two vertical wires are suspended at a distance of 500 mm apart, as shown in following Fig. 1. Their upper ends are firmly secured and their lower ends support a rigid horizontal bar which carries a load 'W'. The left wire has a diameter of 1.6 mm and is made of copper and the right wire has a diameter of 0.9 mm and is made of steel. Both wires initially are 4.5 m long. Determine the position of the line of action of 'W', if due to W, both wires extend by the same amount. Take $E_s = 2\times10^5$ N/mm^2 and $E_c = 1\times10^5$ N/mm^2. **8**

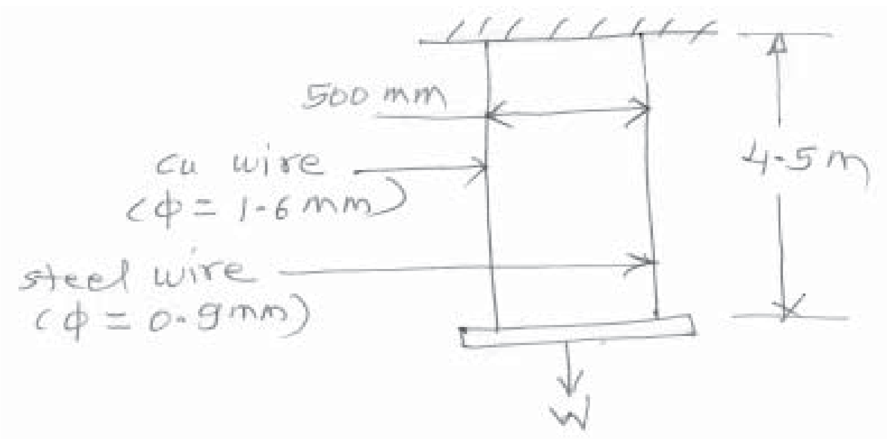


Fig. 1

OR

P.T.O.

2. a) Define the following terms : **4**

i) Factor of safety

ii) Modulus of rigidity

iii) Thermal stress

iv) Volumetric strain.

b) Draw a typical stress-strain diagram for ductile material indicating all silent points. **4**

c) For the arrangement, shown in following Fig. (2), find maximum value of 'P' that will not exceed stress in steel of 140 MPa, in Aluminium of 90 MPa and in Bronze 100 MPa. **8**

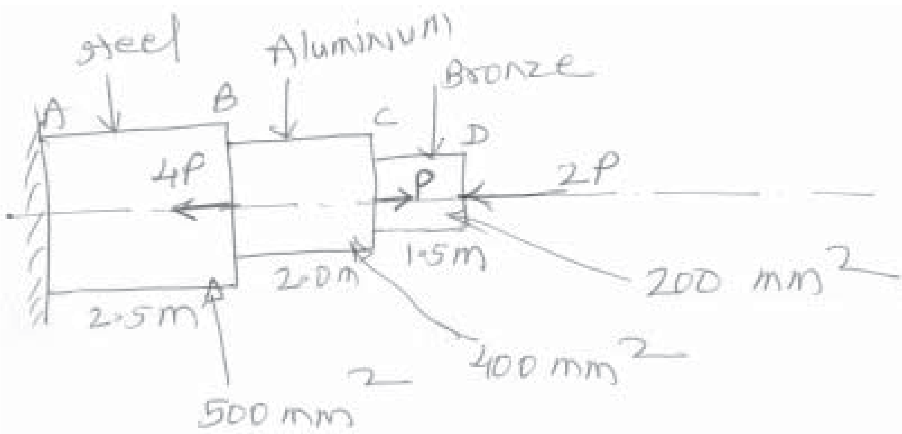


Fig. 2

3. a) The following 3 beams have the same strength and are of the same material and have same weight :

i) I section 400 mm×180 mm with 20 mm thick flanges and 12.5 mm thick web.

ii) Rectangular section of depth twice its width.

iii) Solid circular section.

Compare the strength of the I section with the rectangular and circular section. **8**

b) A beam of I section, as shown in following Fig. 3 is simply supported over a span of 4 m. Determine the safe load, the beam can carry per meter length, if the allowable compressive stress in the beam is 30.82 N/mm^2. **8**

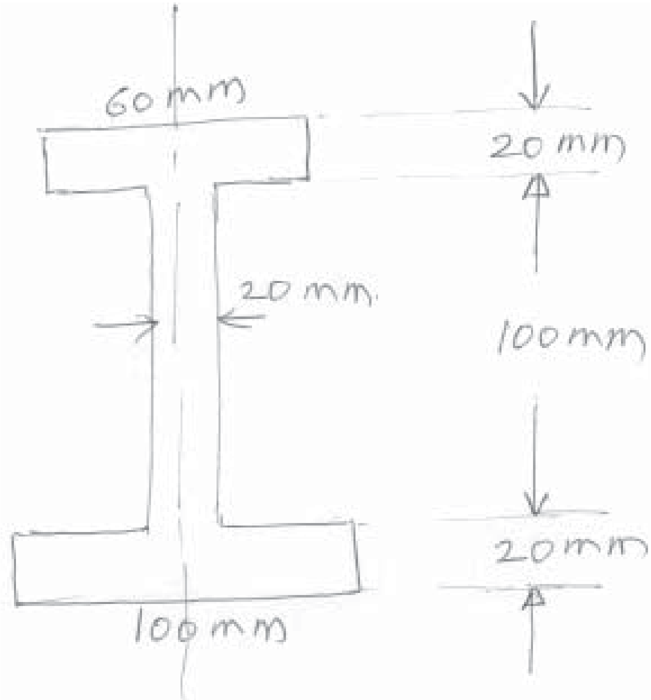


Fig. 3

OR

4. a) Following Fig. 4 shows the cross-section of a beam, which is subjected to a shear force of 20 kN. Draw shear stress distribution across the depth marking values at silent points. **8**

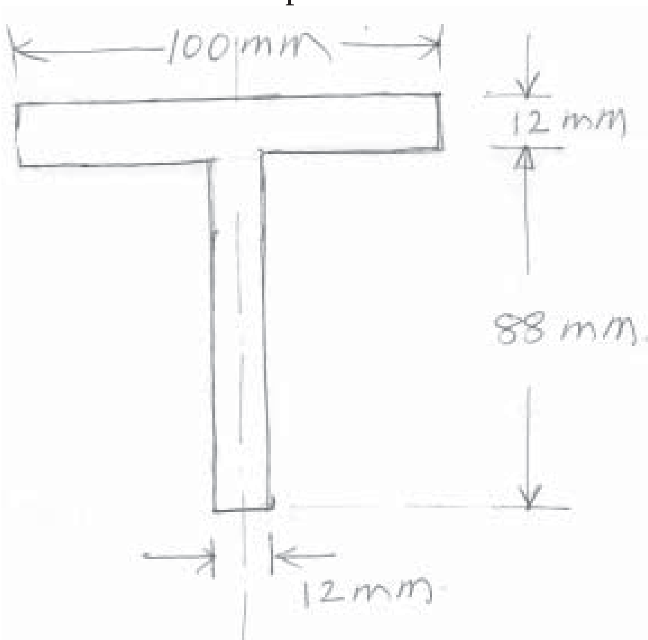


Fig. 4

b) Derive the following relation for bending :

$$\frac{\sigma}{Y}=\frac{M}{I}=\frac{E}{R}\,. \qquad \textbf{8}$$

5. a) State the theorems of "Moment Area Method". **4**

b) Give relations between "Actual Beam" and corresponding "conjugate beam" for any six different conditions. **6**

c) A simply supported beam of length 4 m carries point loads of 3 kN at a distance of 1 m from each end. Using Conjugate beam method, determine,

i) the slope at each end and under each load.

ii) the deflection under each load and at the centre.

Take $E = 2\times10^5$ N/mm^2

$I = 1\times10^8$ mm^4. **8**

OR

6. a) Determine the maximum deflection in the beam, shown in following Fig. 5.
Take $E = 200$ kN/mm^2
$I = 4.79\times10^8$ mm^4.
Use Macaulay's method **12**

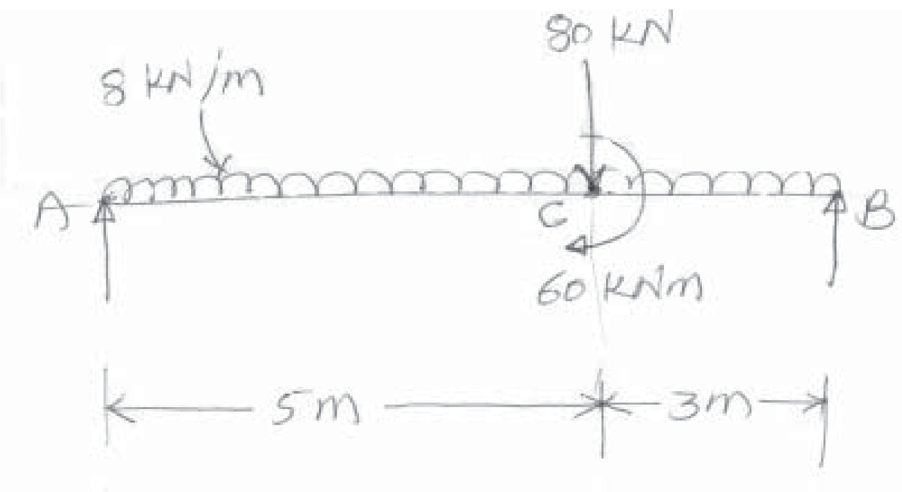


Fig. 5

b) Show that for a simply supported beam of length 'l' subjected to a central concentrated load 'W', deflection at mid-span is given by

$$Y = \frac{Wl^3}{48\ EI}$$

Use double Integration method. **6**

SECTION – II

7. a) A rod 12.5 mm in diameter is stretched by 3.20 mm under a steady load of 10,000 N. What stress would be produced in the bar by a weight (impact) of 700 N falling through 75 mm before commencing to stretch the rod, if it is initially unstressed ?

Take $E = 2.1 \times 10^5$ N/mm^2 **8**

b) An element in strained body is subjected to a tensile stress of 150 MPa and a shear stress of 50 MPa tending to rotate the element in an anticlockwise direction. Find.

i) the magnitude of the normal and shear stresses on a section inclined at 40° with the tensile stress.

ii) the magnitude and direction of maximum shear stress that can exist on the element. **8**

OR

8. a) A bolt is subjected to an axial pull of 8 kN and a transverse shear force of 3 kN. Determine the diameter of he bolt based on :

i) the maximum principal stress theory.

ii) the maximum shear stress theory.

iii) the maximum strain energy theory. **8**

b) A thin cylindrical shell of 2 m long has 200 mm diameter and thickness of metal 10 mm. It is completely filled with the fluid at atmospheric pressure. If an additional 25,000 m^3 fluid is pumped in, find the pressure developed and hoop stress developed. Find also the changes in diameter and length.

Take $E = 2 \times 10^5$ N/mm^2 and

$\mu = 0.3$. **8**

9. a) Prove the following relation for determining shear stresses in a circular shaft subjected to torsion :

$$\frac{\tau}{R} = \frac{G.\theta}{\ell}$$

State 4 assumptions made. **8**

b) A 1.5 m long column has a circular cross section of 50 mm diameter. One end of the column is fixed in direction and position and the other end is free. Taking a factor of safety as 3, calculate safe load using.

i) Rankine's formula

take $\sigma_c = 560\,N/mm^2$ and

$\alpha = \frac{1}{1600}$ for pinned ends.

ii) Euler's formula

Take E = $1.2\times10^5\ N/mm^2$ for CI. **8**

OR

10. a) Derive a relation for the Euler's crippling load for a column having one end fixed and other end free.

State the limitations of Euler's formula in case of slenderness ratio. **8**

b) A solid shaft of 200 mm diameter has the same cross-sectional area as that of a hollow shaft of the same material with inside diameter of 150 mm.

Find the ratio of power transmitted by the two shafts at the same speed. **8**

11. a) Explain weighted point method for selection of engineering material for particular applications. **8**

b) Define Creep. Draw a typical creep curve and explain 3 stages of the creep. **8**

c) State effect of following alloying element in alloy steel :

i) chromium

ii) manganese. **2**

OR

12. a) Explain the following terms :

i) Endurance limit

ii) Stress concentration

iii) S-N Diagram

iv) Fatigue failure. **8**

b) Select suitable material for following components with proper justification :

i) Spring

ii) Crankshaft

iii) axle

iv) Cylinder head

v) worm wheel

vi) condenser tubes. **10**

———————

S.E. (Mechanical) (Semester – I) Examination, 2011
FLUID MECHANICS
(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) **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 the following terms : **8**
   i) Compressibility
   ii) Surface tension
   iii) Viscosity
   iv) Capillarity

   b) A 50 mm diameter and 10 cm long cylindrical body slides vertically down in a 52 mm diameter cylindrical tube. The space between the cylindrical body and tube wall is filled with oil of dynamic viscosity 1.9 N-S/m^2. Determine its velocity of fall if its weight is 16 N. **6**

   c) What is fluid ? What is the difference between real and ideal fluids ? **2**

OR

2. a) A capillary tube of diameter 1.5 mm is dipped in i) water ii) mercury. Find the capillary rise for each case. Surface tension for water and mercury may be taken as 0.075 N/m and 0.52 N/m respectively. The contact angle may be taken as 0° and 130° for the two cases respectively. **8**

b) Derive continuity equation. **4**

c) Explain the concept of 'Stream tube' with sketch. **4**

3. a) Explain :

i) Center of pressure

ii) Total pressure. **4**

b) Explain in brief different pressure measuring devices. **8**

c) State and prove Hydrostatic law. **4**

OR

4. a) Explain with neat sketch the working of micro manometer. **4**

b) State and explain Pascal's law. **4**

c) Explain with neat sketch the method of determining metacentric height of floating body. **8**

5. a) Explain briefly the following heads;

i) Potential head

ii) Velocity head

iii) Datum head. **4**

b) In a vertical pipe conveying oil of sp.gr.0.8, two pressure gauges have been installed at A and B, where diameters are 16 cm and 8 cm respectively. A is 2 m above B. The pressure gauge readings have shown that pressure at B is greater than at A by 0.981 N/cm^2. Neglecting all losses calculate the flow rate. **6**

c) A 300 mm × 150 mm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 300 mm. The differential U-tube mercury manometer shows a gauge deflection of 250 mm. Calculate :

i) The discharge of oil, and

ii) The pressure difference between the entrance section and the throat section.

Take C_d = 0.98 and specific gravity of mercury as 13.6. **8**

OR

6. a) Compare Venturimeter and Orifice meter. **6**

b) A sub-marine fitted with a pitot tube moves horizontally in sea. Its axis is 12 m below the surface of water. The Pitot tube fixed in front of the sub-marine and along its axis connected to the two limbs of a U-tube containing mercury, the reading of which is found to be 200 mm. Find the speed of the sub-marine.

Take the specific-gravity of sea water = 1.025 times fresh water. **8**

c) List of forces acting on fluid mass. Explain the significance of each term. **4**

SECTION – II

7. a) Derive Hagen-Poiseuille equation for laminar flow in the circular pipes. **10**

b) What are repeating variables ? What points are important while selecting repeating variables ? **6**

OR

8. a) A masonry wall of a water tank is 0.9 m thick. At the bottom a crack of thickness 0.3 mm and 600 mm wide has developed and the crack extends to the entire thickness of the wall. If the tank contains 4 m of water above the crack and the other end of the crack is at atmosphere pressure, estimate the leakage volume per day from the crack. (Kinematics viscosity of water = 0.01 stokes). **8**

b) State and explain Buckingham's π-theorem. **4**

c) Explain dimensional homogeneity with an example. **4**

9. a) Derive an expression for the power transmission through the pipes. Find also the condition for maximum transmission of power. **6**

b) A siphon of dia. 200 mm connects two reservoirs having a difference of elevation of 20 m. The total length of siphon is 800 m and the summit is 5 m above the water level in the upper reservoir. If separation takes place at 2.8 m of water absolute. Find maximum length of siphon from upper reservoir to summit. Take friction factor = 0.016, P atm. = 10.3 m of water. **6**

c) What is Siphon ? And what are its applications ? **4**

OR

10. a) A piping system consists of three pipes arranged in series; the lengths of the pipes are 1200 m, 750 m and 600 m and diameters 750 mm, 600 mm and 450 mm respectively.

i) Transform the system to an equivalent 450 mm diameter pipe, and

ii) Determine an equivalent diameter for the pipe, 2550 m long. **6**

b) Derive Darcy weisbach equation. **6**

c) Explain major and minor losses occurred in pipe. **4**

11. a) Distinguish clearly between hydrodynamically smooth and rough boundaries. **6**

b) State the practical importance of the following boundary layer thickness :

i) Displacement thickness

ii) Momentum thickness

iii) Energy thickness. **6**

c) An aeroplane weighing 39.24 kN is flying in a horizontal direction at 360 km/h. The plane spans 15 m and has wing surface area of 35 m^2. CD = 0.03, air density = 1.22 kg/m^3.

Determine :

i) Coefficient of lift

ii) Power required to drive plane

iii) Theoretical value of boundary layer circulation. **6**

OR

12. a) What are form drag and friction drag ? Explain with example. **6**

b) Calculate the friction drag on a flat plate 15 cm wide and 45 cm long, placed longitudinally in a stream of oil of specific gravity 0.925 and kinematics 0.9 stokes; with a free stream velocity of 6 m/s. Also find 'thickness' of boundary layer' and shear stress' at the trailing edge of the plate. **8**

c) Explain 'laminar sub-layer' and its significance. **4**

———————

S.E. (Mechanical) (Sem. – I) Examination, 2011
ENGINEERING MATHEMATICS – III
(Common to Mech. S/W, Prod. & Prod. S/W; Ind. Engg. (Sem – I) Metallurgy Engg. (Sem. – II)
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *i) In Section **I**, attempt Q. No. **1 or 2,** Q. No. **3** or **4,** Q. No. **5** or **6.** In Section **II**, attempt Q. No. **7** or **8**, Q. No. **9** or **10**, Q. No. **11** or **12.***
*ii) Answers to the **two** Sections should be written in **separate** answer books.*
*iii) Figures to the **right** indicate **full** marks.*
*iv) **Neat d**iagrams must be drawn **whenever** necessary.*
*v) **Use** of non-programmable electronic pocket calculator is **allowed**.*
*vi) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Solve **any three** of the following : **12**

i) $(D^2+9)y = 4\cos\left(x+\frac{\pi}{3}\right)$

ii) $(D-4)^3 y = e^{5x} + 6^x + 7$.

iii) $(D^2 - 2D + 2)\, y = e^x \tan x$ (use method of variation of parameters).

iv) $x^2\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = \frac{\sin(\log x)}{x}$

v) $(D^2 + 3D + 2)\, y = x^3$.

b) Solve $\frac{dx}{dt} + y = \sin t,\ \frac{dy}{dt} + x = \cos t$. **5**

OR

2. a) Solve **any three** of the following : **12**

i) $(D^2 - 1)\, y = x \sin x$.

ii) $(D^2 + 6D + 9)y = \dfrac{e^{-3x}}{x^3}$

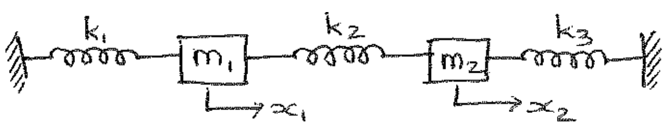
iii) $(D^2 + 1)\, y = \text{cosec } x$ (use method of variation of parameters).

iv) $(D^2 + D)y = \dfrac{1}{1+e^x}$

v) $(2x+1)^2 \dfrac{d^2y}{dx^2} - 2\,(2x+1)\dfrac{dy}{dx} - 12y = 6x$.

b) Solve $\dfrac{dx}{x^2} = \dfrac{dy}{y^2} = \dfrac{dz}{x^2y^2z^2}$. **5**

3. a) For the system shown in adjoining figure if $m_1 = 1$, $m_2 = 3$, $k_1 = 1$, $k_2 = 3$, $k_3 = 3$, assuming that there is no friction, find the natural frequencies of the system and corresponding normal modes of vibration using matrix method. **8**



b) A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form $u = a \sin \dfrac{\pi x}{l}$ from which it is released at time $t = 0$. Find the displacement $u\,(x, t)$ from one end by using wave equation $\dfrac{\partial^2 u}{\partial t^2} = c^2 . \dfrac{\partial^2 u}{\partial x^2}$. **8**

OR

4. a) Solve $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$ if

i) u (0, t) = 0,

ii) $u_x(l, t) = 0$,

iii) u (x, t) is bounded and

iv) $u(x, 0) = \frac{2x}{l}$ for $0 \le x \le l$. **8**

b) Solve the equation $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$

with conditions

i) v = 0 when $y \to \infty$ for all x.

ii) v = 0 when x = 0 for all y.

iii) v = 0 when x = 1 for all y.

iv) v = x (1 – x) when y = 0 for 0 < x < 1. **8**

5. a) Find the Fourier integral representation of the function $f(x) = \begin{cases} 1, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$

and hence evaluate $\int_0^\infty \frac{\sin\lambda \cos\lambda x}{\lambda} d\lambda$. **6**

b) Find the Laplace transform of the following **(any two)** **6**

i) $f(t) = te^{3t} \sin 2t$

ii) $f(t) = \int_0^t \frac{\cos 6t - \cos 4t}{t} dt$

iii) $f(t) = e^{-t}\int_0^t e^t \cosh t \, dt$

c) Using Laplace transform solve the differential equation

$$\frac{d^2y}{dt^2} - 3\frac{dy}{dx} + 2y = 12e^{-2t}, y(0) = 2, y'(0) = 6.$$ **5**

OR

6. a) Using Fourier integral representation, show that

$$\int_0^{\infty} \frac{1-\cos\pi\lambda}{\lambda} \sin\lambda x d\lambda = \begin{cases} \pi/2, & 0 < x < \pi \\ 0, & x > \pi \end{cases}$$ **6**

b) Find the inverse Laplace transform of the following **(any two)** :

i) $F(s) = \log\left(\frac{s^2+1}{s^2+4}\right)$

ii) $F(s) = \frac{s+2}{(s^2+4s+5)^2}$

iii) $F(s) = \frac{2s^2-6s+5}{s^3-6s^2+11s-6}$. **6**

c) Find f (x) if $F_s(\lambda) = e^{-\lambda} - e^{-2\lambda}, \lambda > 0$. **5**

SECTION – II

7. a) The first four moments about the working mean 3.5 of a distribution are 0.0375, 0.4546, 0.0609 and 0.5074. Find the first four central moments, coefficient of skewness and kurtosis. **5**

b) A is one of the eight horses entered for a race and is to be ridden by one of the two jockeys B and C.

The chances of B riding A to that C riding A are 3:2. If B rides A all horses have equal chances of winning race whereas if C rides A, the chances of winning A are double than that of others.

i) Find the probability that A wins

ii) What are the adds against A's winning ? **4**

c) Obtain the lines of regression for the following data **7**

x	1	2	3	4	6
y	0.2	0	0.6	0.8	1.1

OR

8. a) Obtain the correlation coefficient for the following data **6**

x	2	4	6	7	11
y	10	8	7	9	6

b) On an average a box containing 10 articles is likely to have 2 defectives. If we consider a consignment of 100 boxes how many of them are expected to have three or less defectives ? **5**

c) 5000 candidates appeared in a certain paper carrying a maximum of 100 marks. It was found that marks were normally distributed with mean 39.5 and standard deviation 12.5. Determine approximately the no. of candidates who secured minimum 60 marks.

Given Area corresponding to $z = 1.64$ is 0.4495. **5**

9. a) Find the magnitude of tangential and normal components of acceleration for a particle moving along the curve $x = t^2 + 1$, $y = 4t - 3$, $z = 2t^2 - 6t$ at $t = 2$. **6**

b) Find the directional derivative of $xy^2 + yz^3$ at $(1, 2, -1)$ along a line joining $(1, 1, 1)$ to $(2, 3, 0)$. **5**

c) Prove the following **(any two)** :

i) $\nabla \cdot \left[r \nabla \left(\frac{1}{r^n} \right) \right] = \frac{n(n-2)}{r^{n+1}}$

ii) $\nabla \times \frac{(\bar{a} \times \bar{r})}{r^5} = \frac{-3\bar{a}}{r^5} + 5 \frac{(\bar{a} \cdot \bar{r})\,\bar{r}}{r^7}$

iii) $\nabla \cdot \left(\frac{\bar{a} \times \bar{r}}{r^5} \right) = 0$ **6**

OR

10\. a) Show that the vector field $\bar{F}$ given by

$$\bar{F} = (y^3 \cos x + e^z) i + (3y^2 \sin x + z)\bar{j} + (xe^z + y)\bar{k}$$

is irrotational and find scalar function ϕ such that $\bar{F} = \nabla \phi$ **6**

b) Prove that

$$\nabla^4 (r^2 \log r) = 6/r^2$$ **5**

c) If $\bar{r} \times \frac{d\bar{r}}{dt} = 0$, show that $\bar{r}$ has constant direction. **6**

11\. a) Find the work done by a force

$\bar{F} = (x^2 - yz) i + (y^2 - xz)\bar{j} + (z^2 - xy)\bar{k}$ in taking a particle along a straight line joining point (1, 1, 1) to (3, – 5, 7). **5**

b) Evaluate $\iint_S (x^3 i + y^3 j + z^3 k).d\bar{s}$ where s is the surface of the sphere $x^2 + y^2 + z^2 = 1$. **6**

c) Verify Green's theorem for the force field $\bar{F} = x^2 i + xy\bar{j}$ over the region R enclosed by $y = x^2$ and $y = x$. **6**

OR

12. a) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ where

$\bar{F} = (y^2 \cos x + z^3)\, i + (2y \sin x - 4) j + (3xz^2 + 2) k$ and C is a straight line segment joining the points (0, 1, –1) and $\left(\frac{\pi}{2}, -1, 2\right)$ **5**

b) Evaluate $\iint_S \left(\nabla \times \bar{F}\right) \cdot \hat{n} ds$

where S is the curved surface of a paraboloid $x^2 + y^2 = 2z$ bounded by the plane z = 2 and $\bar{F} = 3(x - y)\bar{i} + 2xz\bar{j} + xy\bar{k}$ **6**

c) Evaluate $\iint_S \bar{F} \cdot d\bar{s}$

where $\bar{F} = (x + y^2)\, i + y\bar{j} - 2xz\bar{k}$ and S is the surface bounded by the planes x = 0, y = 0, z = 0 and x+y+z =1. **6**

———————

B/I/11/1,155

[3962] – 266

S.E. (Mechanical) (Semester – II) Examination, 2011
THEORY OF MACHINES AND MECHANISMS – I
(2003 Course)

Time : 4 Hours Max. Marks : 100

SECTION – I

1. a) Explain with neat sketches the various types of kinematic links. **6**

   b) Define kinematic pair and discuss various types of kinematic pairs with examples. **10**

OR

2. a) Define inversion of a kinematic chain ? Discuss various types of inversions of a double slider crank chain. **8**

   b) Determine the degree of freedom of the mechanisms shown in Fig. 1 **8**

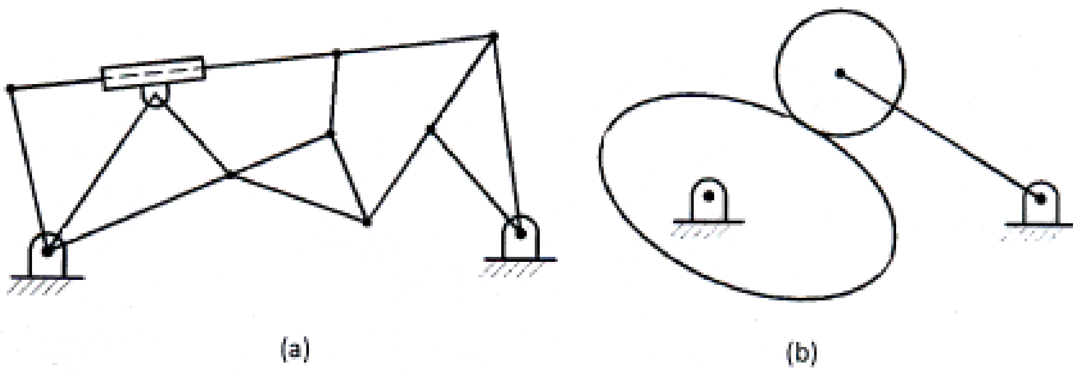


Fig 1

3. a) Draw a neat sketch and explain working of a Ratchet and Escapement Mechanism. **6**

   b) Differentiate between Davis Steering Gear Mechanism and Ackermann steering gear mechanism. **6**

   c) Draw a neat sketch and explain working of a Geneva mechanism. **4**

OR

4. a) Draw a neat sketch and explain working of any one exact straight line generating mechanism. **6**

   b) The driving shaft rotates at a speed of 240 rpm and connects the driven shaft by a Hooke's joint inclined at an angle of 30°. The driven shaft carries a steady load of 8 kW. It also carries a flywheel of radius of gyration of 0.2 m. Find the mass of the flywheel if the input torque is not to exceed 200 Nm at an angle of rotation of 45°of driving shaft. **10**

P.T.O.

5. a) State and explain “Three centers in line” theorem. **4**

b) Fig. 2 shows the mechanism in which the length of various links are as follows : OP = 15 cm, PQ = 30 cm, QR = 22.5 cm and QS = 50 cm. Find the velocity of slider ‘S’ and angular velocity of links QR and QS when the crank OP is rotating uniformly with a speed of 240 rpm in counter-clockwise direction by instantaneous centre method. **14**

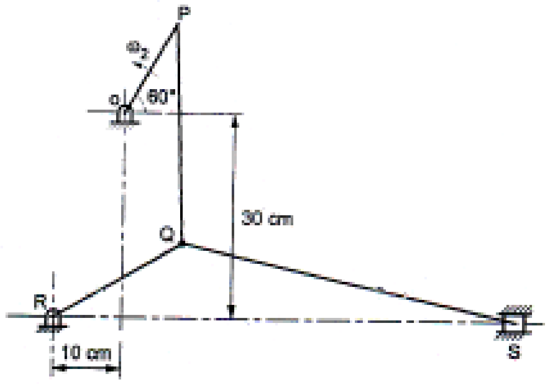


Fig. 2

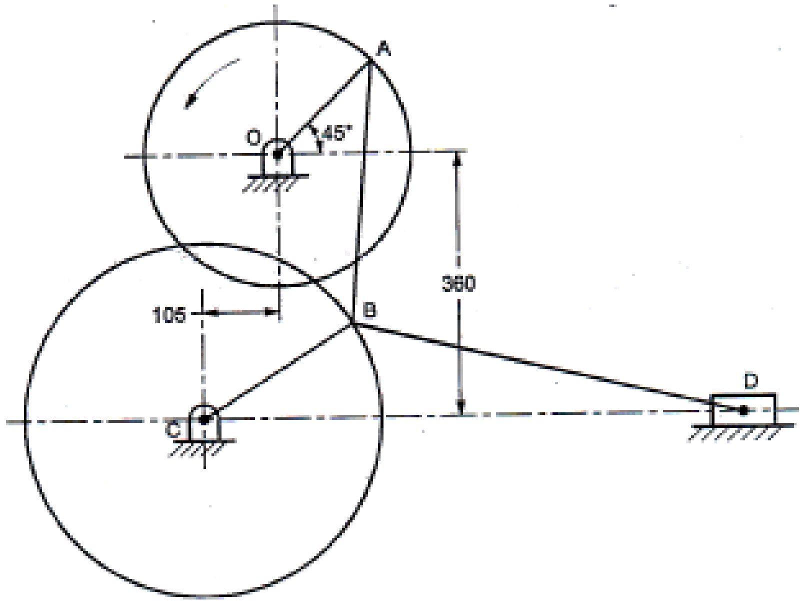
OR

6. a) State and explain Kennedy’s theorem. **4**

b) Discuss various types of instantaneous centre with the help of example. **6**

c) In the toggle mechanism, shown in Fig. 3, the slider D is constrained to move on a horizontal path. The crank OA is rotating at 180 rpm counter-clockwise. Various dimensions are : OA = 180 mm, CB = 240 mm, AB = 360 mm, BD = 540 mm. For the given configuration, find :

i) Velocity of slider D ii) Angular velocity of links AB, CB and BD. **8**



(All dimensions are in mm)

Fig. 3

SECTION – II

7. a) Explain the vector algebra method a velocity and acceleration analysis of a slider crank mechanism. **6**

b) The stroke of a steam engine is 15 cm and the connecting rod is 30 cm in length. The crank has made 45° measured from i.d.c. position and rotates at 600 r.p.m. Also determine the angular velocity and angular acceleration of connecting rod. Determine the velocity and acceleration of the piston by

1) Analytical method and 2) Klein's construction. **10**

OR

8. a) Derive the loop closure equation for slider crank mechanism. **4**

b) The cylinder of rotary engine rotate at uniform speed of 900 rpm clockwise about the lower end B of a fixed vertical crank AB 10 cm long. The connecting rod AP 40 cm rotates about the upper end. The piston P reciprocates in cylinder. Determine the angular acceleration of the connecting rod for a cylinder which has turned through an angle of 45° past the dead center position as shown in Fig. 4. **12**

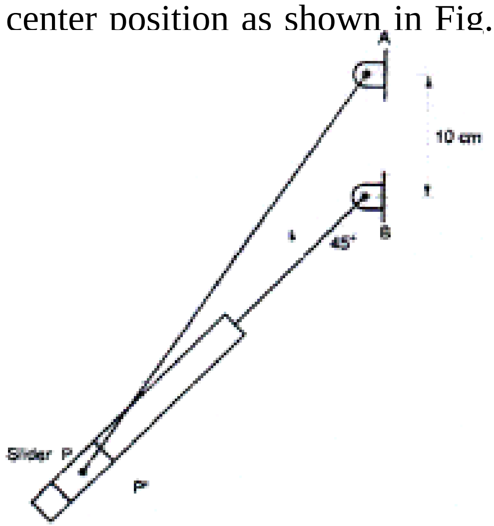


Fig. 4

9. a) Write a short note on D' Alembert's principle. **4**

b) Write a short note on : Bifilar suspension method. **4**

c) The connecting rod of an engine has length equal to 200 mm between centres and has mass equal to 3.5 kg. Its CG is at 80 mm from the big end center and the radius of gyration about an axis through CG is 100 mm. Determine :

i) The two mass dynamically equivalent system when one mass is placed at the small end.

ii) The correction couple if two masses are placed at the two ends and angular acceleration of connecting rod is 100 rad/s^2 clockwise. **8**

OR

10. a) Explain inertia of geared system. **6**

b) In IC engine mechanism, the crank length is 40 cm and connecting rod length is 95 cm. Piston diameter is 10 cm and net gas pressure acting is 15 N/. Find :

i) Thrust on connecting rod.

ii) Piston side thrust.

iii) Torque acting on crankshaft.

iv) Radial load on main bearings when crank is at from TDC. **10**

11. a) Explain Graphical synthesis of two position slider crank mechanism. **6**

b) A four bar mechanism is to be synthesized by using three precision points, to generate the function y = 3x + 3, for the range $0 \le x \le 4$. Assuming 30° starting position and 150° finishing position for input link and 40° starting position and 120° finishing position for the output link, find out values of x, y, θ (input angles) and ϕ (output angles) corresponding to the three precision points. **12**

OR

12. a) Explain the following terms :

i) Type synthesis

ii) Number synthesis

iii) Dimensional synthesis. **6**

b) Synthesize a four bar mechanism with input link 'a', coupler link 'b', output link 'c' and grounded link 'd'. Angles θ and ϕ for three successive positions are given in the table below :

	1	**2**	**3**
$\boldsymbol{\theta}$	20°	35°	50°
$\boldsymbol{\phi}$	35°	45°	60°

If the length of grounded link is 40 mm, using Freudenstein's equation find out other link lengths to satisfy the given positional conditions. Draw the synthesized mechanism in its second position. **12**

[3962] – 267

S.E. (Mech.) (Semester – II) Examination, 2011
I.C. ENGINES AND AUTOMOBILE 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 **righ**t 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) Explain with suitable sketches the working of two stroke engine. **8**
   b) Explain how actual cycle deviates from theoretical cycles. **4**
   c) What are the assumptions made in the analysis of fuel air cycle ? **4**

OR

2. a) Draw a neat sketch of a four stroke S.I. Engine, label the parts and explain their functions. **10**
   b) A Diesel engine has a compression ratio of 20 and cat. off takes place at 5% of stroke. Find air standard efficiency. **6**

Unit – 2

3. a) What are the basic elements of C.I. Engine fuel injection system ? Explain their functions with schematic diagram. **9**
   b) What are the functions of carburettor ? Explain any one type of carburettor with the help of neat sketch. **9**

OR

P.T.O.

4. a) What is petrol injection ? What are its advantages over carburettor engine ? **6**

b) List the types of fuel injectors and explain with a neat sketch working of any one type of fuel injector. **8**

c) What are the air fuel ratio requirements of petrol engine under different loading conditions ? **4**

Unit – 3

5. a) What are the various components to be lubricated in I.C. Engine ? and explain how it is accomplished. **6**

b) What are the harmful effects of overheating of I.C. Engines ? **4**

c) Why is governing of I.C. Engines required ? Enlist the methods used for governing of I.C. engines. **6**

OR

6. a) Explain pressure lubrication system. **6**

b) Why is spark advance required ? Explain any one spark advance mechanism with sketch. **6**

c) Differentiate between evaporative cooling and forced circulation cooling. **4**

SECTION – II

Unit – 4

7. a) What are the various methods of measuring indicated power ? Briefly compare their relative accuracy. Explain any one method in detail. **8**

b) A four stroke four cylinder S.I. Engine has a compression ratio of 8 and bore of 100 mm with stroke equal to bore. The volumetric efficiency of each cylinder is equal to 75%. The engine operates at a speed of 4800 rpm with an air fuel ratio 15. Given that the calorific value of fuel 42 MJ/kg. density of atmospheric air 1.12 kg/m^3, mean effective pressure in the cylinder is 10 bar and mechanical efficiency of engine 80%, determine indicated thermal efficiency of the brake power. **10**

OR

8. a) Explain the factors that limits the extent of supercharging in S.I. and C.I. engine. **8**

b) In a trial on a single cylinder oil engine working on duel cycle, the following observations were made

Compression ratio = 15

Oil consumption = 10.2 kg/h

Calorific value of fuel = 43890 kJ/kg

Air consumption = 3.8 kg/min

Speed = 1900 rpm

Torque on brake drum = 186 N-m

Quantity of cooling water used = 15.5 kg/min

Temperature rise = 36°C

Exhaust gas temperature = 410°C

Room temperature = 20°C

Specific heat of exhaust gas = 1.17 kJ/kg K

Calculate brake power, brake specific fuel consumption, brake thermal efficiency and heat balance sheet per minute basis. **10**

Unit – 5

9. a) Draw the schematic sketch and mention merits and demerits of the following type of combustion chambers in I.C. Engines.

i) Hemispherical combustion chamber in S.I. engine

ii) M. Combustion chamber in C.I. Engine. **10**

b) What is diesel knock ? How dose knocking in a diesel engine differ from detonation in petrol engine ? **6**

OR

10. a) What are the requirements of good combustion chambers used in S.I. Engine and C.I. Engines ? **5**

b) Discuss the effect of the following engine variables on flame propagation

i) Air fuel ratio

ii) Compression ratio

iii) Load

iv) Speed. **6**

c) What is meant by ignition delay in diesel combustion ? Discuss the variables affecting delay period. **5**

Unit – 6

11. a) Discuss in brief the various design and operating parameters responsible for formation of

i) Carbon monoxide

ii) Hydrocarbons

iii) Oxides of nitrogen in petrol and diesel engine. **6**

b) Write short note on : **10**

i) Hybrid vehicle

ii) Engine selection (for any application).

OR

12. a) What is smoke ? What are the bad effects of smoke on human health and how smoke in diesel engine can be controlled ? **6**

b) Discuss briefly the following with regard to S.I. Engines :

i) Crank case emission

ii) Evaporative emission

iii) Exhaust emission. **10**

S.E. (Mechanical) (Semester – II) Examination, 2011
METALLURGY (2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Represent the following planes and directions in the cubic system :

   i) $(\bar{1}00)$ ii) (111) iii) (220)

   iv) (010) v) [110] vi) [001] **6**

   b) What are the types of line imperfection in a crystal ? What is their effect on plastic deformation of crystal ? **6**

   c) Differentiate between hot working and cold working. **4**

OR

2. a) A face centered cubic single crystal yields under a normal stress of 2.15 MPa. If the cosine of angle (ϕ) between the direction of force and normal to slip plane is 0.617 and the cosine of angle (θ) between direction of force and slip direction is 0.756, determine critical resolved shear stress for this crystal. **6**

   b) Explain with the help of neat figure the effect of coldworking and annealing on properties and microstructure of metals and alloys. **6**

   c) Differentiate between slip and twinning. **4**

3. a) A metal bar is subjected to tensile test. The initial diameter and guage length were 12.3 mm and 62 mm respectively. The load at yield point was 66 kN, the maximum load observed 82.8 kN and breaking load was 58 kN. The diameter of bar was 9.06 mm at the fracture surface and final gauge length was 74 mm. Determine :

   i) Yield stress ii) Ultimate tensile stress

   iii) Breaking stress iv) % Elongation

   v) % reduction in area of cross section. **6**

b) i) Draw a creep curve clearly showing various stages of creep. Also draw figures illustrating effect of stress and temperature on the creep curve. **3**

ii) What is notch sensitivity ? Why notches are provided on impact test pieces ? **3**

c) Distinguish between ultrasonic and eddy current test. **4**

OR

4. a) i) Define **any three** of the following :

1) Elastic limit
2) Proof stress
3) Resilience
4) Stiffness. **3**

ii) What are the advantages and limitations of Vicker's hardness test ? **3**

b) i) What are the various methods of improving fatigue life of a component ? **3**

ii) Explain the principle of radiographic test. **3**

c) Distinguish between magnetic particle test and Dye penetrant test. **4**

5. a) Define and explain the following terms :

i) Ferrite ii) Austenite iii) Cementite. **6**

b) Draw well labelled microstructures of **any 2** :

i) 0.2% Carbon steel

ii) 0.8% Carbon steel

iii) 1.2% Carbon steel. **6**

c) How are steels classified ? What is the importance of deoxidation of steel ? **6**

OR

6. a) Define and explain the following terms :

i) Allotropy

ii) Critical temperature

iii) Eutectoid reaction. **6**

b) What are the factors that differentiate ferritic, austenitic and martensitic stainless steel from each other ? Explain. **6**

c) Give one application each of the following :

i) Mild steel ii) C40

iii) AISI 1080 iv) AISI 304 (SS304)

v) XT75W18Cr4V1 vi) Invar. **6**

SECTION – II

7. A) What are transformation products of austenite ? Explain each type of transformation and comment about the mechanical properties of these product phases. **6**

B) Write notes on 'Induction hardening' and 'Flame hardening'. Explain how these heat treatments are different from other case hardening treatments. **6**

C) Explain the term 'hardenability' of steels. State the factors that affect the hardenability. **4**

OR

8. A) Draw Time-Temperature-Transformation curve for eutectoid steel. Explain the method of plotting this curve. **6**

B) Describe liquid and gas carburising treatments. **6**

C) With neat sketch explain Jominy Hardenability Test. **4**

9. A) Explain characteristic properties, microstructures and applications of grey cast irons. What are 'A' and 'B' type of flakes in grey cast iron ? **6**

B) Enlist requirements from materials for becoming bearing material. Which are commonly used bearing materials ? **6**

C) Write a note on 'Alloy cast irons'. **4**

OR

10. A) Compare white cast iron, grey cast iron, nodular cast iron and malleable cast iron on the basis of microstructure, properties and applications. **8**

B) Give composition, properties and typical applications of following non-ferrous alloys (ANY 4) :

i) Hastealloy ii) Duralumin iii) Gilding metal

iv) LM-6 v) Muntz metal vi) Cartridge brass. **8**

11. A) Enlist the methods for production of powders for powder metallurgical components. Explain any two of these methods in detail. **6**

B) What are merits of powder metallurgy as a manufacturing process ? Explain the manufacturing method of self lubricated bearing. **6**

C) Explain construction, principle and working of thermoelectric pyrometer. **6**

OR

12. Write short notes on the following **(any 6)** :

a) Cemented carbides

b) Resistance pyrometer

c) Compaction and sintering

d) Limitations of powder metallurgy

e) Total radiation pyrometer

f) Tempil sticks and seger cones

g) Oil impregnated bearings

h) Disappearing filament pyrometer. **18**

[3962] – 272

S.E. (Mechanical S/W) (Semester – I) Examination, 2011
THERMAL ENGINEERING – I
(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) With neat sketch, explain orsat apparatus. **8**

b) Obtain an expression for finding theoretical air required for complete combustion of 1 Kg of solid fuel. **6**

c) What do you mean by
i) Gravimetric analysis
ii) Volumetric analysis. **4**

OR

2. a) Explain :
i) Flash point
ii) Pour point
iii) Fire point. **6**

b) Write a short note on -Alternative fuels for I.C. engine. **6**

c) Explain -Bomb calorimeter with a neat sketch. **6**

P.T.O.

Unit –II

3. a) Explain how will you determine dryness fraction of steam with the help of separting and throttling calorimeter ? **6**

b) 1 kg of steam at initial condition of 6 bar and 0.2 dry is heated at constant volume until the pressure is 20 bar. Determine final state of steam, heat added, change of energy, change of entropy. **10**

OR

4. a) Compare Carnot and Rankine cycle. **4**

b) Define :

i) Work Ratio ii) Specific steam consumption. **4**

c) Steam power plant operates on Rankine cycle. Turbine receives steam from boiler at 30 bar and 250°C and is exhausted into a condenser at 0.5 bar. Condensate is returned back to boiler by a feed pump.

Calculate :

i) Work done

ii) SSC

iii) Dryness fraction of steam entering the condenses

iv) Rankine cycle efficiency. **8**

Unit – III

5. a) State the advantages of high pressure boilers. **5**

b) Write a short note on - Boiler Draught. **5**

c) Explain with a neat sketch, construction and working of superheater. **6**

OR

6. a) With a neat sketch, explain feed check valve. **6**

b) The following data refers to a boiler trial :

Duration of trial = 8 hrs

Pressure of steam = 14 bar

Dryness fraction = 0.973

Feed water evaporated = 26,700 kg

Temp. of water at inlet = 50°C

Coal used = 4260 kg

C.V. of coal = 28,900 kJ/kg

Air used = 17 kg/kg of coal

Temp. of flue gas = 344°C

Boiler room temp. = 21°C

Cp of flue gas = 1.1 kJ/kgk

Determine :

i) Boiler efficiency

ii) Equivalent of evaporation

iii) Heat lost to the flue gases in kJ/kg and in percentage. **10**

SECTION – II

Unit – IV

7. a) Explain :

i) Heat engine ii) Heat pump. **4**

b) State the limitations of first law of thermodynamics. **4**

c) Explain the principle of increase in entropy. **4**

d) Write a short note on -Clausius inequality. **4**

OR

8. a) A heat pump is used to maintain an auditorium hall at 25°C, when the atm. temp is 10°C. The heat leaks from the hall is 1500 kJ/min. Calculate the pawer required to run the actual heat pump. If the cop of the actual heat pump is 30% of the cop of carnot heat pump working between the same temp. limits. **6**

b) Explain :

i) Dead state

ii) Availability. **4**

c) A temp of 2000°C is obtained in a furnace by burning fuel in air at atm pressure and ambient temp of 27°C. The grass can be assumed to be perfect gas with Cp = 1.0 kJ/kgk. Determine availability of heat in the products of combination. **6**

Unit – V

9. a) State the assumptions in the analysis of air standard cycle. **4**

b) Compare Otto and Diesel cycle. **4**

c) Derive an expression for air standard efficiency of diesel cycle. **8**

OR

10. a) In an air standard diesel cycle, compression begins at 103 KPa and 300 k. After compression heat addition of 545 kJ/kg of air, the peak pressure reached is 4.7 MPa. Calculate :

i) Fuel cut-off ratio

ii) Compression ratio

iii) Max. temp in the cycle

iv) ASE

Assume Cp = 1.004 kJ/kgk. **8**

b) Show that air standard efficiency of otto cycle depends upon the compression ratio. **8**

Unit – VI

11. a) Explain Battery ignition system. **6**

b) How I.C. engines are classified ? **6**

c) Write a short note on Morse test. **6**

OR

12. a) Calculate bore and stroke of a 4 stroke petrol engine for the following data :

Compression ratio = 6

BP = 73.5 kW

Speed = 400 rpm

BMEP = 8.5 bar

Mechanical efficiency = 80%

BSFC = 0.346 kg/kW.h

C.V of fuel = 44100 kJ/kg

Assume, bore = stroke

Also calculate indicated and brake thermal efficiencies, air standard efficiency, relative efficiency and IMEP. **12**

b) Write a short note on- governing of I.C. engine. **6**

S.E. (Mech. S/W) Examination, 2011
PRODUCTION METALLURGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: i) Answer **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**.*
*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 Logarithmic tables, slide rule, scientific electronic calculator is **allowed**.*
*vi) Assume suitable data **if** necessary, state clearly the assumptions you have made.*

SECTION – I

1. a) Comment on the following properties of ceramics :
   i) Fracture toughness
   ii) Machinability
   iii) Modulus of elasticity
   iv) Thermal conductivity
   v) Creep resistance
   vi) Coefficient of thermal expansion. **6**

   b) Give classification of composite material **6**

   c) Give two applications of shape memory alloys. **4**

OR

2. a) What are the various methods of manufacturing a composite component ? How can hollow tubular components manufactured ? **6**

   b) Explain with neat sketch the blow moulding process of manufacturing polymer components. **6**

   c) Give two advantages and two limitations of glass fibers used in the making of composites. **4**

3. a) Explain how fatigue test data is presented (S-N curves) ? Suggest methods of improving fatigue resistance of metals. **6**

b) Explain the following ultrasonic inspection techniques :

i) Pulse echo method

ii) Through transmission method

iii) Angle beam technique. **6**

c) Differentiate between hot working and cold working. **4**

OR

4. a) What is notch sensitivity ? Explain the significance of a notch in the specimen of Charpy impact test. **6**

b) What is the importance of P/D^2 ratio in Brinell hardness test ? What are the limitation of Brinell hardness test method ? **6**

c) Give the advantages and applications of magnetic particle test. **4**

5. a) How are steels classified on the basis of de-oxidation, amount of carbon and alloying elements other than carbon ? **6**

b) What is heat affected zone ? Explain weld decay and suggest methods to avoid weld decay. **6**

c) How are nodular cast irons manufactured ? How are they designated ? **6**

OR

6. a) State one application each of the following steels :

i) Austenitic stainless steel

ii) EN 31

iii) Low carbon steel

iv) Medium carbon steel

v) High carbon steel

vi) X75W18CrV1 **6**

b) What is the effect of following alloying elements on the properties of steel ?

i) Carbon

ii) Chromium

iii) Nickel **6**

c) Explain the effect of silicon and cooling rate on the structure and properties of cast iron. **6**

SECTION – II

7. a) What is critical temperature ? What are the various critical temperature lines found in iron-iron carbide equilibrium diagram ? What are the changes that occur at these lines ? **6**

b) Why tempering is necessary immediately after hardening ? What are the effects of tempering on the microstructure of hardened steel ? **6**

c) What are quench cracks ? How can they be prevented ? **4**

OR

8. a) Draw a neat and well labeled TTT curve for eutectoid steel and superimpose CCR representing following heat treatments on the diagram

i) Martempering

ii) Austempering

iii) Annealing. **6**

b) What is retained Austenite ? How is it eliminated ? **6**

c) Differentiate between annealing and normalizing. **4**

9. a) Explain the surface preparation processes necessary before electroplating of components. **6**

b) Why is case carburizing done ? Is a heat treatment after carburizing necessary ? **6**

c) Differentiate between Nitriding and carburizing. **4**

OR

10. a) Explain with neat figure the ion implantation method. **6**

b) What is chemical vapour deposition ? What are its advantages and limitations ? **6**

c) Differentiate between Flame hardening and Induction hardening. **4**

11. a) Suggest suitable material for the following (**any six**) : **6**

i) Heat exchanger tubing

ii) Cartridge case

iii) Contact switch for two wheeler horns

iv) Flexible bellows

v) Brazing rod

vi) Non-sparking tool

vii) Gate valve body.

b) What are Babbits ? Why copper addition is necessary in Tin based Babbits ? **6**

c) Explain the classification of Aluminium alloys. What are the applications of pure Aluminium ? **6**

OR

12. Write short notes on **any three** : **18**

a) Age hardening

b) Bearing materials

c) Effect of zinc on copper alloys

d) Modification of Aluminium alloys

e) Applications of copper and copper alloys.

———————————

[3962] – 274

S.E. Mechnical S/W (Semester – I) Examination, 2011
PRODUCTION ENGINEERING – I (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer 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) What is pattern ? Describe different allowances provided on pattern in short. **8**

b) Explain the following with neat sketch :
i) Sand Slingers ii) Split Pattern. **6**

c) What do you understand from the term "Gating System" ? What are the main requirements expected of an ideal gating system ? **4**

OR

2. a) Describe the Shell Moulding process with neat sketch. Also state its advantages, limitations and applications. **8**

b) Explain in short following characteristics of moulding sand in short
i) Refractoriness ii) Permeability. **6**

c) Compare permanent mould casting method to sand casting. **4**

P.T.O.

Unit No. 02

3. a) Describe the process of cold spinning with sketch stating its advantages and specific uses. **8**

b) Explain the following press operation in short;

i) Notching

ii) Shaving

iii) Trimming

iv) Blanking. **8**

OR

4. a) Explain with neat sketches the following forging operations :

i) Upsetting

ii) Drawing Out

iii) Fullering

iv) Bending. **8**

b) How a press size is designated ? What are the factors that influence the press size ? **4**

c) What are common forging defects ? State their causes. **4**

Unit No. 03

5. a) Explain 'Thermit Welding' with neat sketch. What are its main advantages ? **8**

b) Differentiate between soldering and brazing. **4**

c) State different types of adhesives and state their advantages and limitations. **4**

OR

6. a) Describe with figure the process of submerged arc welding stating its advantages and limitations. **8**

b) Describe with figure the plasma welding, stating its advantages and disadvantages. **8**

SECTION – II

Unit No. 04

7. a) List out various taper turning methods on lathe and explain the taper turning attachment with sketch. **8**

b) Sketch and explain the construction and working of 'Lathe Tailstock'. **8**

OR

8. a) Why are back gears used ? Describe in detail with sketch the method of using them. **8**

b) State the functions of the following in lathe

i) Half centres ii) Follower rest

iii) Chasing dial iv) Mandrel. **8**

Unit No. 05

9. a) Classify the drills used in drilling machine. Write the advantages of using spiral flutes drill instead of straight flutes. **8**

b) What are the different operations that can be performed on drilling machine ? Explain with the help of neat sketch. **6**

c) Distinguish between Up milling and Down milling process. **4**

OR

10. a) Index 69 divisions by compound indexing method.

The hole circle available are

Plate I 15, 16, 17, 18, 19, 20

Plate II 21, 23, 27, 29, 31, 33

Plate III 37, 39, 41, 43, 47, 49 **6**

b) Explain drill spindle assembly with neat sketch. **8**

c) Sketch and describe in short following milling cutter. **4**

i) Plain milling cutter

ii) End mill.

Unit No. 06

11. a) State different types of bonds used in the manufacture of abrasive wheel. Describe any one in detail stating its advantages and disadvantages. **8**

b) What is centreless grinding ? Draw a working setup of centreless external grinding process and explain in short. **8**

OR

12. a) Explain with neat sketch the mounting of grinding wheel. **8**

b) What is super finishing ? How does it differ from lapping and honing ? **4**

c) Why 'trueing and dressing' are necessary in grinding wheel ? **4**

B/I/11/130

[3962] – 275

S.E. (Mechanical S/W) (Semester – II) Examination, 2011
FLUID MECHANICS AND MACHINERY
(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) **All** questions are **compulsory**.*

SECTION – I

1. a) Define the following fluid properties
   1) Specific weight
   2) Dynamic viscosity
   3) Surface tension
   4) Specific gravity
   5) Bulk modulus of elasticity. **10**

   b) State and explain Newton's law of viscosity and what is Newtonian and non-Newtonian fluid. **8**

OR

2. a) Define : **8**
   1) Surface tension
   2) Capillarity
   3) Vapour pressure
   4) Elasticity.

   b) Prove that the pressure intensity at a point in a stationary liquid varies directly as the depth of the point below free surface. **10**

P.T.O.

3. a) Define centre of pressure and total pressure. **6**

b) Prove that the centre of pressure of a plane surface is always below the centre of gravity. What is the limiting position of the centre of pressure and when does it occur ? **10**

OR

4. a) From first principles, derive formula for total pressure on a plane surface submerged in the liquid. Also find relation for the point of application of total pressure. **10**

b) What is pressure diagram ? What are uses and limitations ? **6**

5. a) Define :

i) Path line ii) Stream line

iii) Stream tube iv) Streak line

v) Unsteady flow vi) Mean velocity. **6**

b) Derive continuity equation **10**

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0$$

OR

6. a) Prove that potential flow is also irrotational flow. **6**

b) Derive continuity equation in one dimensional flow. **10**

SECTION – II

7. a) Describe Reynold's experiment and state the significance of Reynold's number. **10**

b) Differentiate between major and minor energy losses and write expression for computing them. **6**

OR

8. a) Define Buoyancy and centre of Buoyancy. **6**

b) A wooden block of relative density 0.7 has width 15 cm, depth 30 cm and length 150 cm it floats horizontally on the surface of sea water (density 1000 kg/m^3) calculate the volume of water displaced, depth of immersion and the position of centre of buoyancy find meta centric height. **10**

9. a) Derive impulse-momentum equation. **6**

b) Explain :

1) Specific speed of turbine
2) Unit speed, unit discharge, unit power of turbine
3) Cavitation in turbines. **10**

OR

10. a) Classify turbines. **4**

b) What is impulse momentum principle ? Derive equation for force exerted by a jet on vertical moving plate. **12**

11. a) Derive expression for specific speed of centrifugal pump. **10**

b) Write short note on NPSH. **6**

OR

12. a) Show that the resistance R to the motion of sphere of diameter 'D' moving with uniform velocity V through a fluid of density ρ and viscosity μ is given by **12**

$$R = \rho V^2 D^2 \phi \left(\frac{\mu}{\rho V D} \right)$$

b) Explain geometric similarity and kinematic similarity. **4**

S.E. (Mechanical Sandwich) (Semester – II) Examination, 2011

THEORY OF MACHINE AND MACHINE DESIGN – I

(2003 Course)

Time: 4 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 electronic pocket calculator is **allowed**.*

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

SECTION – I

1. a) What is an inversion of a kinematic chain ? Explain any two inversions of single slider crank chain with practical applications. **8**

b) Write short notes on :

i) Pentograph mechanism

ii) Equivalent linkages of mechanism. **8**

OR

2. a) Differentiate between machine, mechanism and structure. **6**

b) Write a short note on elliptical trammel. **4**

c) What is the condition for correct steering ? Prove that the condition of correct steering is always satisfied in Davis steering gear mechanism. **6**

3. a) State and explain "Kennedy's Theorem" of three centres inline. **4**

b) Fig.1 shows a sewing machine needle box mechanism O_1ABO_2CD, in which different dimensions are as follows :

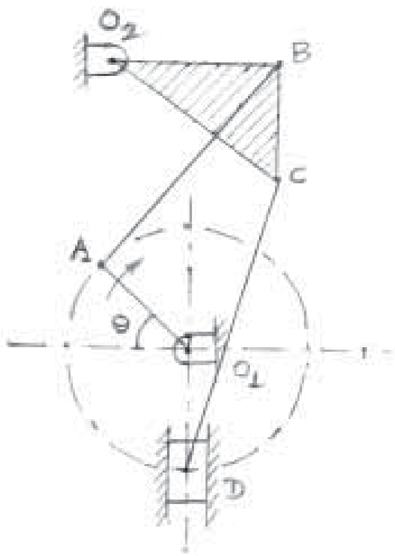


Fig.1 [For Q.3(b) and Q4(b)]

Crank O_1A = 16 mm

Crank angle with horizontal, $\angle\theta = 45°$

Vertical distance between O_1 and O_2 = 40 mm

Horizontal distance between O_1 and O_2 = 13 mm

O_2B = 13 mm

BC = 16 mm

AB = 35 mm

CD = 40 mm

$\angle O_2BC = 90°$

Slider D lies vertically below O_1, where needle is mounted, when crank O_1A rotates at 400 r.p.m., find by using relative velocity and relative acceleration method,

i) Velocity and acceleration of needle.

ii) Angular velocity and angular acceleration of link O_2BC. **12**

OR

4. a) In an I.C. engine mechanism, crank 100 mm long and connecting rod 400 mm long. The crank rotates clockwise at 10 rad/s and at a particular instant it is inclined to IDC position at 30°. Using analytical method, determine

i) Velocity of piston

ii) Acceleration of piston

iii) Angular acceleration of connecting rod. **6**

b) For the mechanism shown in Fig.1, in which crank rotates in clockwise direction at 400 rpm. By using instantaneous centre of rotation method, calculate velocity of needle, which is on slider D and angular velocity of link O_2BC. **10**

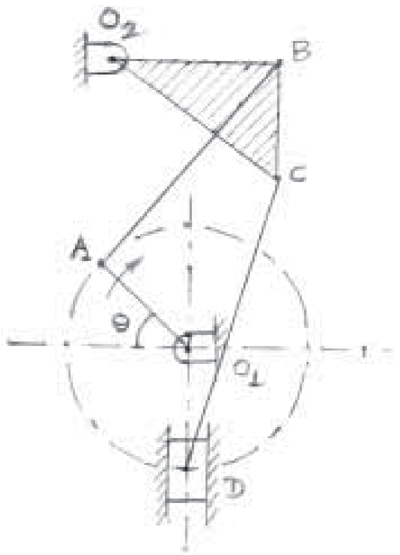


Fig.1 [For Q.3(b) and Q4(b)]

5. a) With the help of neat sketch, derive frequency equation of bifilar suspension. **8**

b) A connecting rod is suspended from a point 25 mm above the small end centre and 650 mm above its C.G. It makes 20 oscillations in 35 seconds. Find dynamically equivalent two masses when one mass is placed at small end centre. Take mass of connecting rod as 40 kg. **10**

OR

6. a) Write a note on 'Correction couple'. **6**

b) A single cylinder horizontal steam engine has a stroke of 0.75 m and a connecting rod 1.8 m long. The mass of reciprocating parts is 520 kg and that of the connecting rod is 230 kg. Centre of gravity of the connecting rod is 0.8 m from crank pin and the moment of inertia about an axis through the centre of gravity perpendicular to the plane of motion is 100 kg.m^2. For an engine speed of 90 rpm and a crank position of 45° from the IDC, determine the torque on the crankshaft due to the inertia of these parts by analytical method. **12**

SECTION – II

7. a) Explain Castigliano's theorem with suitable example. **4**

b) A belt pulley is keyed to the shaft midway between the supporting bearings kept at 1000 mm apart. The shaft transmit 20 kW power at 400 rpm. The pulley has 400 mm diameter. The angle of wrap of belt on pulley is 180° and the belt tension acts vertically downwards. The ratio of belt tension is 2.5. The shaft is made of steel having an ultimate tensile strength and a yield strength of 400 N/mm^2 and 240 N/mm^2 respectively. The combined shock and fatigue factors in bending and torsion are 1.5 and 1.25 respectively. The permissible angle of twist in shaft is 0.25° per metre length and the permissible lateral deflection is 1 mm per metre length. Design the shaft on the basis of strength and rigidity.

Take $G = 80 \times 10^3$ N/mm^2 and $E = 200 \times 10^3$ N/mm^2. **12**

OR

8. a) What are the advantages of hollow shaft over solid shaft ? State an example where hollow shafts are used. **4**

b) Two 35 mm shafts are connected by a flange coupling. The flanges are fitted with 6 bolts on bolt circle of 125 mm diameter. If the shaft transmits a torque of 800 N-m at 350 rpm, calculate

i) key dimensions

ii) hub length

iii) thickness of flange

iv) power transmission capacity.

Take,

Allowable shear stress for shaft material = 63 N/mm^2

Allowable shear stress for bolt material = 56 N/mm^2

Allowable shear stress for flange material = 10 N/mm^2

Allowable shear stress for key material = 46 N/mm^2 **12**

9. a) Why square threads are used for power transmission and V threads for fastners ? **4**

b) A circular bar of 30 mm diameter is welded to a steel plate by an annular fillet weld. The force of 5 kN is applied on the bar at a distance 100 mm from the plane of the weld. If the allowable shear stress in the weld material is 80 N/mm^2, determine the size of the weld. **12**

OR

10. a) State the advantages and limitations of welded joints. **4**

b) A square threaded, triple start power screw, used in a screw jack, has a nominal diameter of 50 mm and a pitch of 8 mm. The screw jack is used to lift a load of 7.5 kN. The coefficient of thread friction is 0.12 and collar friction is negligible. If the length of the nut is 48 mm, claculate

i) the maximum shear stress in the screw body.

ii) the direct shear stress in screw and nut.

iii) the bearing pressure. **12**

11. a) Explain 'slip' and 'creep' in belt. **6**

b) A V belt drive is used to transmit 30 kW power from an electric motor running at 1440 rpm to a machine running at 480 rpm. The centre distance between the input and output shaft is 1000 mm. The pulley groove angle is 38° and the coefficient of friction between the belt and pulley is 0.2. The density of the material is 1000 kg/m^3 and allowable tensile stress for the belt is 1.53 N/mm^2. The cross sectional dimensions of the V belt are as follows :

Width of the belt at the top = 37 mm

Width of the belt at the bottom = 19 mm

Depth of the belt = 25 mm

Find :

i) the pulley diameters and

ii) the minimum number of belts required. **12**

OR

12. a) State the advantages, limitations and applications of chain drive. **6**

b) Explain the procedure for the selection of V belts from manufacturer's catalogue. **6**

c) Derive the condition for maximum power transmitting capacity of belt drive based on friction capacity. **6**

[3962] – 277

S.E. (Mechanical S/W) (Semester – II) Examination, 2011
PRODUCTION ENGINEERING – II
(2003 Course)

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.*
*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) A workpiece of material SAE 1020 rotating at 40 m/min is orthogonally cut 3 mm wide with a feed rate 0.20 mm/rev with HSS. If the total specific energy required to shear the material is 38.25 K W/cm^3/min. Find the power required to take the cut and also cutting force acting on the tool. **8**

b) What is tool wear ? And how are they measured ? **8**

OR

2. a) Show positive, negative and neutral rake angle with the help of sketch and criterion under which they are provided on the tool. **8**

b) During machining the workpiece of diameter 50 and length 125 with HSS, the feed rate is 140 mm min and rpm is 159.15. The time accumulated by the tool used for machining is 100 min, before it goes for sharpening when running at 40 m/min. Find the time taken to take one cut along the length, tool life of the tool and number of workpieces machined before it goes for regrind at working rpm, if n = 0.25. **8**

P.T.O.

3. a) List the limitations of broaching operation. **6**

   b) Write a short note on horizontal broaching machine. **6**

   c) Briefly explain gear hobbing process. **4**

OR

4. a) How gear lapping and grinding is done ? **6**

   b) Explain the methods to cut external and internal threads. **6**

   c) Sketch and label the broach. **4**

5. a) Recommend the NC motion control systems to : i) machine 'n' number of holes in a rectangular plate at given pitch 'p' ii) machine perpendicular edges of the same plate iii) to cut a arc of radius 'r' take the help of sketch . **6**

   b) Write the general format of the block used for writing a CNC program with its meaning. **6**

   c) Define NC and list the disadvantages when compared to CNC. **6**

OR

6. a) Distinguish between CNC and DNC. **5**

   b) What role AGV's play in FMS and how are they controlled ? **6**

   c) What features on machining center makes it a versatile machine ? **7**

SECTION – II

7. a) Distinguish between CM and ECM. **8**

   b) Explain PAM. **8**

OR

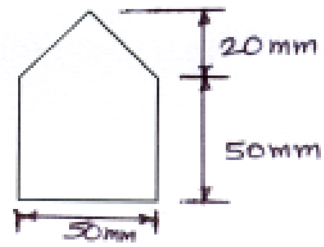
8. Write a short note on :

   a) LBM. **8**

   b) EDM. **8**

9. a) How simple, compound, combination and progressive die distinguish themselves from each other ? **6**

b) Draw the strip layout for the shown component considering high percentage utilization. The strip is 3 mm thick and 3m long. Show the front scrap, back scrap, scrap bridge, feed per blank, scrap on the length and width of the strip. Also find the number of pieces that we will get from the strip supplied and percentage utilization of the strip. **7**



c) Define i) press tonnage ii) centre of pressure iii) clearance. **5**

OR

10. a) Define i) deep drawing ii) shallow drawing iii) ironing. **6**

b) What is the effect of the following parameters on the drawing operation :

i) radius on draw die

ii) radius on punch

iii) blank holding force ? **6**

c) How the spring back is taken care in air bending and channel bending ? **6**

11. a) Write a short note on turning fixture. **8**

b) Write a note on angle plate jig. **8**

OR

12. a) Sketch three different types of locators showing its application. **6**

b) What are the points taken into consideration while clamping ? **5**

c) Define Jig and Fixture and explain the term fool proof used in Jig and Fixture. **5**

———————

[3962] – 284

S.E. (Prod./Industrial Engg.) (Semester – I) Examination, 2011
INDUSTRIAL ELECTRONICS
(Common to Production S/W)
(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, electronics pocket calculator and steam tables is* ***allowed****.*
6) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) With the help of constructional diagram and V.I. characteristics, explain how diac and triac acts as bi-directional devices. State applications of these devices. **6**

b) Distinguish between 'ON-line' and OFF-line UPS. Explain any one with block diagram. **6**

c) Give the comparison between MOSFET and IGBT. **4**

OR

2. a) Explain the working of fan regulator circuit using SCR. **6**

b) Name different current limiting methods. Explain any one in detail. **6**

c) Explain UJT as a relaxation oscillator. **4**

3. a) Draw the circuit diagrams for ideal and practical differentiator circuits. Explain freq. response curves for the both. **8**

b) Describe difference between synchronous and asynchronous counters. Explain with a logic diagram and truth table 3-bit Ripple counter. **8**

OR

4. a) With circuit diagrams explain the working of log and antilog amplifiers. **8**

b) With logic diagram explain MS-JK Flip-Flop. Explain how race around condition is avoided in this Flip-Flop. **8**

5. a) State the need for PLC. Describe PLC using block schematic. **6**

b) Explain how Computerized Numerical Control (CNC) is used in industry. List the advantages of using CNC. **8**

c) Explain excitation sequence of winding of stepper motor for half and full step. **4**

OR

6. a) What is the principle of resistance welding ? Explain typical cycles required in resistance welding. Specify typical electronic circuit to implement above said sequential operations. **8**

b) With a block schematic explain working of DNC. **6**

c) Explain merits and demerits of AC and DC motors. **4**

SECTION – II

7. a) Explain the working of resistance thermometer. Give its advantages and limitations. **6**

b) Explain the working of LVDT. State its advantages. **6**

c) Write note on proximity detectors. **6**

OR

8. a) Write note on Pneumatic actuators. **6**

b) Explain the working of photo conductive detector and photo voltaic detector. **6**

c) Write note on Vibration transducer. **6**

9. a) Solve the differential equation $2\frac{d^2x}{dt^2}+7\frac{dx}{dt}+6x=0$ with initial conditions $x(0)=0$ and $\frac{dx(0)}{dt}=1$. **6**

b) Explain the following properties of Laplace transform. **10**

i) Linearity
ii) Time scaling
iii) Freq. scaling
iv) Time delay
v) Initial value theorem.

OR

10. a) Find the transfer function G(S) of given electrical circuit in fig no.1 using Laplace transform **8**

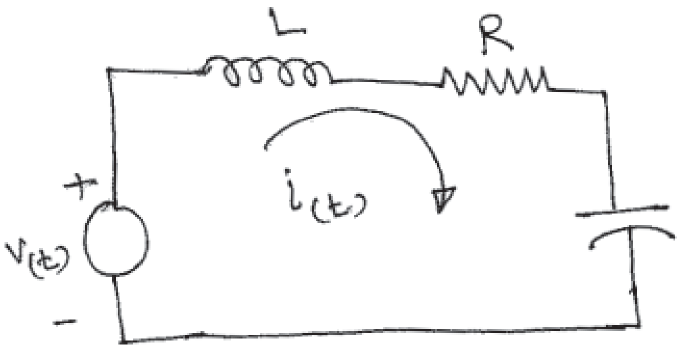


Fig. 1

b) Short notes : **8**

i) Step response of first order system
ii) Dynamic response of second order system.

11. a) Explain with block diagrams, Pre-chlorination control and Alum dosing control in water treatment plant. **8**

b) Explain with block diagram, automation strategy in steel plant. **8**

OR

12. a) Explain with block diagram, automation system in thermal power plant. **8**

b) Explain with block diagram, generalized data acquisition system. **4**

c) What are the requirements of distributed control system ? **4**

[3962] – 285

S.E. (Production & Industrial Engineering) (Sem. – II) Examination, 2011
THEORY OF MACHINES
(Common to Production S/W)
(2003 Course)

Time : 4 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) Figures to the **right** indicate **full** marks.*
*5) **Use** of slide rule, electronic pocket calculator is **allowed**.*
*6) Assume **suitable** data, **if** necessary.*

SECTION – I

1. a) Explain inversions of double slider crank chain. **6**

b) State and explain the Grashoff criterion as applied to 4 bar chain. How is it useful in studying the inversion of 4 bar chain ? **6**

c) Define following terms :

i) Kinematic chain

ii) Mechanism

iii) Higher Pair

iv) DOF of mechanism. **4**

OR

2. a) Explain in brief Kutzback criterion for determining DOF of mechanism. **6**

b) How Cam-Follower mechanism can be converted into its equivalent mechanism by equivalent linkage concept. **6**

c) Differentiate between spatial and planer mechanism. **4**

P.T.O.

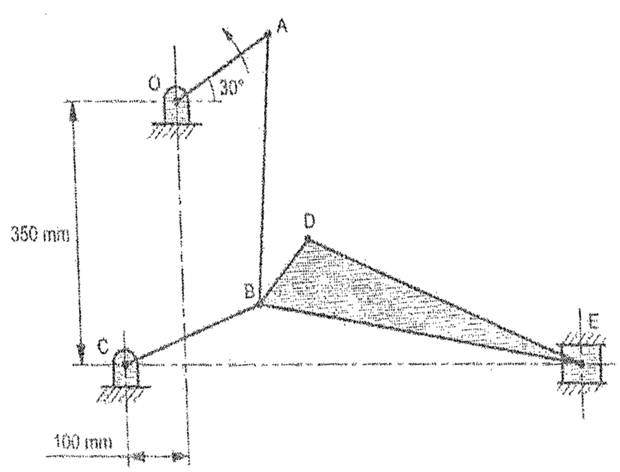
3. a) State and prove Kennedy theorem of 3 centres in line. **4**

b) In the Mechanism shown in figure, the slider E is constrained to move along the horizontal path .
OA=180 mm, AB=360 mm, CB=240 mm, BD=120 mm, DE=480 mm, BE=540 mm
If the link OA rotate at 60 rpm in the anticlockwise direction, find for the position shown:

i) Velocity and acceleration of point E

ii) Velocity and acceleration of point D

iii) Angular velocity and angular acceleration of BDE. **12**



OR

4. a) The crank of an engine 180 mm long and the ratio of connecting rod length to crank radius is 4. Determine acceleration of piston, acceleration of point X on connecting rod (Located at 1/4 th distance from big end) when the crank is turned through 40° from IDC. Crank rotate at 300 rpm clockwise and is increasing at the rate of 120 rad/sec^2. Use Klein's construction only. **8**

b) The connecting rod of an engine has a length equal to 200 mm between centres and has a mass 2.5 kg. Its C.G is at 80 mm from big end and radius of duration about an axis through the centre of gravity perpendicular to the plane of motion is 100 mm.
Find:

i) The two mass dynamically equivalent system when one mass is placed at small end.

ii) The correction couple, if the two masses are placed at two ends and angular acceleration of connecting rod is 100 rad/sec^2 clockwise. **8**

5. a) Explain properties of involute profile toothed gears in mesh. **4**

b) Define following terms :

i) Pressure angle iii) Pitch point

ii) Circular pitch iv) Backlash **4**

c) Two gear wheels mesh externally and are to give a velocity ratio of 3. The teeth are of involute form of module 6. The standard Addendum is 1 module. If the pressure angle is 18° and the pinion rotates at 90 rpm. Find :-

i) No. of teeth on each wheel so that interference is just avoided

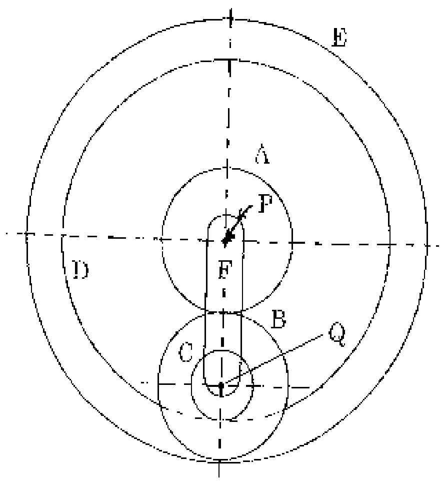
ii) Length of path of contact

iii) Maximum velocity of sliding. **10**

OR

6. a) State and prove law of gearing for constant velocity ratio. **8**

b) A compound epicyclic gear is shown in figure. The gears A,D and E are free to rotate on axis P. The compound gear B and C rotate together on axis Q at the end of arm F. All the gears have equal pitch. The number of external teeth on gears A, B, and C are 18, 45 and 21 respectively. The gears D and E are annular wheels. The gear A rotate at 90 rpm in the anticlockwise direction and the gear D rotates at 450 rpm clockwise. Find the speed and direction of the arm and gear E. **10**



SECTION – II

7\. a) Explain following terms as applied to cam with neat sketches.

i) Pressure angle

ii) Stroke of follower

iii) Prime circle. **6**

b) Draw profile of a cam which will give lift of 37.5 mm to a roller follower. The diameter of roller is 25 mm and line of stroke is offset by 20 mm from cam axis. The outstroke of the follower takes place with SHM during 72° of cam rotation followed by period of rest during 18° of cam rotation. The follower then returns with uniform acceleration and retardation during 54° of cam rotation. The minimum radius of cam is 50 mm. Cam rotate at uniform speed 240 rpm anticlockwise. **10**

OR

8\. a) Derive an expression of displacement, velocity and acceleration for follower moving with SHM. **6**

b) Draw profile of cam which raises a value with SHM through SCM in $\frac{1}{4}$ of revolution, keep it fully raised through $\frac{1}{9}$ revolution and it closed in next $\frac{1}{6}$ revolution with cycloidal motion. The valve remains closed during next remaining revolution. Roller diameter is 1.5 cm and minimum cam radius 3 cm. The axis of valve rod is offset by 1.5 cm from camshaft axis. Cam rotating clockwise direction. **10**

9\. a) Explain inline engine. How are they balanced and is it possible to balance them completely ? **6**

b) A rotating shaft carries four unbalanced masses 18 kg, 14 kg, 16 kg and 12 kg at radil 5 cm, 6 cm, 7 cm and 6 cm respectively. The 2nd , 3rd and 4th masses revolve in planes 8 cm, 16 cm and 28 cm respectively measured from plane of first mass and are angularly located at 60°, 135° and 270° respectively measured clockwise from the first mass looking from this mass end of the shaft. The shaft is dynamically balanced by two masses, both located at 5 cm radil and revolving in the planes midway between those of 1st and 2nd masses and midway between those of 3rd and 4th masses. Determine magnitude of balance masses and their respective angular positions. **10**

OR

10. a) Write a short note on direct and reverse crank method. **6**

b) The cranks of two cylinder uncoupled inside cylinder locomotive are at right angles and are 300 mm long. The distance between centre lines of cylinders is 650 mm. The wheel centre lines are 1.6 m apart. The reciprocating mass per cylinder is 300 kg. The driving wheel diameter is 1.8 m. If the hammerblow is not to exceed 45 kN at 100 Km/hr determine :

i) The traction of reciprocating masses to be balanced.

ii) Variation in tractive effort. **10**

11. a) What are causes and effects of vibration ? **5**

b) Determine equivalent stiffness when :

i) Springs are in series.

ii) Springs are in parallel. **5**

c) A vibrating system is defined by following parameters :
M=3 kg, K=100 N/m, C=3N-sec/m
Determine :

a) Damping factor

b) Natural frequency of damped vibration

c) Logarithmic decrement

d) Ratio of two consecutive amplitudes

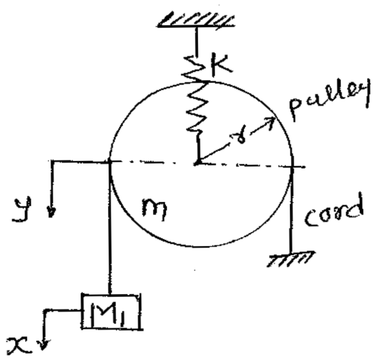
e) No.of cycles after which the original amplitude is reduced to 20 percent. **8**

OR

12. a) Explain significance of vibration isolation. What are vibration isolation materials ? **5**

b) Write a short note on writing speed of shaft. **5**

c) Find natural frequency of system shown in figure. The cord may be assumed inextensible in the spring mass pulley system and no slip. **8**



———————

[3962] – 287

S.E. (Production & Industrial Engg.) (Semester – II) Examination, 2011
DESIGN OF MACHINE ELEMENTS
(Common to Production S/W)
(2003 Course)

Time: 3 Hours Max. Marks: 100

SECTION – I

1. a) What do you mean by design considerations ? Explain with illustrative examples any four important design considerations. **8**

   b) Explain : **8**
      i) Preferred Series and their applications
      ii) Design analysis and Design synthesis.

OR

2. a) Describe the main alloying elements in alloy steels and their effect on properties on alloy steel. **4**

   b) Suggest suitable material for the following application. Support your answer with reason. **8**
      i) Shaft subjected to variable torsion and buckling.
      ii) Nut of a heavy duty screw jack.
      iii) Hacksaw Blade
      iv) Drill Spindle.

   c) Explain how material selection is done when more than two materials are found to be suitable. **4**

3. a) Describe and compare Rankine's theory and Tresca-Guest theory. **8**

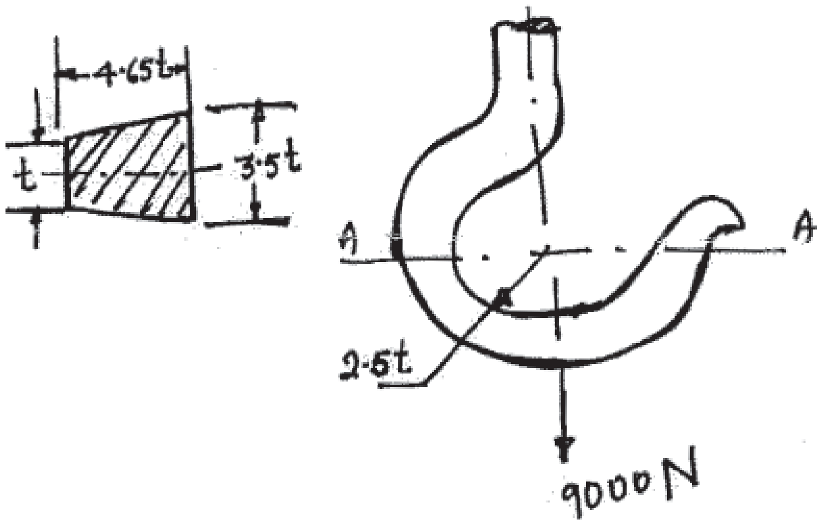
   b) A bell crank lever is to be designed to raise a load of 5.5 kN at the short arm end. The arm lengths are 150 mm and 500 mm respectively. The permissible stresses for the lever and pin materials in shear and tension are 60 N/mm^2 and 90 N/mm^2 respectively. The bearing pressure on the pin is to be limited to 12 N/mm^2. Assume the lever cross section as t × 4t and the fulcrum pine as 1.25 times the pin diameter. **8**

OR

P.T.O.

4. a) Explain in detail the procedure for design of a cotter Joint. **8**

b) A crane hook with trapezoidal cross section as shown in figure is made of plain carbon steel with permissible tensile stress of 120 N/mm^2. If the load acting on the hook is 95 kN. Determine the dimensions of the hook. **8**



5. a) A shaft is supported on two bearings which are 1 m apart. The shaft carries two belt pulleys at a distance of 200 mm and 800 mm from the left hand bearing. The diameter of both the pulleys is 500 mm with 180° overlap. The two belt directions are perpendicular to each other. The maximum belt tension in any belt is 2500 N. The ratio of belt tension is 2.25. The shaft is made of steel with an ultimate tensile strength of 800 N/mm^2 and a tensile yield strength of 550 N/mm^2. If the combined shock and fatigue factors in bending and torsion are 1.50 and 1.0 respectively, design the shaft using τ_s as smaller of { [0.75 (0.18 S_{ut})], [0.75 (0.3 syt)] } . **12**

b) Explain the various design equations for splined shaft. **6**

OR

6\. a) Explain in detail with relevant equations design procedure for Muff Coupling. **6**

b) Following data refers to a helical compression spring :
Mean coil diameter = 120 mm
Maximum axial Load = 8000 N
Spring rate = 70 N/mm^2
Allowable shear stress for spring = 270 N/mm^2
Modulus of rigidity for spring material = 80×10^3 N/mm^2
Determine :
i) Wire Diameter and
ii) Number of active turns. **8**

c) Explain the significance of Wahl's factor in spring design. **4**

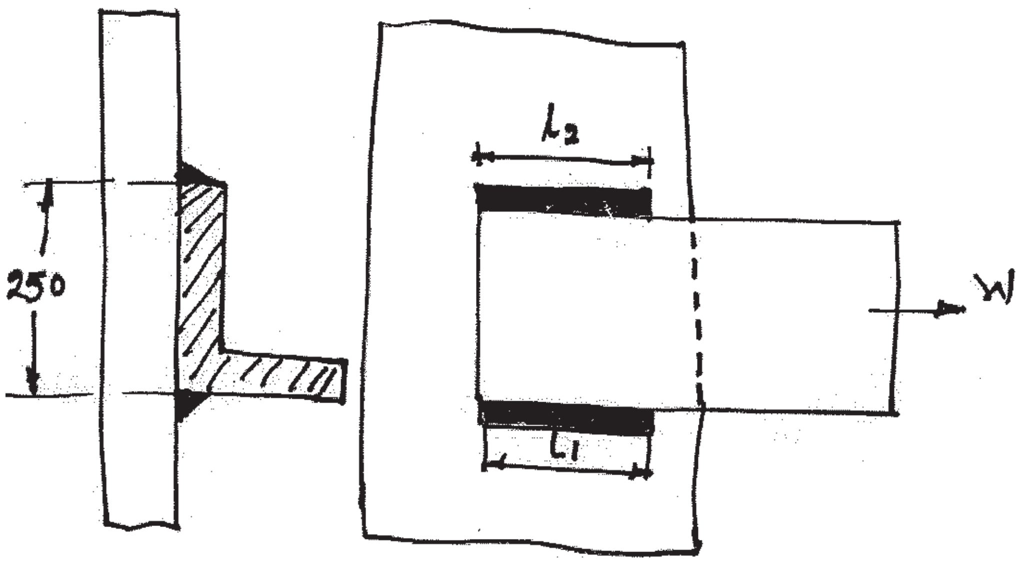
SECTION – II

7\. a) Describe and compare various forms of threads. **8**

b) Explain in detail the various stresses in power screws. **8**

OR

8\. a) A steel angle is welded to steel plate by the fillet welds as shown in the figure of length 220 mm each. The leg size is 12.5 mm. If the permissible shear stress for the weld is 80 N/mm^2 , calculate the load carrying capacity of the welding connection. **4**



b) Explain the procedure to design welds subjected to Bending Moment. **8**

c) State the advantages and limitations of the welded joints over riveted joints. **4**

9. a) A cone clutch having asbestos friction lining is used to transmit 30 kW power at 500 r.p.m. coefficient of friction is 0.25, permissible intensity of pressure is 0.35 N/mm^2 and semi cone angle is 12 degrees. If the outer diameter is 320 mm form space limitation find (i) Inner diameter (ii) Face width of the friction lining and (iii) force required to engage the clutch. Assume uniform wear theory. **12**

b) Design considerations in a long shoe brake. **4**

OR

10. a) Explain the importance of PV value in design of brakes. **4**

b) Using relevant equations describe the analysis of short and long shoe brake. **4**

c) A multiple disk clutch consisting of alternate steel and bronze plates transmits 7 kW at 750 r.p.m. the inner and outer diameters of the contacting surfaces are 120 mm and 160 mm respectively. The coefficient of friction is 0.15 and the intensity of pressure is 0.28 MPa. Calculate the number of steel and bronze disks required and the operating force. Assume uniform wear theory. **8**

11. Explain : **18**

i) Selecting a chain from manufacturer's catalogue.

ii) Power ratings of belt and chains

iii) Rope drum's construction and design.

iv) Stresses in wire ropes

v) Maximum power condition for belt drive.

vi) Materials for roller chain and sprocket.

OR

12. a) A rope drive transmits 550 kW form a pulley of effective diameter 4.25 m, running at a speed of 100 r.p.m. the angle of lap is 150 degrees and groove angle is 45 degrees, coefficient of friction is 0.3, the mass of the rope is 1.6 kg/m and the allowable tension in each rope is 2500 N. Calculate the number of ropes required. **8**

b) Explain Material selection for flat and V belts. **6**

c) What is the effect of centrifugal tension on the performance of belts ? **4**

S.E. (Electrical) (Semester – I) Examination, 2011
POWER PLANT ENGINEERING
(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**.*

SECTION – I
UNIT – I

1. a) Explain Rankine cycle with T-S diagram. **4**

b) State the advantages of Reheat cycle. **4**

c) A steam power plant operates on Rankine cycle. Steam entering the turbine has a pressure of 50 bar and temp. of 500°C; expands to a condenser pressure of 0.05 bar. Find :

i) Heat supplied

ii) Turbine work

iii) Pump work

iv) Dryness function of steam entering the condenser

v) Rankine cycle efficiency. **10**

OR

2. a) Explain Bomb calorimeter with a neat sketch. **6**

b) Explain Orsat apparatus with a neat sketch. **6**

c) Write a short note on Fluidised bed combustion. **6**

UNIT – II

3. a) State the advantages of using condenser. **4**

b) Explain :

i) Boiler efficiency

ii) SSC. **4**

c) How steam condensers are classified ? Compare surface and jet condensers. **8**

OR

4. a) Explain with a neat sketch, construction and working of a centrifugal pump. **8**

b) Explain – Governing of a Pelton wheel. **8**

UNIT – III

5. a) Draw general layout of a modern steam power plant and explain its working. **8**

b) Classify hydroelectric plants. Explain pump storage plant. **8**

OR

6. a) Explain :

i) Hydrograph

ii) Flow duration curve

iii) Mass curve. **6**

b) Compare Hydro and Thermal power plant. **6**

c) What is cavitation ? How can it be avoided ? **4**

SECTION – II

UNIT – IV

7. a) State the advantages and disadvantages of diesel power plant. **8**

b) Why the starting of diesel plant is more difficult ? What different methods are used for starting diesel engine ? Which method is common and why ? **8**

OR

8. a) Explain different methods used to improve the thermal efficiency of the open cycle gas turbine plant. **8**

   b) State the advantages and disadvantages of gas turbine power plants over diesel and thermal power plants. **8**

UNIT – V

9. a) Explain with a neat sketch :

      i) Pressurised water Reactor (PWR)

      ii) Boiling water Reacter (BWR)

      Also state its avantages and disadvantages. **12**

   b) Write a short note on : Gas cooled Reactor. **6**

OR

10. a) State the advantages and limitations of Nuclear Power Plants. **6**

    b) Explain the various factors which should be considered while selecting a site for nuclear power plant. **6**

    c) Write a short note on : Nuclear waste disposal. **6**

UNIT – VI

11. a) Which are the non-conventional sources of energy and why they are seriously thought throughout the world ? **5**

    b) What is the importance of solar power in the present energy crisis in the world ? **5**

    c) Write a short note on : Wind Mills. **6**

OR

12. a) Explain MHD system with its advantages and drawbacks. **8**

    b) Comment on : Renewal energy development program of India. **8**

———————

S.E. (Electrical) (Semester – I) Examination, 2011
ELECTRICAL MACHINES – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *i) Answer 3 questions from Section **I** and **3** questions from **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, pocket calculator and steam tables is **allowed**.*
*vi) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Prove the condition for maximum efficiency of single phase transformer. **4**

b) Draw the Phasor diagram of 1-phase transformer on load condition at :

i) Unity power factor

ii) Leading power factor. **6**

c) The required no load voltage ratio in a 150 KVA, 50 Hz, single phase transformer is 5000/250 V. Find efficiency at half rated KVA, Unity power factor and also efficiency at full load 0.8 p.f. lagging if the full load copper losses are 1800 W; care losses are 1500 W. **6**

OR

2. a) Explain the various features of on ideal transformer. **4**

b) How approximate equivalent circuit is different from accurate equivalent circuit of transformer. **6**

c) A 250 KVA single phase transformer has iron loss of 1.8 KW. The full load copper loss is 2000 Watts, calculate :

i) Efficiency at full load, 0.8 lagging p.f.

ii) KVA supplied at maximum efficiency

iii) Maximum efficiency at 0.8 lagging p.f. **6**

3. a) Explain load sharing of transformers connected in parallel with equal voltage ratios and unequal voltage ratios. **8**

b) Two 2200/110 V Transformers are operated in parallel to share a load of 120 KVA at 0.8 p.f. lagging. Transformers are rated below.

A : 100 KVA : 0.8% resistance and 10% reactance

B : 60 KVA : 1% resistance and 5% reactance

Find the load carried by each transformer. **8**

OR

4. a) How equivalent circuit parameters are obtained from open and short circuit tests on transformer ? **8**

b) A 5 KVA, 500/250 V, 50 Hz, single phase transformer gave the following readings.

O.C. Test : 500 V, 1 A, 50 W (L.V. side open)

S.C. Test : 25 V, 10 A, 60 W (L.V. side shorted)

Determine :

i) The efficiency on full load, 0.8 lagging p.f.

ii) The voltage regulation on full load, 0.8 leading p.f.

iii) The efficiency on 60% of full load, 0.8 leading p.f. **8**

5. a) With proper connection and phasor diagrams describe the different ways of connecting three phase transformers. **8**

b) With the help of neat connection diagram, explain the Sumpner's test on 1-phase transformer. Also state its limitations. **10**

OR

6. a) What are the advantages of single three phase transformer unit over a bank of single phase transformer ? **6**

b) State the conditions which must be fulfilled for successful parallel operation of 3 phase transformers. **6**

c) Write the short notes on Testing of transformer as per B.I.S. (2026). **6**

SECTION – II

7. a) Draw a neat sketch of a D.C. machine. Label it. List the various parts and material used for them. Also state the function of each parts. **8**

b) A long shunt d.c. compound generator drives 20 lamps, all are connected in parallel. Terminal voltage is 550 V with each lamp resistance as 500 Ω. If $R_{sh} = 25\ \Omega$, $R_a = 0.06\ \Omega$ and $R_{se} = 0.04\ \Omega$, calculate the armature current and the generated e.m.f. **8**

OR

8. a) Distinguish between lap and wave type of windings in DC machines. **4**

b) Explain the following terms in brief :

i) Pole pitch

ii) Back pitch

iii) Resultant pitch

iv) Commutator pitch. **4**

c) A d.c. series generator has armature resistance of 0.5 Ω and series field resistance of 0.03 Ω. It drives a load of 50 A. If it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 r.p.m. calculate the terminal voltage at the load. Assume 4 poles, lap type winding, flux per pole as 2 mwb and total brush drop as 2V. **8**

9. a) Draw the circuit diagrams for separately excited generators and self excited series generator indicating all the currents and voltages. **8**

b) A d.c. shunt motor runs at a speed of 1000 r.p.m. on no load taking a current of 6A, from the supply when connected to 220 V d.c. supply. Its full load current is 50 A. Calculate its speed on full load. Assume $R_a = 0.3\ \Omega$ and $R_{sh} = 110\ \Omega$. **8**

OR

10. a) Draw the performance characteristics of different types of d.c. generators and explain them. **8**

b) Obtain the torque equation of d.c. motor. **4**

c) Explain the various losses in d.c. machine. **4**

11. a) Describe Hopkinson's test in detail with its advantages and disadvantages. **10**

b) What is commutator ? What is meant by good commutation ? How is it achieved ? **8**

OR

12. a) Explain Swinburne's test for finding the efficiency of a d.c. machine. Can this method applicable to d.c. series motors. **8**

b) A retardation test is carried out on a 1000 r.p.m. d.c. machine. The time taken for the speed to fall from 1030 rpm to 970 rpm is

i) 36 seconds with no excitation

ii) 15 seconds with no excitation

iii) 9 seconds with full excitation and the armature supporting on extra load of 10 A. at 219 V. Calculate

1) Moment of inertia of the armature in $Kg.m^2$

2) Iron loss

3) Mechanical loss at the mean speed of 1000 r.p.m. **10**

———————

S.E. (Electrical) (Semester – I) Examination, 2011
ELECTRICAL MEASUREMENTS
(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) Attempt Que. No. **1 or 2,** Que. No. **3** or **4,** Que. No. **5** or **6.** Que. No. **7** or **8**, Que. No. **9** or **10**, Que. No. **11** or **12.***

SECTION – I

1. a) With a neat sketch explain the method of absolute measurement of current by Rayleigh's current balance. **8**

b) Explain the terms : **8**

i) Hysteresis. ii) Threshold.

iii) Dead band. iv) Accuracy.

OR

2. a) In a survey of 15 owners of a certain model of a car, the following figures are for average petrol consumption where reported : 25.5, 30.3, 31.1, 29.6, 32.4, 39.4, 28.9, 30.0, 33.3, 31.4, 29.5, 30.5, 31.7, 33.0, 29.2.

Calculate :

i) Mean value ii) Median value

iii) Standard deviation iv) Average deviation

v) Variance vi) Probable error. **10**

b) Explain parallax error and error due to inherent shortcomings of the instruments. How to minimise them ? **6**

P.T.O.

3. a) Discuss briefly the following methods for measurement of medium resistance :

   i) Ammeter - voltmeter method

   ii) Substitution method

   iii) Wheatstone bridge method. **8**

   b) A length of cable is used for testing its insulation resistance by loss of charge method. An electrostatic voltmeter of infinite resistance is connected between the cable conductor and earth, forming a joint capacitance of 600 pf. It is observed that after charging the voltage falls from 250 V to 92 V in 1 min. Calculate insulation resistance of the cable. **4**

   c) Classify the resistances from measurement point of view and give 2 examples of each. **4**

OR

4. a) Explain the effect of voltage, frequency and form factor of waveform on iron losses. **6**

   b) What are the difficulties in magnetic testing of bar specimen in comparison with ring specimen ? What is permeameter ? With a neat diagram describe Hopkinson permeameter. **10**

5. a) Write a short note on various sources and null detectors used for AC bridges. **6**

   b) With a neat diagram explain the working of vibrating reed type frequency meter. **6**

   c) Write short note on Dynamomometer type single phase power factor meter. **6**

OR

6. a) With a neat diagram explain the use of Maxwell's inductance -capacitance bridge for measurement of unknown inductance. Derive an expression for unknown inductance. Why is this bridge not suitable for large Q coils ? **9**

   b) The four impedances of an ac bridge are :

   $Z_1 = 400 \angle 50° \ \Omega$, $Z_2 = 200 \angle 40° \ \Omega$, $Z_3 = 800 \angle -50 \ \Omega$, $Z_4 = 400 \angle 20° \Omega$. Find out whether the bridge is balanced under these conditions. **6**

   c) Explain the term sliding balance for achieving balance point quickly in AC bridges. **3**

SECTION – II

7. a) Derive the torque equation for D' Arsonal galvanometer with usual notations. Explain the intrinsic constants involved and write the equation of motion to examine dynamic behaviour of galvanometer. **10**

b) State and explain methods of producing damping torque in indicating type instruments. What are the effect of over damping and under damping ? **8**

OR

8. a) With neat sketch explain the construction and working of attraction type moving iron instrument. State its advantages and disadvantages. **8**

b) The coil of moving coil voltmeter is 40 mm× 30 mm wide and has 100 turns wound on it. The control spring exerts a torque of 0.25×10^{-3} Nm when the deflection is 50 divisions on scale. If the flux density of magnetic field in the airgap is 1 Wb/m^2, estimate the resistance that must be put in series with coil to give 1 volt/div. Resistance of voltmeter is 10,000 ohm. **6**

c) Explain the type of suspensions provided to the galvanometer. How is damping torque produced in the galvanometer ? **4**

9. a) Derive the torque equation of single phase dynamometer type wattmeter with usual notations. **6**

b) Compare dynanometer type wattmeter and induction type wattmeter. **4**

c) With a neat circuit diagram and phasor diagram explain two wattmeter method for measuring active power in three phase star connected (R+L) balanced load. **6**

OR

10. a) With neat diagram explain construction of low power factor type wattmeter. State its application. **6**

b) A wattmeter reads 5 kW when current coil is connected in R phase and pressure coil is connected between R and N for a balanced symmetrical three phase system suppling three phase inductive load of 25 Amp at 400 volts. What will be the reading of wattmeter if connections of current coil are unchanged and pressure coil is now connected between B and Y phases ? Find total reactive power for this case. **4**

c) With a neat circuit diagram and phasor diagram explain one wattmeter method for measurement of reactive power in three phase star connected load. **6**

11. a) What are different systems in induction type energymeter ? Describe each in brief. **6**

    b) Derive the expression for ratio error for CT with usual notations. **6**

    c) What is difference in CT and ordinary transformer ? **4**

OR

12. a) With a neat circuit diagram explain CT, PT operated energy meter. **6**

    b) What are the methods of reducing errors in case of PT. **4**

    c) What is phase angle error and creeping error in induction type energy meter ? How they can be compensated ? **6**

———————

B/I/11/220

S.E. (Electrical) (Sem. – II) Examination, 2011
POWER SYSTEM – 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) Explain the following terms along with the units. **8**
   i) Load factor. ii) Demand factor.
   iii) Utilization factor. iv) Diversity factor.

   b) A generating station has following daily loads.

T (hr)	0 – 6	6 – 8	8 – 12	12 – 14	14 – 18	18 – 20	20 – 24
Load (MW)	8	3.5	10	2	9.5	4	5

   Sketch load distribution curve and determine the load factor and plant capacity factor assuming the capacity of plant of 12 MW. **8**

OR

2. a) Explain the following **(Any two)** :
   i) Difference between load curve and load duration curve.
   ii) Diversity of load decreases the capital cost of the power system.
   iii) Load factor of a power station is generally less than one. **8**

P.T.O.

b) What do you understand by Bmm coefficients of a power system ? Derive the values of these coefficients for a Power system fed by 2 generating plants. **8**

3. a) Derive expression for maximum and minimum dielectric stress in a single core cable. **8**

b) In connection with the faults on the cables, write in brief.

i) Causes of failure of underground cables.

ii) Procedure to locate the fault. **8**

OR

4. a) What is grading of cables ?

Explain capacitance grading and derive the relation for the same. **8**

b) A single core cable is having a conductor diameter of 2 cm and consisting of 3 A, B and C insulating materials of primitivities 5, 4 and 2 respectively and permissible stress of 50 kV/cm (rms), 40 kV/cm (rms) and 30 kV/cm (rms) respectively. If the line is designed for 110 kV, find the minimum intersheath radius of the cable. **8**

5. a) Derive the formula for voltage distribution across the units of a string of suspension insulators. Define string efficiency. State assumptions made. **9**

b) State the methods of making voltage distribution uniform across the units of string insulators. A 3 unit insulator string is fitted with a guard ring. The capacitance of the link pins to metal work and guard ring can be assumed to be 15% and 5% of the capacitance of each unit. Determine the voltage distribution and string efficiency. **9**

OR

6. a) Discuss the necessity of voltage control equipment in power system. What are the types of voltage regulators used for voltage control ? Explain any one in brief. **9**

b) Estimate voltage distribution and string efficiency for the string of 3 insulators if the ratio of mutual capacitance to ground capacitance is 0.11 for each disc. Assume line voltages as 33 kV, 3ph, 50 Hz. Why is string efficiency of suspension insulators less than 100% ? **9**

SECTION – II

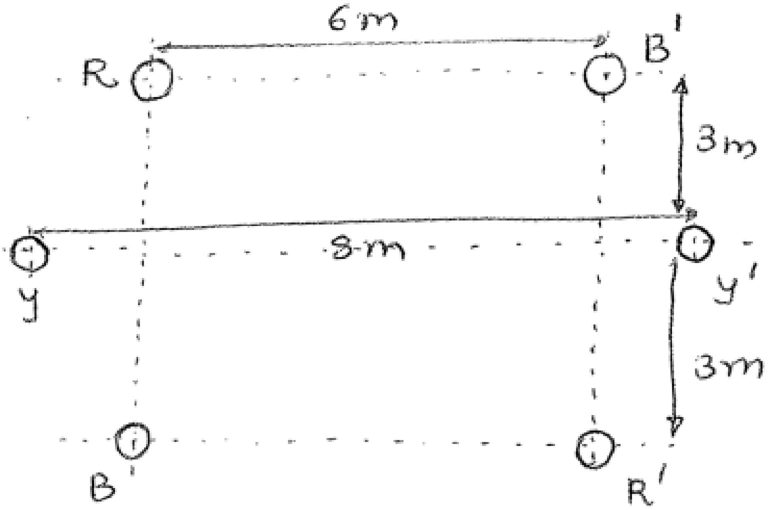
7. a) Why transmission lines are transposed ? Derive an expression of capacitance of three phase unsymmetrical transmission line with transposed conductors where

d_1 = Distance between conductors A and B

d_2 = Distance between conductors B and C

d_3 = Distance between conductors C and A. **8**

b) Six conductors of a double circuit transmission line are arranged as shown below. The diameter of each conductor is 3 cm. Find the capacitive reactance to neutral and the charging current per km per phase at 132 kV and 50 Hz, assuming that the line is regularly transposed. Neglect the effect of earth path. **8**



OR

8. a) Discuss the following terms related to transmission line of power system.

1) Proximity effect 2) Skin effect

3) Self GMD 4) Mutual GMD. **12**

b) A three phase 33 kV overhead sub transmission line 50 km long has its conductor ACSR 20 mm diameter spaced at the corner of an equilateral triangle of 2 m side. Find the inductance per phase of the system. **4**

9. a) Obtain the equations for sending end voltage and current in terms of receiving end voltage and current for nominal T (Tee) method. Also draw the phasor diagram. **8**

b) Two 3-phase transmission lines have generalised constants.

$A_1 = D_1 = 0.98 \angle 2°$, $B_1 = 28 \angle 69°$ ohms, $C_1 = 0.0002 \angle 88°$ Mho $A_2 = D_2 = 0.95 \angle 3°$, $B_2 = 40 \angle 85°$ ohms, $C_2 = 0.0004 \angle 90°$ Mho. They are connected in series and delivers a load current of 200 Amp at 0.95 P.f. lagging at 110 kV. Determine the sending end voltage and sending end current. **8**

OR

10. a) What is meant by generalised circuit constants of transmission line ? Derive the values of A, B, C and D constants in case of short transmission line. **8**

b) A 200 km long three phase overhead line has a resistance of 48.7 Ω/ph, inductive reactance of 80.20 Ω/ph and capacitive reactance (line to neutral) of 8.42 nF/km. It supplies a load of 13.5 MW at a voltage of 88 kV and power factor 0.9 lagging. Using nominal π (pie) network, find the sending end voltage, current, voltage regulation and power angle. **8**

11. a) What is Universal circle diagram ? What is its use over ordinary power circle diagram? Explain the procedure of drawing receiving end universal power circle diagram. **10**

b) An overhead line has an ACSR conductor of 1.95 cm diameter and a span of 244 m. The allowable tension is 3.56×10^4 N. Find :

1) Sag in still air condition with no ice covering

2) Vertical sag when there is an ice covering of 0.96 cm thickness and a horizontal wind pressure of 382 N/m^2 of projected area Ice weighs 8920 N/m^3. **8**

OR

12. a) Derive an equation for sag between supports at unequal levels. What is stringing chart ? State applications. **10**

b) A 3ϕ 50 Hz transmission line has following constants

$A = D = 0.96\angle 0.6°,\ B = 32\angle 68°\Omega,\ C = 0.215 \times 10^{-3} \angle 90°\ s$ construct the universal power circle diagram for the line and complete the following:

a) If the load supplied at receiving end is 64MW at 0.8 p.f. lag and 132 kV, find sending end voltage and power factor.

b) Voltage regulation. **8**

———————

[3962] – 298

S.E. (Electrical) (Sem. – II) Examination, 2011
DIGITAL COMPUTATIONAL TECHNIQUES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) 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.***
*2) Answer 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) **Use** of non-programmable electronic pocket calculator is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. A) Explain floating point and normalized floating point representation of number. **6**

B) Explain Inherent and Truncation errors. **6**

C) Convert the following numbers into equivalent decimal number **6**

i) $(1280)_8$ ii) $(4E6)_{16}$

iii) $(1011101011)_2$

OR

2. A) Explain concept of numerical instability. **6**

B) State and explain Sturms Theorem. **6**

C) Describe the positional number system for the representation of numbers. **6**

3. A) Explain Bisection method to find solution of a transcendental equation. **8**

B) Use Newton-Raphson method to obtain a root correct up to three decimal places of the following equation 2x = cosx + 3. **8**

OR

P.T.O.

4. A) What are the causes of failure of Newton-Raphson method ? Explain. **8**

B) Find the root of equation as indicated below using Secant method

$x^3 + x^2 + x - 100 = 0.$ **8**

5. A) Explain Gauss Seidel iteration method. **8**

B) Solve the following set of equations by Gauss-Jordan method. **8**

$5x_1 - x_2 = 9$

$-x_1 + 5x_2 - x_3 = 4$

$x_1 - x_2 + 5x_3 = -6$

OR

6. A) Explain the Gauss elimination method used for solving simultaneous linear algebraic equation. Explain concept of 'pivoting' used in this method. **8**

B) Use the Gauss Seidel Method to obtain the solution of the system at the end of 5^{th} iteration. **8**

$10x_1 + 2x_2 + x_3 = 9$

$x_1 + 10x_2 - x_3 = -22$

$-2x_1 + 3x_2 + 10x_3 = 22.$

SECTION – II

7. A) Derive an expression for Newton-Gregory backward difference interpolation formula. **8**

B) The population of the town with year is given by following table. Estimate the population for the year 1955. **8**

Year	1941	1951	1961	1971	1981	1991
Population (in 1000's)	112	140	164	175	183	189

OR

8. A) Derive the expression for Newton's divided difference interpolation formula for given data points with unequal intervals. **8**

B) Using Sterling's formula, evaluate f (1.22) from the data points given below. **8**

x	1	1.1	1.2	1.3	1.4
f (x)	0.841	0.891	0.932	0.963	0.985

9. A) Derive the Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule of integration from Newton-Cote's quadrature formula. **8**

B) Evaluate $\int_1^2 \frac{\sin x}{x} dx$, using Simpson's three-eighths rule with 6 sub-interval. **8**

OR

10. A) Using Newton Cote's quadrature formula, derive the equation for Trapezoidal rule for numerical integration. **8**

B) Evaluate $\int_0^2 \log_e \sqrt{1+x}\, dx$, using Simpson's one-third rule with 8 sub-interval. **8**

11. A) Derive the Euler's formula to solve $\frac{dy}{dx} = f(x, y)$. Also show graphically the effect of reduction in step size in the Euler's method. **9**

B) Apply Taylor Series method to find approximate value of y at x = 1.1 and x = 1.2, in steps h = 0.1; if $\frac{dy}{dx} = \log (xy)$. Given that y (1) = 2. **9**

OR

12. A) Solve using Runge-Kutta fourth order method to find approximate value of y at x = 0.1 and x = 0.2, in steps h = 0.1; if $\frac{dy}{dx} = \frac{1}{x+y}$. Given that y (0) = 1. **9**

B) Solve $\frac{dy}{dx} = \frac{1}{2}(1+x^2)y^2$ with y (0) = 1, given that y (0.1) = 1.06, y (0.2) = 1.12, y (0.3) = 1.21. Evaluate y (0.4) and y (0.5) by Milne's Predictor-Corrector method. **9**

———————

[3962] – 299

S.E. (Electrical) (Semester – II) Examination, 2011
INSTRUMENTATION
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) What is instrumentation ? Discuss the purposes it serves in detail. **10**

   b) State various characteristics of process. Define and explain any two of them in brief. **6**

OR

2. a) With neat block diagram explain components of a instrumentation system. **8**

   b) Derive expression for step and ramp response of a first order system. Draw waveforms of input and response for both the cases. **8**

3. a) Discuss various controls normally available for use of CRO. **8**

   b) What are the various ways of classification of transducers ? Explain each one in brief. **8**

OR

4. a) State specific adjustments required to obtain Lissajous figures on CRO. Discuss use of Lissajous figures. **8**

   b) Compare :

   Passive - Active transducers

   Primary - Secondary transducers. **8**

P.T.O.

5. a) Explain with help of neat connection diagram, how RTD is used for measurement of temperature. State types of RTD elements. What is PT 100 ? **10**

b) Compare various types of manometers used for measurement of pressure. **8**

OR

6. a) Explain electrical methods for measurement of level of liquid in tank. List transducers used for each method. **10**

b) List various transducers for measurement of temperature. State one application of each and also mention range of temperature for which it is used. **8**

SECTION – II

7. a) Describe the methods for measurement of flow using

1) Venturimeter

2) Orifice plate. **6**

b) Explain the construction of wire wound strain gauges and derive the expression for the gauge factor. **6**

c) Explain the effect of temperature on strain gauge. **4**

OR

8. a) Draw and explain the construction and working principle of LVDT. State four advantages of LVDT. **6**

b) Describe the construction of foil type strain gauges and explain their advantages over wire wound strain gauges. **6**

c) A resistance wire strain gauge with a gauge factor of two is bonded to a steel structural member subjected to a stress 100 MN/m^2. The modulus of elasticity if steel is 200 GN/m^2. Calculate the percentage change in the value of the gauge resistance due to the applied stress. **4**

9. a) What is an X.Y recorder ? How do you distinguish it from a X-t or Y-t recorder ? Explain with suitable circuit diagram, the working of X-Y recorder. Describe its application. **10**

b) What is the function of an actuator ? Draw and explain the construction, working principle of a direct pneumatic actuator for converting pressure signals into mechanical shaft motion. **6**

OR

10. a) What is the function of recorder ? Describe the working of strip chart recorder. What are the different types of tracing systems used in it ? Explain with the help of suitable diagrams. **10**

b) With block diagram, explain the function of elements of the final control operation. **6**

11. a) State and explain in brief different functions of SCADA systems. What are their common features ? **6**

b) What is PLC ? What are its types ? Explain with suitable examples. **6**

c) Explain the function of remote terminal unit, CRT display and main unit. **6**

OR

12. Write short notes on : (**3×6 each**)

a) Communication for SCADA system

b) Ladder diagram elements with examples

c) Concept of MMI and HMI.

[3962] – 303

S.E. (Elex. & E and TC) (Semester – I) Examination, 2011
NETWORK THEORY (2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **3** questions from Section **I** and **3** question from Section **II.***
*2) Answer to the **two** Sections should be written in **separate** books.*
*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) What are phasors ? The circuit shown operates in sinusoidal state. Find the voltage across capacitor, inductor and resistor using phasor analysis. **6**

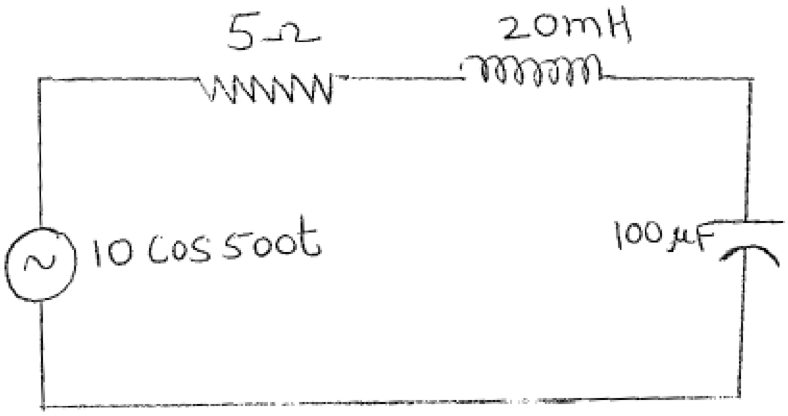


Fig. 1

P.T.O.

b) Find power absorbed by 3Ω and 2Ω resistor in the circuit. Use loop analysis. **6**

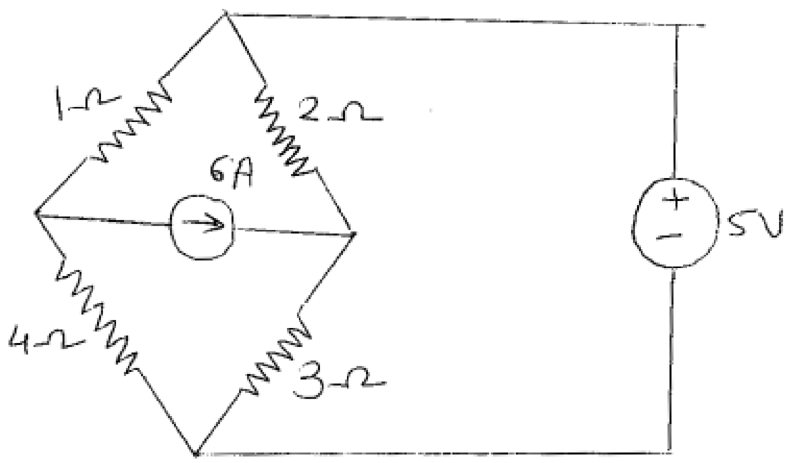


Fig. 2

c) Obtain the Thevenin's equivalent circuit across A – B and hence the current in 10Ω resistor across A – B. **6**

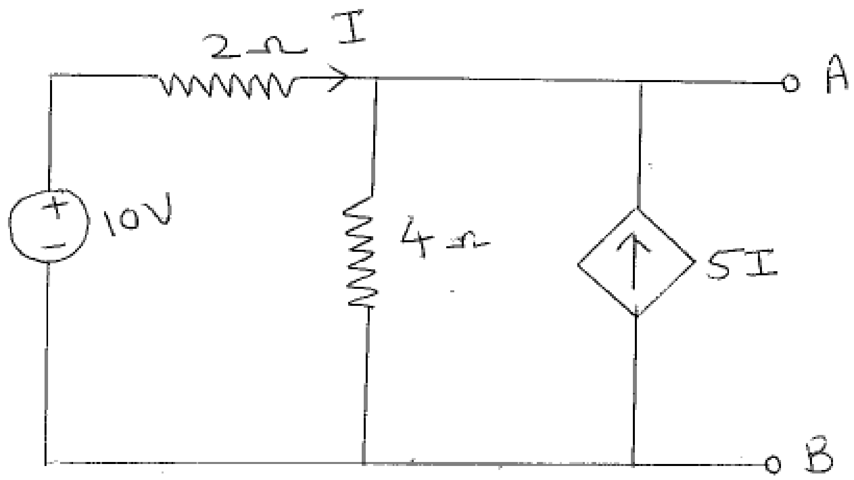


Fig. 3

OR

2. a) State and explain the Norton's Theorem. **4**

b) Use source transformation to find current in 12 Ω resistor. **8**

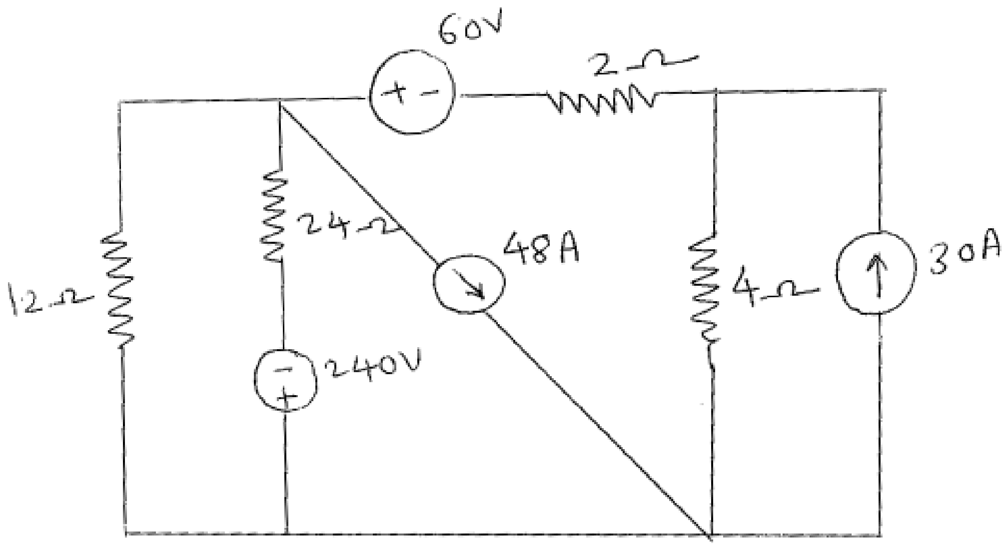


Fig. 4

c) Find the current (I) in the circuit by using superposition theorem. **6**

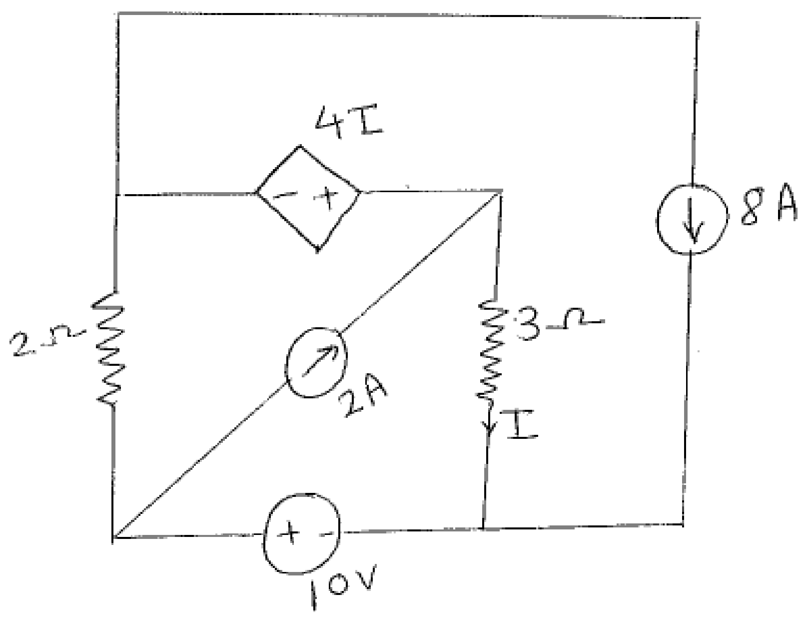


Fig. 5

3. a) Define figure of merit (Q). On what factors it is dependent ? **4**

b) A coil resonates at 2 MHz when 18 pF capacitor is shunted across it. When shunting capacitor is 81 pF the resonating frequency is 1 MHz. Find the distributed capacitance of the coil. What is the self resonating frequency. **6**

c) Find the Band width of antiresonating circuit with following conditions : **6**

1) Q of inductive branch = 100.

2) Frequency of unity power factor = 1 MHz.

3) Value of inductance = 100 μH.

4) Internal generator resistance = 10 KΩ.

OR

4. a) Give practical applications of a series and parallel resonant circuits. **4**

b) A resistor, capacitor and a variable inductor are all in series. The combination is connected to 200 V, 50 Hz supply. The maximum current obtained by varying the inductance is 0.314 A. The voltage across capacitor when the current in the circuit is maximum is 800 V. Find the values of the circuit elements. **6**

c) A parallel resonant circuit has fixed C and a variable inductor (L). Q of the inductor is 4. Find the values of L and C for a circuit impedance of (100 + To) at f = 2.4 MHz. What is the bandwidth at matched condition ? **6**

5. a) What are initial conditions ? The circuit shown is in the steady state with switch (K) closed. At t = 0 it is opened. Find V_k, $\frac{dV_k}{df}$ at t = o^t. **6**

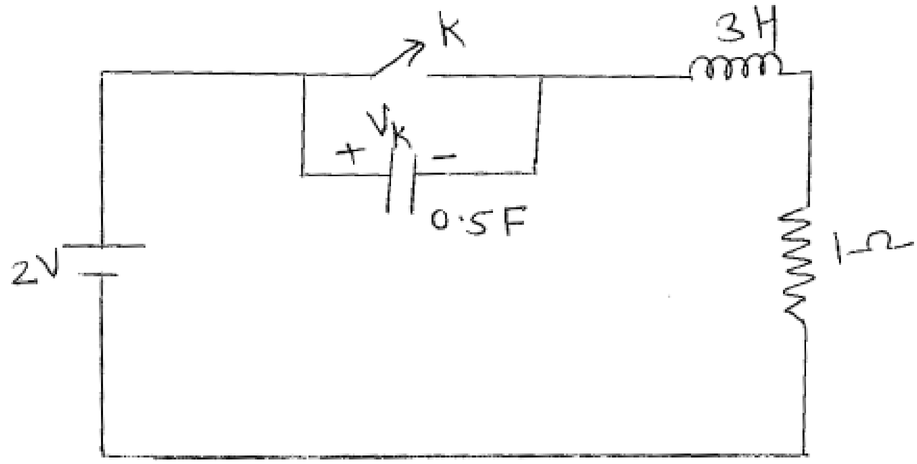


Fig. 6

b) Define rise time, Delay time and time constants of an R-C circuit. **4**

c) Let $V_c(\bar{o}) = 2V$. By using Laplace Transform find voltage V_c (t). **6**

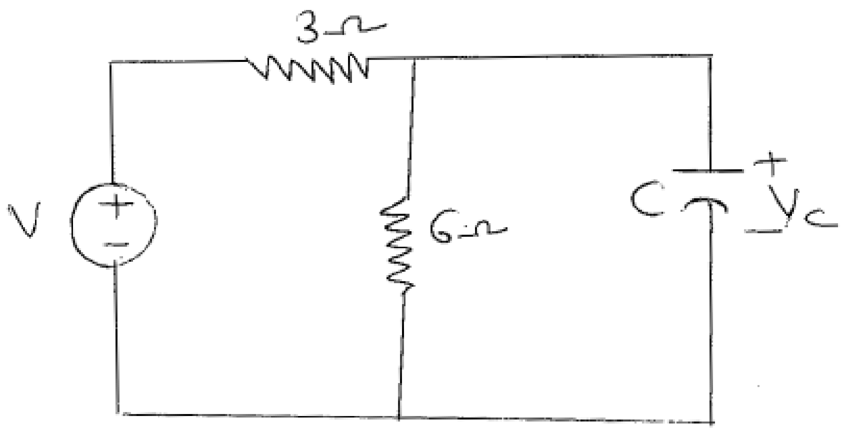


Fig. 7

OR

6. a) Define rise time, Delay time and time constant of an R-L circuit. **4**

b) In the R.C. circuit shown switch is closed at t = 0. Obtain the current j (t) by using Laplace Transform method. **6**

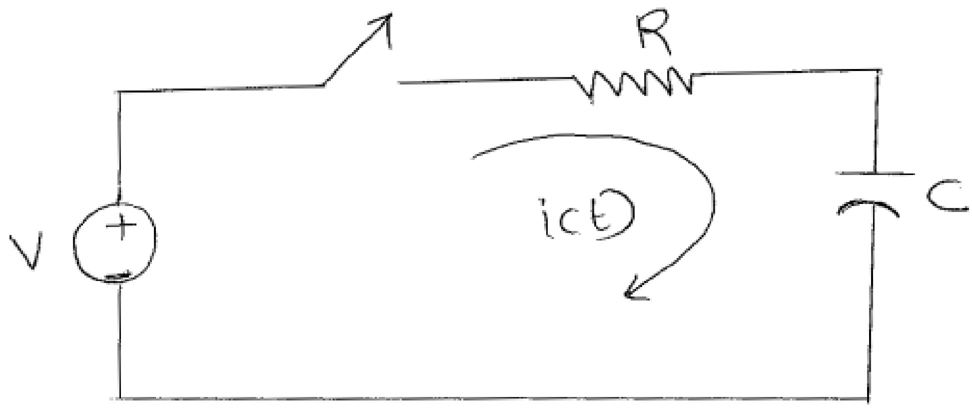


Fig. 8

c) The switch charges from ‘a’ to ‘b’ at t = 0. The switch was on ‘a’ for a long time for t < 0. Using Laplace Transform obtain V_2 (t) and plot it. **6**

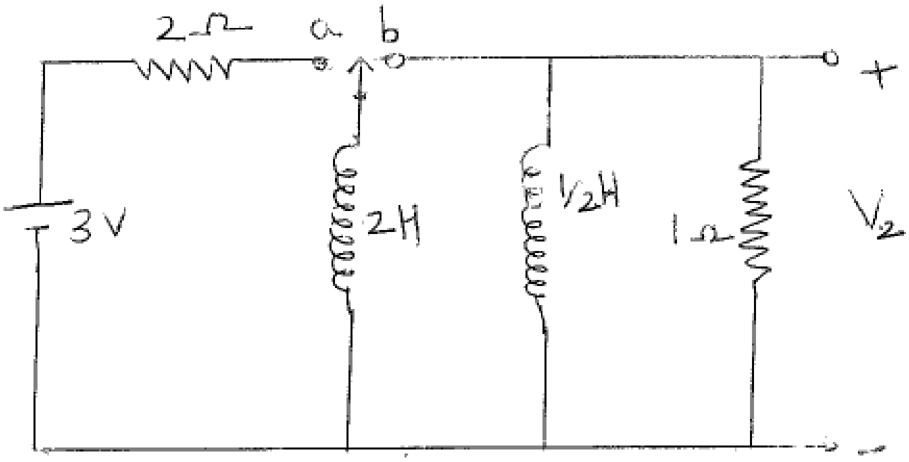


Fig. 9

SECTION – II

7. a) Design a suitable matching section to match a symmetrical T-section having $Z_{OT} = (500 + J_O)\ \Omega$ to the symmetrical Π – section having $Z_{O\pi} = (400 + J_O)\ \Omega$. **5**

b) What is a composite filter ? Design an m-derived T-type Low Pass Filter to work into load of 500 Ω and cut off frequency at 4 KHz with peak attenuation at 4.5 KHz. **7**

c) Give practical applications of attenuators. An symmetrical $\pi - \text{section}$ attenuator has series arm of 275 Ω and each shunt arm of 450 Ω. Determine following quantities :

1) The characteristic impedance of the network.

2) The attenuation provided by the Section. **6**

OR

8. a) State and explain properties of an asymmetrical network. **4**

b) A transmission line has 10 T-section with each T has series arm of 50 Ω and shunt arm of 500 Ω. The line is terminated into its characteristic impedance. An generator of IV and internal resistance of 200 Ω is terminated at the sending end. What will be the voltage and current at the receiving end ? **8**

c) What are disadvantages of prototype filters ? Explain how they are eliminated in m-derived filters. Each of the two series elements of T-type Low Pass filter consists of inductance of 30 mH and shunt element of 0-2 μF capacitor. Calculate the design impedance and cut off frequency. **6**

9. a) Explain various types of network functions. **4**

b) Find the driving point admittance Y (s) and plot the poles and zeros of Y (s). **6**

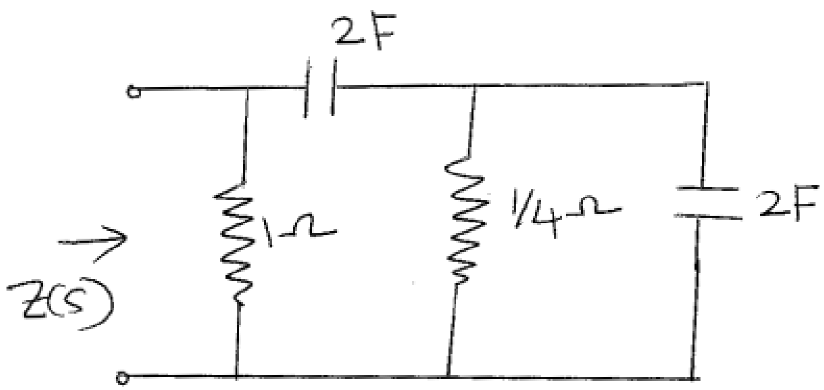


Fig. 10

c) For the function given draw the pole-zero plot and hance obtain the time domain response V (t). **6**

$$V(s) = \frac{5(S+5)}{(S+2)(S+7)}$$

OR

10. a) State and explain properties of driving point functions and transfer functions. **4**

b) Explain how time domain behaviour can be obtained from pole-zero plots. **4**

c) Find the network functions $\frac{V_1}{I_1}$, $\frac{V_2}{V_1}$ and $\frac{V_2}{I_1}$ for the network shown. **8**

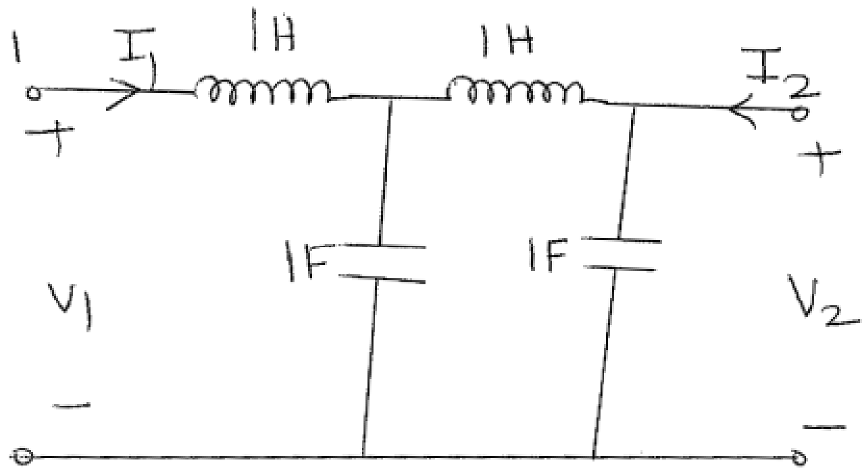


Fig. 11

11. a) Obtain h-parameters in terms of y-parameters. **4**

b) Find the Z and Y parameters of the circuit shown. **8**

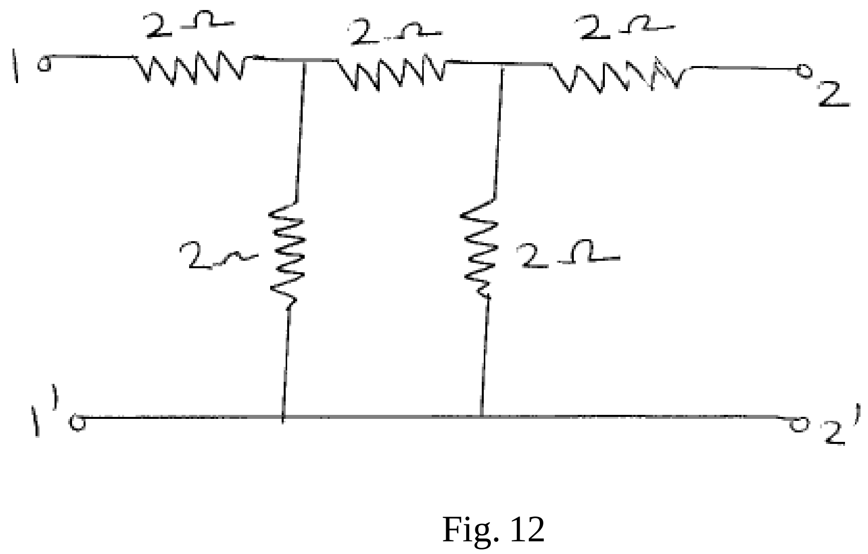


Fig. 12

c) Explain parallel connections of two or more two-port networks. **4**

OR

12. a) Obtain T-parameters in term of h-parameters. **4**

b) Explain the cascaded connection of two or more two-port networks. **4**

c) For the network shown determine h and T parameters. **8**

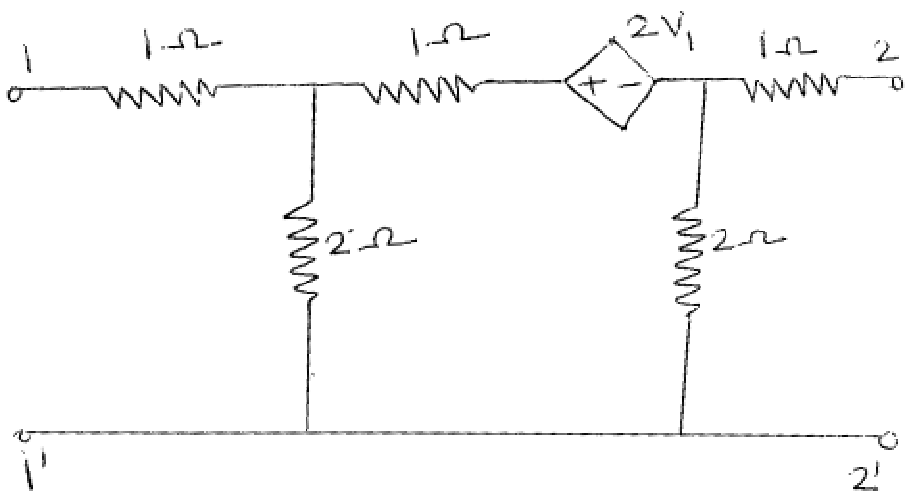


Fig. 13

S.E. (Electronics & E & TC) (Semester – I) Examination, 2011
CONTROL SYSTEM (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 – I

1. a) Explain how control systems are classified ? **8**

b) Obtain the transfer function for the system shown below. **8**

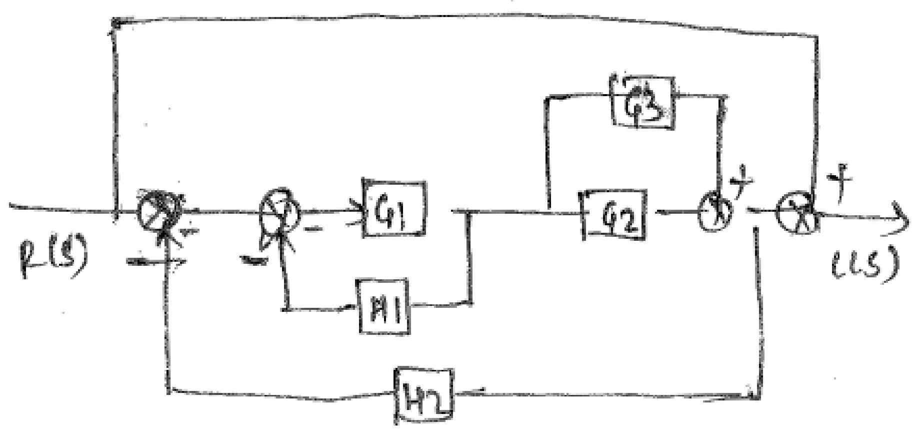


Fig. 1

OR

2. a) Explain Block diagram reduction rules. **8**

b) Using Mason's gain formula find the gain of the following system shown in fig. **8**

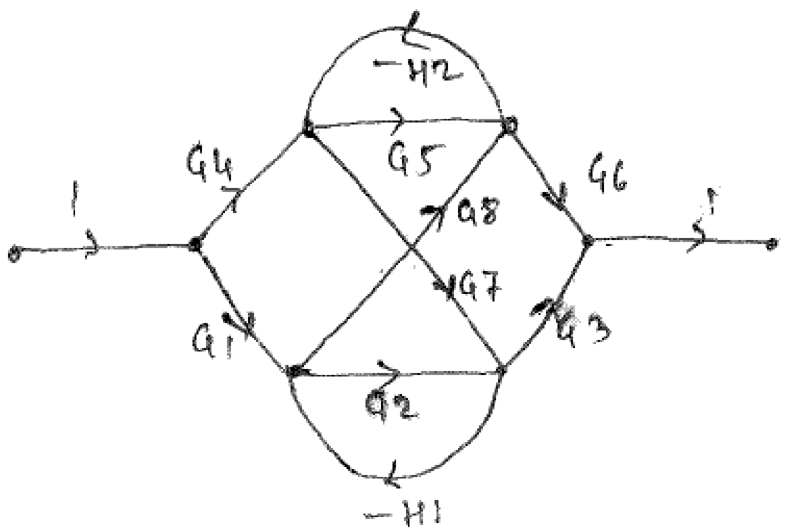


Fig. 2

3. a) Define the following terms :

i) Stable system ii) Unstable system

iii) Critical stable system iv) Marginal stable system. **8**

b) Find kp, kv, ka and steady state error. For a system with open loop transfer function.

as. :- $G(s)H(s) = \dfrac{10(s+2)(s+3)}{s(s+1)(s+5)(s+4)}$

where the input is $r(t) = 3 + t + t^2$. **8**

OR

4. a) Define kp, kv and ka and derive the formulae for each respectively. **8**

b) Sketch the root locus for following open loop function and comment on stability $G(s)H(s) = \dfrac{K}{s^2 + 2s + 2}$. **8**

5. a) Explain the terms : **6**
   i) Phase margin
   ii) Gain margin.

   b) Draw a Bode plot for transfer function G (s). H (s) = 20 (1 + 0.15). **12**

OR

6. a) Define Nyquist stability criteria. **6**

   b) Draw a polar plot of the following system $G(s)\,H(s) = \frac{5}{s\left(s+2\right)}$. **12**

SECTION – II

7. a) What are the advantages of state space analysis over conventional control system analysis. **4**

   b) Define the terms :
   i) State ii) State variable iii) State vector iv) State space. **4**

   c) Obtain a state model of the system with transfer function **8**

$$\frac{Y(s)}{V(s)} = \frac{6}{s^3 + 6s^2 + 11s + 6}$$

OR

8. a) Give the properties of state transition matrix. **8**

   b) Obtain the state model by Foster's form of a system whose T.F. is

$$T.F. = \frac{s^2 + 4}{(s+1)(s+2)(s+3)}.$$ **8**

9. a) What is transducer ? Write a note on resistance thermometer. **8**

   b) Explain error detector using synchros. **8**

OR

10. a) Draw and explain the working of electromagnetic type flowmeter. **8**

    b) Explain the working principle of piezoelectric type transducer. **8**

11. a) A proportional controller is employed for the control of temperature in the range 50° C - 130° C with a set point of 73.5° C. The zero error controller output is 50 %. What will be the offset error resulting from a change in the controller output to 55 % and proportional gain is 2 % find the offset in °C ? **10**

    b) Draw the block diagram of a PLC and explain the function of each block. **8**

OR

12. a) Explain PID action in detail with mathematical equation. **8**

    b) Explain the ladder diagram for washing machine. **10**

————————

B/I/11/615

S.E. (Elex. & E and TC) (Semester – II)
Examination, 2011
ENGINEERING MATHEMATICS – III
(2003 Course) (Common to)
For Semester – I : Electrical, Electrical S/W & Instru.
For Semester – II : E and TC, Computer & I.T.

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 electronic pocket calculator is **allowed**.*
*5) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Solve **any three** : **12**

   i) $(D^4 - 2D^3 - 3D^2 + 4D + 4)\, y = x^2 e^x$

   ii) $(D^2 + 3D + 2)\, y = \sin e^x$

   iii) $(D^2 + 1)\, y = \operatorname{cosec} x$ (by variation of parameters)

   iv) $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2 \sin(\log x)$

   v) $(D^2 + 2D + 1)\, y = 2 \cos x + 3e^x$

   b) An uncharged condenser of capacity C is charged by applying emf of value $E \sin\left(\frac{1}{\sqrt{LC}}\right)t$ through the leads of inductance L and negligible resistance. Find the charge at any time t. **4**

OR

2. a) Solve **any three** : **12**

i) $(D^3 + 2D^2 + D)\, y = e^{2x} + x^2 + x$

ii) $(D^2 + 3D + 2)\, y = e^{e^x}$

iii) $(D^2 + 1)\, y = \frac{1}{1+\sin x}$ (by variation of parameters)

iv) $(2x+1)^2 \frac{d^2y}{dx^2} - 2(2x+1)\frac{dy}{dx} - 12y = 6x$

v) $\frac{dx}{y} = \frac{dy}{-x} = \frac{dz}{xe^{x2} + y^2}$

b) Solve : $\frac{du}{dx} + v = \sin x$

$\frac{dv}{dx} + u = \cos x$. **4**

3. a) Show that $v = 3x^2y - y^3$ is harmonic. Also find its harmonic conjugate and corresponding analytic function f(z) in terms of z. **6**

b) Evaluate : $\oint_c \frac{z^2+1}{(z-2)\,(z^2)} dz$

where C : $|z-2| = 3$: by Cauchy's Integral Formula. **5**

c) Find the bilinear transformation, which maps the points 0, –1, i of the z–plane on to the points 2, ∞, $\frac{1}{2}(S+i)$ of W – plane. **5**

OR

4. a) Prove that : $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|F(z)|^2 = 4|F'(z)|^2$. **5**

b) Evaluate : $\oint_c \frac{2z^2+2z+1}{(z+1)^3(z-3)}dz$;

where C is the circle $|z+1| = 2$; by using residue theorem. **6**

c) Find the mapping of the straight line y = x under the transformation $W = \frac{z-1}{z+1}$. **5**

5. a) Using Fourier integral representation, show that : **6**

$$\int_0^\infty \left[\frac{1-\cos\pi\gamma}{\gamma}\right]\sin\gamma x\, d\gamma = \begin{cases}\frac{\pi}{2}, & 0 < x < \pi \\ 0 ; & x > \pi\end{cases}.$$

b) Find the Fourier sine and cosine transforms of the function $f(x) = x^{m-1}$. **6**

c) Find the z-transform (**any two**) : **6**

i) $f(k) = \begin{cases}0 ; & k < 0 \\ 1 ; & k \geq 0\end{cases}$

ii) $f(k) = \begin{cases}3^k ; & k < 0 \\ 2^k ; & k \geq 0\end{cases}$

iii) $f(k) = \sin\left(\frac{k\pi}{4}+\alpha\right) \; ; k \geq 0$

OR

6. a) Find the inverse z-transform (**any two**) : **6**

i) $\dfrac{z}{(z-1)(z-2)}$ if $|z| \geq 2$

ii) $\dfrac{10z}{(z-1)(z-2)}$ (by inversion integral method)

iii) $\dfrac{z^2}{z^2+1}$

b) Solve the difference equation : **6**

12 f(k + 2) – 7f(k + 1) + f(k) = 0; $k \geq 0$

given f(0) = 0 and f(1) = 3.

c) Find the Fourier sine transform of $\dfrac{e^{ax}}{x}$. **6**

SECTION – II

7. a) Find Laplace transforms of the following (**any three**) : **12**

i) t cosh t sin 2t

ii) $e^{-t} \int_0^t \left(\dfrac{\sin t}{t}\right) dt$

iii) $(t + 1)^2\, u(t - 4)$

iv) $\dfrac{(2t+1)}{3}$, where f(t) = f(t + 3) and $0 \leq t \leq 3$

b) Solve the differential equation by Laplace Transform method

$\dfrac{d^2y}{dt^2} - 4y = 6$ where y(0) = 0, $y'(0) = -6$. **4**

OR

8. a) Find Inverse Laplace Transforms of the following (**any three**) : **12**

i) $\dfrac{2s-1}{s(4s+1)(3s-1)}$

ii) $\tan^{-1}\left(\dfrac{1}{s}\right)$

iii) $\left[\dfrac{s+4}{s^2+4s+29}\right]$

iv) $\left[\dfrac{4s+1}{(s+1)^4}\right]+\left[\dfrac{s^2+10}{s^2+9}\right]$

b) Use convolution theorem, to evaluate

$L^{-1}\left[\dfrac{4}{(s+1)\,(s^2+16)}\right].$ **4**

9. a) Prove the following (**any two**) : **8**

i) $\nabla.\left[r\nabla\left(\dfrac{1}{r^4}\right)\right]=\dfrac{8}{r^5}$

ii) $\nabla^2\left(\dfrac{1}{r}\right)=0$

iii) $\left(\bar{b}.\nabla\left[\bar{a}.\nabla\left(\dfrac{1}{r}\right)\right]\right)=\dfrac{3(\bar{a}.\bar{r})(\bar{b}.\bar{r})}{r^5}-\left(\dfrac{\bar{a}.\bar{b}}{r^3}\right)$

where $\bar{a}, \bar{b}$ are constant vectors.

b) Find the directional derivative of $\phi = x^2y^2z^2$ at point (1, 1, –1) in the direction of tangent to the curve $x = e^t$, $y = 2\sin t + 1$, $z = t - \cos t$ at $t = 0$. **4**

c) Find the angle between the tangents to the curve $x = 2t + 3$, $y = t^2 + 2$, $z = t^3 - 1$ at points $t = 2$, and $t = 3$. **4**

OR

10. a) Show that the vector field

$\overline{F} = 2xyzi + (x^2z + 2y)j + x^2yk$ is irrotational vector field. Hence find a scalar potential function ϕ such that $\overline{F} = \nabla\phi$. **6**

b) If ϕ is a scalar point function, prove that $\text{curl}[\text{grad } \phi] = 0$. **5**

c) Find the angle between two surfaces $z^3 - 5x^2y^2 = 3$ and $2x^2 - 2y^2 = 0$ at the point (1, –1, 2). **5**

11. a) If a vector force $\overline{F} = 2x^2yi + 3xyj$ displaces a particle in xy plane from the point (0, 0) to (1, 4) along a curve $y = 4x^2$, find the work done by the force $\overline{F}$. **5**

b) Verify the Stokes theorem for the vector point function $\overline{F} = x^2i - xyj$ over the surface bounded by planes with boundaries $x = 0$, $y = 0$, $x = a$, $y = a$ in the plane $z = 0$. **7**

c) Verify Greens Lemma for

$$\oint_C (x^2ydx + x^2dy)$$

where C is the boundary of Area A, along the sides of a triangle whose vertices are (0, 0), (1, 0) and (0, 1). **6**

OR

12. a) Use Gauss divergence theorem to evaluate $\iint_s (F.\hat{n})\, dS$ where

$\overline{F} = 4xzi - y^2 j + yzk$ and S is the surface of a cube bounded by planes x = 0, y = 0, z = 0 , x = 1, y = 1, z = 1. **7**

b) Show that the line integral $\int_c (2xy+3)dx + (x^2 - 4z)dy - 4ydz,$ where C is any path joining (0, 0, 0) to (1, –1, 3), does not depend on the path and hence evaluate the integral. **5**

c) Maxwell's equations are given by $\nabla.\overline{E} = 0, \nabla.\overline{H} = 0,$

$$\nabla \times \overline{E} = -\frac{\partial \overline{H}}{\partial t}, \nabla \times \overline{H} = \frac{\partial \overline{E}}{\partial t}$$

Show that $\nabla^2 \overline{H} = \dfrac{\partial^2 \overline{H}}{\partial t^2}$ and $\nabla^2 \overline{E} = \dfrac{\partial^2 \overline{E}}{\partial t^2}$. **6**

———————

S.E. (Elex. and E & T.C.) (Sem. – II) Examination, 2011
DATA STRUCTURE AND FILES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer to* ***two*** *Sections should be written in* ***separate*** *books.*
2) ***Neat*** *diagrams must be drawn* ***whenever*** *necessary.*
3) Figures to the ***right*** *indicate* ***full*** *marks.*
4) Assume suitable data, if necessary.

SECTION – I

1. a) Compare the following parameter techniques with suitable example: **6**
   i) Call by value
   ii) Call by reference

   b) What is recursion ? Write a recursive function for computing n^{th} term of Fibonacci sequence. **8**

   c) What are pointers ? Explain with example. **2**

OR

2. a) Write a function in 'C' using pointers to find the transpose of the matrix. **6**

   b) What is file ? Compare sequential and random access file. **6**

   c) What is the purpose of structure in 'C' ? Compare structure and union. **4**

3. a) Explain memory organisation of arrays. Explain different types of memory. organisation used for two dimensional array. **8**

   b) Write down function in 'C' for Binary search. **8**

OR

4. a) Sort the following list of numbers using quick sort. **8**
   27, 76, 17, 9, 57, 90, 45, 100, 79

   b) What is hashing ? What is overflow ? Why collision handling is required ? Explain linear probing with suitable examples. **8**

5. a) Convert the given infix expressions in postfix form. **6**
   i)c ∗ (a – b ∗ (c/a) + b) + c

   b) Write down two separate ‘C’ functions to add and delete an element from linear queue using array of structure. **8**

   c) Explain circular queue with example. **4**

OR

6. a) What are the advantages of doubly linked list over singly linked list ? Explain with suitable example. **4**

   b) Write a pseudo ‘C’ code for addition of two polynomials using circular link list. **8**

   c) Compare between the following data structures **6**
      i) Linear and non-linear
      ii) Static and dynamic.

SECTION – II

7. a) Write a function in ‘C’ to insert a node in DLL with all possible combinations. **8**

   b) Write down difference between SLL and DLL. **4**

   c) Explain circular DLL with example. **4**

OR

8. a) Differentiate between static and dynamic memory allocation. **4**

   b) Write functions in ‘C’ to delete and insert a node in SLL with all possible combinations. **8**

   c) Write down and explain a node structure in detail for SLL, containing fields as name, roll no, address, marks, status as pass or fail. **4**

9. a) Write pseudo code to traverse a given binary tree in post order without using recursion. **6**

   b) What is threaded binary tree ? Explain the advantages and disadvantages of threaded binary tree. **4**

   c) Construct binary tree for the following data
      Inorder - D – E + C $ B ∗ A – G ∗ F
      Postorder - DE – C + B $ A ∗ GF ∗ –
      Write its preorder traversal. **6**

OR

10. a) Write a 'C' function for counting of nodes in a binary tree. **8**

b) Write a pseudo C code to delete a node in a given binary search tree. **6**

c) Define the following :

i) Binary tree

ii) Complete binary tree. **2**

11. a) Write non-recursive pseudo C code for BFS of a graph. **6**

b) What is spanning tree ? Find minimum spanning tree for following graph using Prim's algorithm. Show step by step result start vertex is 1. (See figure 1). **8**

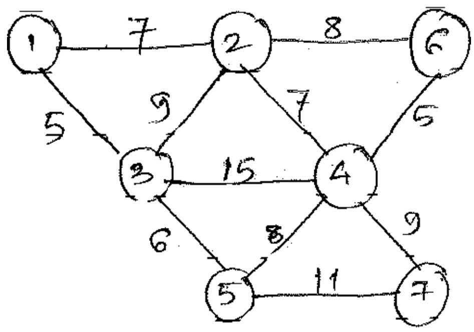


Figure 1

c) What are the different ways of representing graph ? Explain with suitable examples. **4**

OR

12. a) Represent the following graph using adjacency list and find the shortest path using Dijkstra's algorithm. Write all the sequence of steps used in the algorithm. (see figure 2) **8**

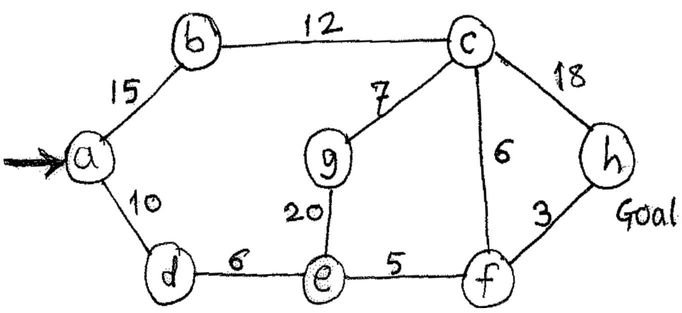


Figure 2

b) Explain the following with example :

i) Subgraph

ii) Adjacency list of graph

iii) Adjacency matrix of graph

iv) Strongly connected component

v) Spanning tree. **10**

———————

S.E. (Elex. and E & TC) (Semester – II) Examination, 2011
ANALOG COMMUNICATION
(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**.*

SECTION – I

1. a) Enlist and explain basic types of modulation techniques. **8**

b) What is baseband signal ? State different types of baseband signals with their range of frequencies. **6**

c) Compare TDM and FDM. **4**

OR

2. a) State various types of communication channels with their bandwidth. Also state application of each. **8**

b) Compare PAM, PWM and PPM. **6**

b) Explain basic block diagram of a communication system. **4**

3. a) Explain high level AM transmitter. **8**

b) Modulating frequencies of 5KHz and 6 KHz are applied to SSB modulator using a carrier frequency of 150 KHz.

1) Sketch the spectrum of output of SSB modulator if the filter method of SSB generation passes the USB.

2) Sketch the output if it passes LSB.

3) Sketch the spectrum of modulating signal. **8**

OR

4. a) Explain any one balanced modulator circuit in detail. **8**

b) An AM transmitter has carrier of 100 kW power and modulated by a modulation index of 75%. Find total power transmitted by the transmitter in the following cases :

1) DSBFC 2) DSBSC 3) SSB **8**

5. a) Explain FM generation by Armstrong method. **8**

b) An angle modulated signal given by

$$V_{FM}(t) = 10 \cos (2\pi \times 10^6 + 20 \sin 2000\pi t)$$

Find :

i) Power of modulated signal

ii) Deviation

iii) Bandwidth. **8**

OR

6. a) Explain FM generation by reactance modulator. **8**

b) Compare :

i) AM and FM

ii) NBFM and WBFM **8**

SECTION – II

7. a) What is tracking ? Explain two-point and three-point tracking. **8**

b) Explain radio receiver characteristics. **6**

c) A superhet receiver is tuned to 455 KHz. Its local oscillator provides mixer with an input of 1045 KHz. Calculate image frequency. **4**

OR

8. a) Explain superheterodyne receiver in detail. **10**

b) Draw and explain practical diode detector. **8**

9. a) Explain internal and external sources of noise. **8**

b) Three amplifiers have the following characteristics :

$F_1 = 9$ dB $G_1 = 45$ dB

$F_2 = 6$ dB $G_2 = 35$ dB

$F_3 = 4$ dB $G_3 = 15$ dB

The amplifiers are connected in tandem. Determine the overall noise figure and equivalent noise temperature. **8**

OR

10. a) Explain performance of DSBSC in presence of noise. **8**

b) Explain the terms :

i) Noise figure ii) Noise temperature

iii) Noise bandwidth iv) Signal to noise ratio. **8**

11. a) State different types of propagation and explain them. **8**

b) Draw and explain Yagi Uda antenna. State its application. **8**

OR

12. a) Explain half wave dipole antenna. **6**

b) Explain fading with its causes. **6**

c) Define : **4**

1) Virtual height 2) Skip distance.

———————

[3962] – 311

S.E. Instrumentation and Control (Semester – I) Examination, 2011
ANALOG TECHNIQUES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer to the* ***two*** *Section should be written in* ***separate*** *answer book.*
2) Neat diagrams must be drawn ***wherever*** *necessary.*
3) Figures to ***right*** *indicate* ***full*** *marks.*
4) Assume suitable data if necessary.

SECTION – I

1. a) Explain the Physical structure of BJT. With the help of a neat labeled diagram, explain the working and plot the input-output characteristics for CB configuration of a transistor. **10**

b) Design a fixed bias circuit, that is, find R_B and R_C so that $I_B = 40\mu A$ and $V_{CE} = 6V$. Given : $V_{cc} = 12$ V, $\beta = 80$ and $V_{BE} = 0.7$ V. **6**

OR

2. a) What are biasing circuits ? State and draw neat labeled circuit diagrams of various biasing circuits. **8**

b) Define stability factor. On what all factors does the stability factor depend ? **4**

c) Differentiate between BJT and FET. **4**

3. a) Draw the hybrid equivalent circuit of a transistor in CE configuration and derive the expression for the h-parameters. **10**

b) Explain the various coupling methods in Multistage Amplifier. **6**

OR

4. a) Explain Cascode amplifier with a neat diagram. **6**

b) Why are bypass and coupling capacitors required ? What is AC degeneration ? **10**

P.T.O.

5. a) Explain and derive the expression for differential mode gain A_{DM} and common mode gain A_{CM} of a differential Amplifier. **8**

b) Explain the block diagram, equivalent circuit and ideal characteristics of the operational amplifier. Design a circuit using op-amp for unity Gain. **10**

OR

6. a) Explain the following terms related to OP AMP :

i) Slew Rate

ii) CMRR

iii) Offset voltage

iv) UGB. **8**

b) Design a non-inverting amplifier for a gain of 11. If the OP AMP used is 741, calculate the value of the common mode gain. **5**

c) Differentiate between inverting and non-inverting amplifiers using OP AMPs. **5**

SECTION – II

7. a) Explain the working of a Wein bridge oscillator. Derive the expression for frequency of oscillation and the value of the gain required for sustained oscillations. **10**

b) Calculate the frequency of a BJT phase shift oscillator for R = 6K, C = 1500 pF and Rc = 18KΩ. **6**

OR

8. a) State and explain the various types of oscillators. **8**

b) Compare and draw neat labeled diagrams of Wein bridge and Phase shift oscillator. **8**

9. a) Define power conversion efficiency and derive its expression for idealized V-I characteristics. **7**

   b) Explain the terms :

      i) Junction Temperature

      ii) Thermal Resistance

      iii) Power derating curve. **9**

OR

10. a) Elaborate on how are power amplifiers classified ? **8**

    b) Explain the working of Class B amplifier with a neat labeled diagram. **8**

11. Write short note on (any **3**) : **18**

    1) Photo Transistor

    2) Triac

    3) UJT relaxation oscillator

    4) Series regulator using transistor.

OR

12. a) Explain how the voltage regulation is achieved in zener series regulator. **6**

    b) Explain the characteristics of SCR, based on its transistor model. Also draw its semiconductor equivalent. **6**

    c) Explain the working of solar cell and photovoltaic cell with neat diagrams. **6**

———————

[3962] – 312

S.E. (Instrumentation and Control) (Semester – I) Examination, 2011
MATERIALS AND PROCESSES FOR SENSORS
(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 – I

1. a) Explain the properties and applications of Tungsten. **8**

b) Enlist the guidelines for material selection of Thermocouple. **8**

OR

2. a) Explain the properties and applications of Copper. **8**

b) Enlist the guidelines for material selection of mercury filled thermometer. **8**

3. a) Explain the effect of frequency on dielectric material. **8**

b) Enlist the applications of piezoelectric material. **8**

OR

4. a) Explain the applications of dielectric material. **8**

b) Explain the properties of elastic materials. **8**

5. a) Explain the types of Corrosion. **8**

b) What is corrosion rate ? Explain its significance in engineering application. **6**

c) Which are the factors affecting the protectiveness of the oxide film ? **4**

OR

6. a) List various methods of corrosion control and explain any two of them in detail. **10**

b) Explain the term service performance of ceramic. **8**

SECTION – II

7. a) Explain the magnetic field and magnetic induction. **8**

b) Give properties and applications of soft magnetic materials. **8**

OR

8. a) Discuss effect of temperature on ferromagnetism. **8**

b) Discuss the material selection criteria for LVDT. **8**

9. a) Enlist various materials used for Laser and compare the performance of Lasers based on spectral response and optical power. **8**

b) Write a note on materials for fiber-optic cables. **10**

OR

10. a) What are various requirements of fiber optic materials ? **8**

b) Write a note on Bio-materials. **10**

11. a) Explain Ion plating. **8**

b) What is electroplating ? Explain its use and any one technique in detail. **8**

OR

12. a) Compare thick and thin film technology. **8**

b) Write a note on types of Stainless steels. **8**

[3962] – 314

S.E. (Instrumentation and Control) (Semester – I) Examination, 2011
BASIC INSTRUMENTATION
(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) Write notes on following : **12**
   i) Units and standards
   ii) Dynamic characteristics of measuring instruments
   iii) Virtual Instrumentation.

   b) A multimeter is having sensitivity of 1500Ω/V and used to measure voltage across a circuit having an output resistance of 10 KΩ. Open circuit voltage is 8V. Find the reading of meter when it is set to 15V range. Also find % error. **4**

OR

2. a) Explain Accuracy and precision in detail. **8**

   b) Voltage across 20 KΩ resistor is to be measured by a voltmeter having sensitivity of 1000Ω/V Range of meter is 75V. Determine the accuracy of voltmeter Refer Fig.1. **8**

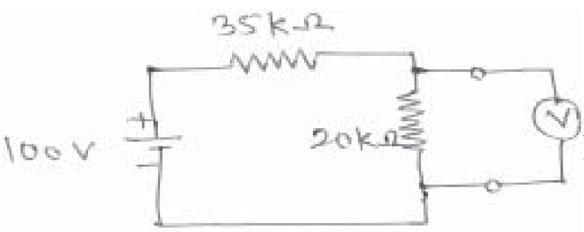


Fig. 1

P.T.O.

3. a) What is traceability ? Explain traceability chart. **8**

b) Write a note on “Calibration uncertainty Ratio”. **8**

OR

4. a) Explain Electrostatic discharge control. **6**

b) Write the technical system requirements for a calibration laboratory. **8**

c) Give colour scheme for calibrated instruments. **2**

5. a) Derive an expression for extension of range of an ammeter. How to eliminate the effects due to change in temperature ? **6**

b) Explain “Vibration Galvanometer”. **4**

c) The resistance of slide wire AB in a simple potentiometer is 100Ω and its length is 100 cm. The working battery emf is 3V and has negligible resistance. The potentiometer is calibrated at 50.95 cm with a standard cell of 1.0190 V. Determine

i) Current through slide wire and a variable register R1 in series with working battery.

ii) Unknown emf when null point is obtained at 84.30 cm. **8**

OR

6. a) Explain self balancing potentiometer. **8**

b) Design a series ohmmeter for

E = 3.2 V, ammeter resistance = 200Ω.

FSD of meter = $100\mu A$ and half scale deflection resistance is 5000Ω.

Also determine half scale deflection when ‘E’ is reduced by 20%. **6**

c) Compare PMMC and moving Iron instruments. **4**

SECTION – II

7. a) Derive an equation for measuring impure inductor in Maxwell's inductance capacitance bridge. State advantages and disadvantages. **8**

b) Describe an expression for sensitivity of Wheatstone is bridge and state the condition for which it will be maximum. **10**

OR

8. a) Explain Schering bridge, **8**

b) A highly sensitive galvanometer can detect a current as low as 10 nA. This is used in Wheatstone is bridge excited by 10V. Calculate the smallest change in resistance which can be detected by galvanometer having negligible resistance. All the arms of bridge have 1000 Ω resistance. **10**

9. a) Classify analog recorders and explain magnetic tape recorder. **10**

b) Write a note on Lissajous Pattern. Also draw the patterns obtained if phase varies from 0° to 360° in steps of 30°. **6**

OR

10. a) Explain strip-chart recorder. Give any two applications. **8**

b) Write a note on CRT. **8**

11. a) Explain inclinometer. **8**

b) With neat diagram explain digital caliper. **8**

OR

12. a) Explain three point shaft gauging. **6**

b) Explain : **10**

i) Allowance ii) Deviation

iii) Tolerance iv) size

v) Line standard

[3962] – 315

S.E. (Instrumentation and Control) (Semester – II) Examination, 2011
DIGITAL TECHNIQUES
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *i) Answers to the **two** Sections should be written in **separate** answer books.*
*ii) **Neat** diagrams must be drawn **wherever** necessary.*
*iii) Figures to the **right** indicate **full** marks.*
*iv) Assume **suitable** data, if **necessary.***

SECTION – I

1. a) Convert the following : **8**
   i) $(214)_{10}$ to octal
   ii) $(3FD)_H$ to binary
   iii) $(0.582)_H$ to decimal
   iv) $(3509)_{10}$ to hexadecimal.

   b) Perform following arithmetic functions : **4**
   i) $(19B9)_{16} + (C7E6)_{16} =$
   ii) $(317)_8 + (613)_8 =$

   c) i) Convert gray code 101011 into its binary equivalent. **2**
   ii) Convert $(592)_{10}$ to excess-3code. **2**

OR

2. a) Do the following conversions. **8**
   i) $(11101.11)_2$ to decimal number.
   ii) $(684)_{10}$ to hexadecimal number.
   iii) $(19.6)_{10}$ to binary number.
   iv) $(110011)_2$ into hexadecimal number.

   b) i) Add $(3F8)_H$ and $(5B3)_H$. **2**
   ii) Add $(167)_8$ and $(325)_8$. **2**

   c) Using Quine Mc Cluskey method simplify the following expression.
   $D = f(a, b, c, d) = \sum(0,1,2,3,6,7,8,9,14,15)$. **4**

P.T.O.

3. a) Convert the following : **8**
   i) SR flipflop to T flipflop
   ii) JK flipflop to D flipflop.

   b) i) Compare SRAM and DRAM
   ii) Compare PROM and PLA. **8**

OR

4. a) What is contact bounce phenomenon ? Explain how basic SR flipflop constructed using NAND gate can be used to avoid contact bounce phenomenon. **8**

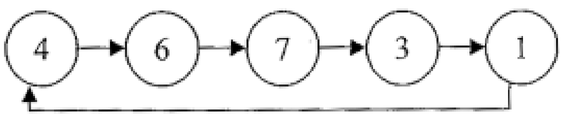
   b) Write a note on PAL programming. **8**

5. a) i) Compare synchronous counter and Asynchronous counter. **10**
   ii) Design divide by 6 counter using T flipflop.

   b) Design MOD-22 counter by using IC 7493. Draw connection diagram and explain the reset logic. **8**

OR

6. a) Design nonsequential Synchronous counter for avoid lockout condition. **10**



   b) Design divide by 86 counter by using IC 7490. **8**

SECTION – II

7. a) Implement the following function using 4 : 1 multiplexer
   $F = \sum m\ (0, 1, 3, 4, 8, 9, 15)$. **8**

   b) In a multi digit display system explain the concept of trailing zero blanking and leading zero blanking. **8**

OR

8. a) What is multiplexed display system ? What are the advantages and limitations of it over a nonmultiplexed system ? **8**

   b) Design 4 : 16 decoder using two 3 : 8 decoders. **8**

9. a) Explain different schemes for interfacing TTL to CMOS. **8**

   b) Write a note on Tristate logic. **8**

OR

10. a) Draw the circuit diagram and explain the operation of 2 input TTL NAND gate with totem pole output. **8**

    b) Explain the working of CMOS NOR and CMOS NAND gate with appropriate circuit. **8**

11. Design a digital clock that display seconds, minutes and hour. Show the detail design along with IC'S selected. **18**

OR

12. Generate the following pulse train, where the desired pulse train is 010111. **18**

———————

[3962] – 316

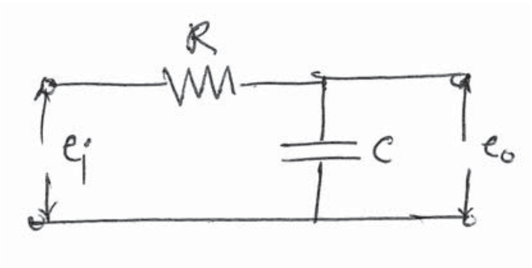
S.E. (Instru. and Control) (Semester – II) Examination, 2011
AUTOMATIC CONTROL SYSTEMS
(2003 Course)

Time: 3 Hours   Max. Marks: 100

SECTION – A

1. a) Define and explain following w.r.t. control system **6**
   i) Open loop and close loop control system.
   ii) Linear and non linear control system.

   b) Define transfer function. Find transfer function of following networks and drawforce-voltage analogus. **10**



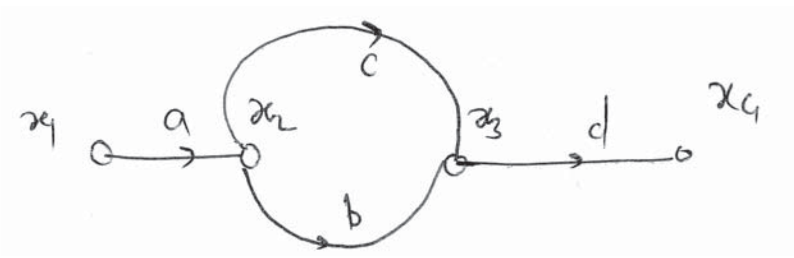
networks :

What are the contraints of transfer function approach ?

OR

2. a) Identify following systems as open loop and close loop systems and justify your answer . **10**
   i) Toaster ii) Microwave oven iii) Traffic control system iv) Television set v) Electronic gun vi) Cassete tape player vii) Hair dryer viii) Camera (auto focus) ix) Video recorder

   b) **6**

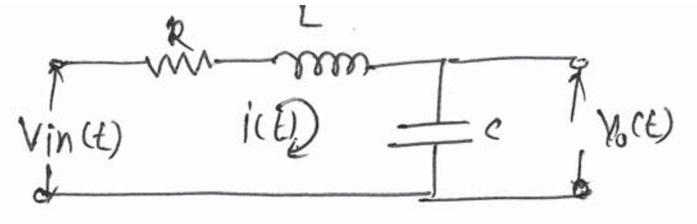


Compute x_4/x_1 using Masson's Gain formula.

P.T.O.

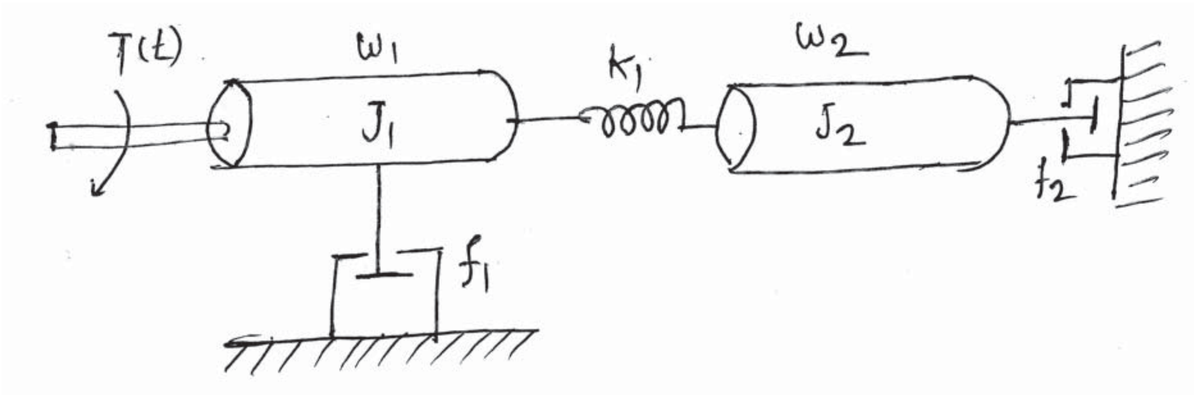
3. a) Explain force-voltage-current analogy. **8**

b) Calculate T.F. of following network. **8**



OR

4. a) Draw the electrical analog of the mechanical rotational system. **8**



b) Write a short note on loading effects in inter connected systems. **8**

5. a) Explain significance of poles and zeros of the systems. **6**

b) Explain the specifications/characteristics parameter of second order underdamped system for step response. **12**

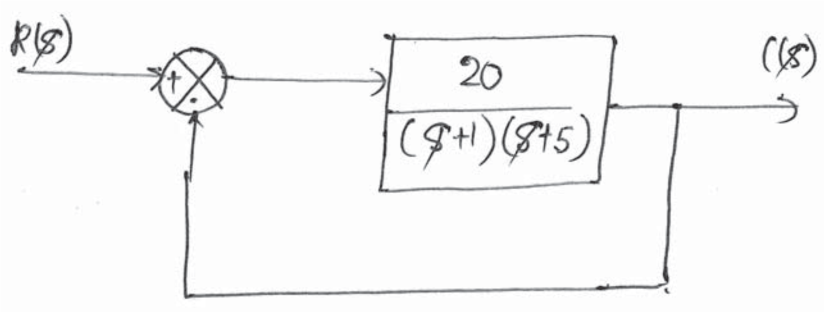
i) Rise time ii) Steady state time/settling time

iii) Peak time iv) delay time/dead time

v) Peak overshoot vi) Fall time.

OR

6. a) A block diagram of a unity feedback control system, is shown in figure. **10**



Determine the characteristic equation of the system, ω_n, ξ, ω_d, t_p, m_p, the time at which the first undershoot occurs, time period of oscillations and the number of cycles completed before reacting the steady state.

b) Determine the stability of a closed-loop control system whose characteristic equation is. **8**

$$s^5 + s^4 + 2s^3 + 11s + 10 = 0$$

SECTION – B

7. a) Write a short note on time domain and frequency domain correlation. **6**

b) Construct bode plot for the system whose open loop transfer function is given by **10**

$$G(s)H(s) = \frac{4}{s(1+0.5s)(1+0.08\,s)}$$

Determine a) the gain margin b) the closed loop stability.

OR

8. a) Define gain margin and phase margin of a system. **6**

b) Sketch the Bode plot for the open-loop transfer function for unity feedback system given below and assess stability **10**

$$G(s) = \frac{50}{(s+1)(s+2)}$$

Calculate gain margin and phase margin of the system.

9. a) What is Root Locus ? **2**

The open-loop transfer function of a control system is given by **10**

$$G(s)\,H(s) = \frac{K}{s(s+6)(s^2+4s+13)}$$

Sketch the root locus and determine

a) The break away points

b) The angle of departure from complex poles

c) The stability condition.

b) Write a short note on Compensator. **4**

OR

10. a) State and explain Mapping theorem. **6**

b) Define stability. State and explain Nyquist criteria for stability of a control system. **10**

11. a) Advantages of state space approach over classical methods. Explain in brief. **6**

b) Write down the properties of state transition matrix. **6**

c) Define following : **6**

i) State

ii) State variable

iii) State trajectory

iv) State model.

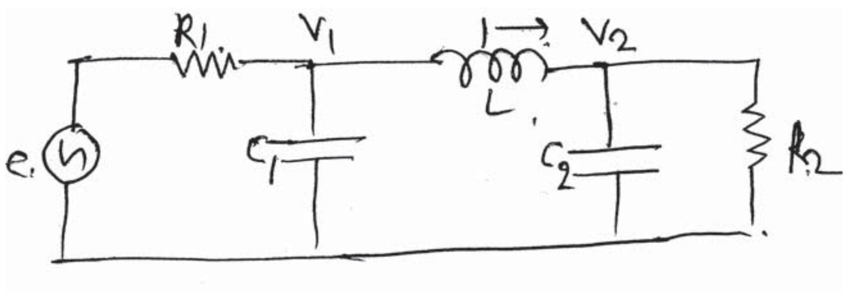
OR

12. a) Define following and explain in brief. **8**

i) State vector

ii) State space

iii) Block diagram of state equation.

b) 

10

Show/compute state space representation of electrical network.

S.E. (Instru. and Control) (Semester – II) Examination, 2011
LINEAR TECHNIQUES
(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. A) Enlist important characteristics of op-amp - (any 8). **8**

B) How to plot frequency response of op-amp ; explain. **10**

OR

2. Draw and explain practical experimental way to determine any two characteristics of op-amp with neat circuit diagrams. **18**

3. A) We want to subtract signal A from signal B using op-amp subtractor circuit. Draw and explain circuit how to do the same. **8**

B) How input voltage is converted into output current using operational amplifiers; explain in detail any one of two types (floating load and grounded load). **8**

OR

4. A) How to design a Schmitt trigger ; explain with example. **8**

B) How ZCD works ; explain or explain how precision rectifier works. **8**

5. A) Draw internal block diagram of IC 555 timer and explain its working. **8**

B) How to design an astable multivibrater using IC - 555 ? State steps in design. **8**

OR

6. A) Write a short note on IC 8038. **8**

B) What is Barkhausen criteria ? Design a Wein bridge oscillator with suitable data. **8**

SECTION – II

7. Draw frequency responses of ideal low pass, high pass, band pass, band reject filter. Also draw their practical approximate responses. **16**

OR

8. A) State design steps in active low pass filter. **8**

   B) How to design active band pass filter ; explain. **8**

9. Enlist different types of ADCs, and DACs. Explain any one technique of ADC and DAC conversion in detail. **16**

OR

10. A) What are internal components of a VCO ? Explain. **8**

    B) What is PLL ? What is centre frequency of a PLL ? Explain internal block diagram of a PLL IC. **8**

11. A) Draw basic voltage regulator using op-amp and explain how it regulates load voltage. **10**

    B) Write a short note on IC 723. **8**

OR

12. Write short notes on : **18**

    A) IC 78 XX

    B) AD 590 or LM 334

    C) LM336

———————

[3962] – 318

S.E. (Instrumentation and Control) (Semester – II) Examination, 2011
SENSORS AND TRANSDUCERS – II
(2003 Course)

Time : 3 Hours   Max. Marks : 100

Instructions : *1) Answer **any one** question from **each** Unit.*
*2) Answer 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) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***

SECTION – I

Unit – I

1. a) Define :
   1) Reynolds Number   2) Beta Ratio
   3) Laminar Flow   4) Turbulent Flow. **8**

   b) Describe Pitot tube with merits and demerits. **8**

OR

2. a) Describe mathematical expression of flow rate for ultrasonic flow meter. **8**

   b) Explain electromagnetic flow meter. **8**

Unit – II

3. a) Compare orifice, venture and flow nozzles. **8**

   b) Discuss solid flow measurement applications. **8**

OR

4. a) Derive mathematical expression for hot wire anemometer. **8**

   b) Explain Rotameter. **8**

P.T.O.

Unit – III

5. a) Explain ultrasonic level measurement with mathematical derivation. **10**

b) Compare float and displacer level measurement. **8**

OR

6. a) Explain air bubbler density measurement with mathematical derivation. **10**

b) Explain Hydrometer. **8**

SECTION – II

Unit – IV

7. a) Explain with suitable diagram calibration set up of accelerometers. **8**

b) Explain photo electrical pulse counting method for angular velocity measurement. **8**

OR

8. a) Explain piezoelectric accelerometers. **8**

b) Describe capacitive tachometer. **8**

Unit – V

9. a) Explain with suitable diagram, Redwood viscometer. **8**

b) Explain : 1) pH 2) Conductivity 3) Viscosity 4) Cell constant. **8**

OR

10. a) Give classification of Viscosity. State their units. **8**

b) State methods of conductivity measurement. Explain any one. **8**

Unit – VI

11. a) Compare various methods of thickness measurement. **8**

b) Explain hygrometer with merits and demerits. **10**

OR

12. a) Explain Ultrasonic thickness measurement with mathematical derivation. **10**

b) Describe dew point humidity meter. **8**

———————

S.E. (Printing Engg. and Communi. Tech.) (Sem. – I) Examination, 2011
PRINTING AND ALLIED TECHNIQUES
(2003 Course)

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 the following terms : **8**
   i) Font of type ii) Series of type
   iii) Family of type iv) x-height.

   b) Comment on the following : **8**
   i) Spacing ii) Use of all capitals
   iii) Line length iv) Line end decision.

OR

   a) Legibility and Readability are the two sides of the one coin called Typography, explain with suitable examples. **8**

   b) Explain the effective use of Alphabets in the Print communication with suitable examples. **8**

2. a) Explain the Projection and Contact Photographic technique with suitable diagrams. **8**

   b) Explain various parts of the camera with suitable diagram. **8**

OR

   a) Explain the various types of original used in Process Photography. **8**

   b) Explain the method of preparing the screen by Direct-Indirect. **8**

3. a) Explain how Pre-Sensitized plates are prepared. **9**

b) Explain the nature of different image carriers used in different printing processes with suitable diagrams. **9**

OR

a) Explain any one method of preparing the screen without using the photographic technique. **9**

b) Explain the working of exposing used in screen making with suitable diagram. **9**

SECTION – 2

4. a) Explain the machine configurations of Letterpress printing process with suitable diagrams. **8**

b) Explain the machine configurations of Gravure printing process with suitable diagrams. **8**

OR

a) Explain the machine configurations of Flexographic printing process with suitable diagrams. **8**

b) Explain the machine configurations of Offset printing process with suitable diagrams. **8**

5. a) List down various post printing operations (minimum 10 operations). **8**

b) Explain various print finishing operations requires in the manufacturing of greeting cards. **8**

OR

a) Explain the method of creating a raised effect using screen printing process. **8**

b) Explain the method of lamination of printed paper with suitable diagram. **8**

6. a) Explain the Pad printing process with suitable diagram. **9**

b) Explain the purpose of Bar code in various applications. **9**

OR

7. a) Explain the Gravure-Inkjet Printing Technology in detail. **9**

b) Explain the Lenticular process with suitable diagram. **9**

[3962] – 325

S.E. (Ptg. Engineering and Communi. Tech.) (Sem. – II) Examination, 2011
PRINTING MACHINE MANUFACTURING PROCESSES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *1) **All** questions are **compulsory**.*
*2) **Assume** suitable data, **if** necessary.*

SECTION – I

1. a) What is alloy steel ? Why are alloying elements added to steel ?

State the effects of important alloying elements in steel. **8**

b) List the important properties of nonferrous metals and alloys. **8**

OR

a) What is the difference between cast iron, wrought iron and steel ? **8**

b) State why cutting alloys are superior to high-speed steels. **8**

2. a) State the principle of centrifugal casting and state its advantages and limitations. **8**

b) Explain the various allowances provided on pattern. **8**

OR

a) Explain in short the various moulding methods. **8**

b) Explain the pattern layouts. **8**

3. a) Draw a neat sketch and explain the various elements of single point cutting tools. **8**

b) Explain the centre lathe principle by drawing a block diagram of lathe. **8**

c) Explain adaptive control. **2**

OR

a) Write a note on set-over method of taper turning. **5**

b) What is alathe carriage ? Explain its various parts with the help of sketch. **8**

c) Explain the working principle of CNC M/c. **5**

P.T.O.

SECTION – II

4. a) Describe with sketches different operations performed on milling machine. **8**

   b) Differentiate between up-milling and down-milling. **8**

OR

   a) Describe with sketches the different operations performed on Drilling M/c. **8**

   b) Explain twist drill terminology. **8**

5. a) Explain in detail the Grinding wheels specifications. **8**

   b) Write a note on centreless grinding machine. **8**

OR

   a) Differentiate between Shaper and Planer. **8**

   b) Explain in short slotting machine. **8**

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

   a) Line and end standard

   b) Errors in measurement

   c) Vernier height gauge

   d) Angle gauges.

———————

S.E. (Ptg. Engg. & Commni. Tech.) (Semester – II) Examination, 2011
MICROPROCESSOR TECHNIQUES AND PERIPHERAL INTERFACE
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. a) Draw and explain the Block diagram of 8085 in detail. **10**

   b) Explain any four following pins of 8085 in detail. **8**

TRAP	ALE
RST 7.5	INTR
SID	RESET
RESET OUT	CLK

OR

2. a) Write short notes on : **10**

   1) IC 74245 2) IC 74138.

   b) Differentiate between the following : **8**

   1) I/O Mapped I/O and Memory Mapped I/O

   2) Software and Hardware interrupts.

3. a) Explain what operation will take place when the following instructions are executed **8**

   PUSH

   SHLD

   LXI H

   RST

   b) Write an assembly language program to divide 8 bit number by 8 bit number and store the result in memory. Draw flow chart. **8**

OR

4. a) Draw and explain the timing diagram of MVI A, 80H. (Use graph paper). **8**

   b) Write a program to add the two numbers from memory location 7000 h to 2000 h. Store it at location 3000 h (Draw flowchart). **8**

5. a) Draw and explain the flag register of 8085. Explain each flag in detail with example. **8**

   b) Write an assembly language program to subtract two numbers, 06 and 09, Assume suitable registers. **8**

OR

6. a) What is the difference between JMP and CALL instruction ? Explain in detail with example. **8**

   b) Explain the SIM and RIM instruction in detail. **8**

SECTION – II

7. a) Explain I/O modes of 8255 in detail. **10**

   b) Draw and explain block diagram of 8155 in detail. **8**

OR

8. a) Draw block diagram of 8279. Explain the interfacing with keyboard. **10**

   b) Draw and explain block diagram of 8259 in detail. **8**

9. a) Draw and explain DMA controller chip 8257. Explain the advantages with printing application. **8**

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

      1) Significance of SOD and SID pins

      2) Asynchronous and Synchronous data transfer.

OR

10. a) Draw and explain block diagram of 8251 in detail. Explain its use in any printing application. **8**

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

1) RS 232C

2) RS 485.

11. a) Explain roller display using 8085. **8**

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

1) Application of Microprocessor in printing technology

2) Stepper motor control using Microprocessor.

OR

12. a) Explain PLC in detail. State its application in printing technology. **8**

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

1) Printer interface with 8085

2) Floppy disk controller.

B/I/11/100

[3962] – 328

S.E. (Ptg. Engg. and Communi. Tech.) (Semester – II) Examination, 2011
THEORY OF PRINTING MACHINES
(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) Assume ***suitable*** *data, if* ***necessary****.*

SECTION – I

1. a) Explain Geneva mechanism with neat sketch. **6**

b) State inversions of single slider crank chain. Explain any two. **10**

OR

2. a) Define :

i) Kinematic link.

ii) Kinematic pair.

iii) Kinematic chain.

iv) Mechanism.

v) Machine.

vi) Inversion. **6**

b) Explain the working of Oldham's coupling with neat sketch. **6**

c) Draw a neat sketch of Ratchet and Pawl arrangement and state applications. **4**

P.T.O.

3. Figure 1 shows a combined four bar and slider mechanism in which crank AB rotates at a uniform speed of 420 rpm. Determine :

   i) The velocity and acceleration of slider F.

   ii) Angular velocity and angular acceleration of link FB. **16**

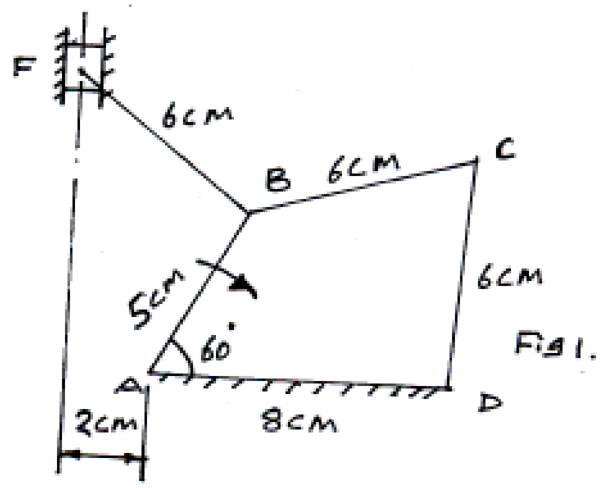


Fig. 1

OR

4. Figure 2 shows the toggle mechanism in which crank OA rotates at a uniform speed of 105 rpm in clockwise direction. Determine the velocity and acceleration of slider P. **16**

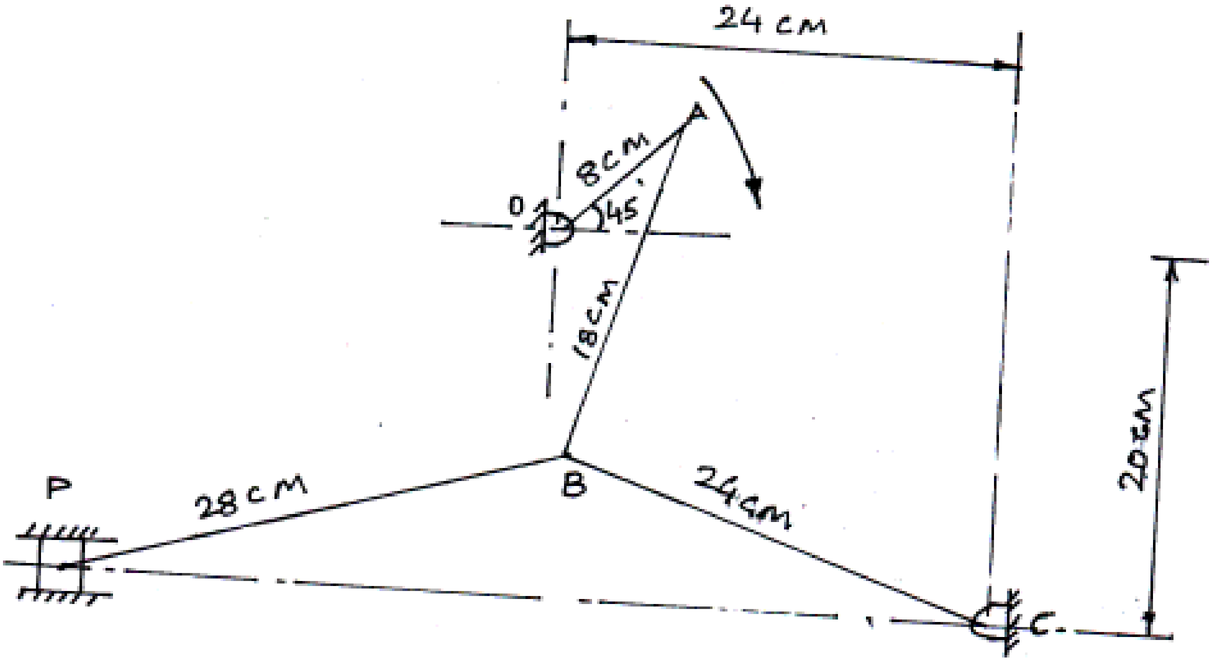


Fig. 2

5. In the mechanism shown in fig. 3, crank OA rotates uniformly at 15 rad/sec counter clockwise. Find acceleration of slider F. Dimensions are OA = 100 mm, AB = 400 mm, AC = 150 mm, CE = 350 mm, EF = 300 mm. **18**

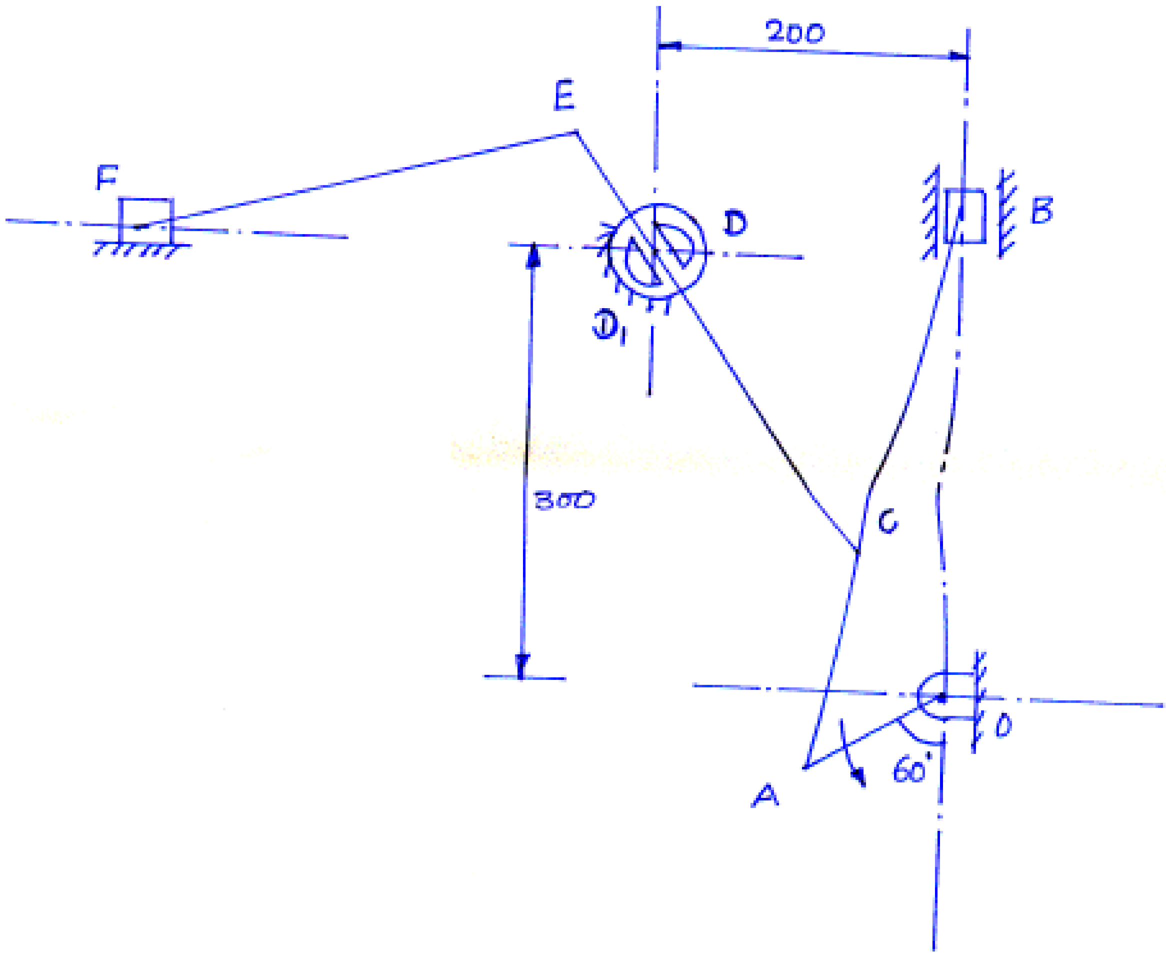


Fig. 3

OR

6. In the mechanism shown in Fig. 4, crank OA rotates uniformly at 10 rad/sec in clockwise direction.

Find :

a) Acceleration of slider B

b) Angular acceleration of slotted lever DP

OA = 300 mm, OC = 600 mm, CD = 300 mm, BD = 750 mm. **18**

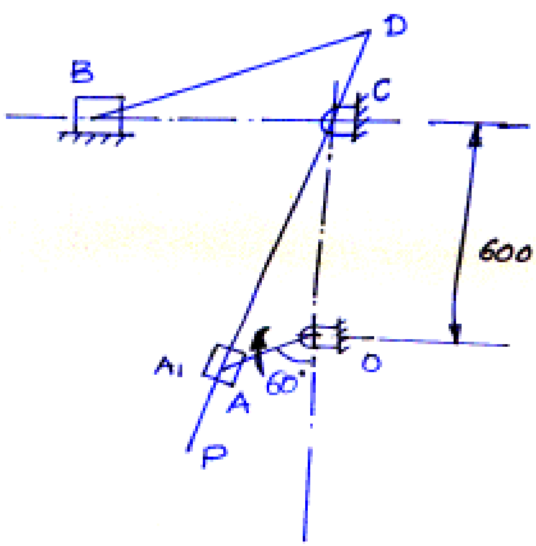


Fig. 4

SECTION – II

7. a) Explain the working of single plate clutch with neat sketch. **8**

b) Derive the expression for torque transmitting capacity of a multiplate clutch based on uniform wear and uniform pressure theory. **8**

OR

8. a) State the laws of static friction. **4**

b) 100 kW is transmitted at 3000 rpm by a multiple disc friction clutch. The plates are in oil and have the friction surface of steel and phosphor bronze alternatively, $\mu = 0.07$ and the axial intensity of pressure is not to exceed 1.5 bar. External radius is 1.25 times the internal radius, and the external radius is 125 mm. Determine the number of plates needed to transmit the required torque. Assume uniform wear. **12**

9. a) Derive the expression for ratio of tensions on tight and slack sides of band and block brake. **10**

b) A band and block type of brake having 12 blocks each of which subtends an angle of 18° at the drum center, is applied to a rotating drum of diameter 800 mm. The blocks are 100 mm thick. The drum and the flywheel mounted on the same shaft together have a mass of 1600 kg and have a combined radius of gyration fo 500 mm. The two ends of the band are attached to the pins on the opposite sides of the brake fulcrum at a dist. of 35 mm and 140 mm from the fulcrum. The coefficient of friction between blocks and drum is 0.3. A force of 150 N is applied at a distance of 800 mm from the fulcrum to apply the brake. Find :

i) The maximum torque.

ii) the angular retardation of the brake drum. **6**

OR

10. a) Explain self locking and self energizing of brakes. **8**

b) A simple band brake is operated by a lever of length 500 mm. The brake drum has a diameter of 500 mm and the brake band embraces 5/8 of the circumference. One end of the band is attached to the fulcrum of the lever, while the other end is attached to a pin on the lever 100 mm from the fulcrum. If the effort applied to the end of the lever is 2 kN and the coefficient of friction is 0.25. Find the maximum braking torque on the drum. **8**

11. a) Derive expression of limiting tension ratio for flat belt drive. **6**

b) Explain the meaning of initial tension in belt drive and the effect of initial tension on the power transmission. **6**

c) Differentiate between maximum and greatest power transmitted by belt drive. **6**

OR

12. a) Compare belt drive with chain drive. **6**

b) Two parallel shafts having centre distance 5 m are connected by open flat belt drive. The pulley diameters are 1.6 m and 1 m. When the drive is stationary, the tension in the belt is adjusted to 3 kN. The belt has mass 1.5 kg/m length. The coefficient of friction between belt and pulley is 0.3. Calculate the power transmitted when the faster pulley rotates at 400 rpm. **12**

———————

S.E. (Chemical) (Semester – I) Examination, 2011
PROCESS CALCULATIONS
(2003 Course) (Common to Biotech)

Time : 3 Hours Max. Marks : 100

Instructions : *I) Answers to the **two** Sections should be written in **separate** books.*
*II) **Neat** diagrams must be drawn **wherever** necessary.*
*III) Black figures to the **right** indicate **full** marks.*
*IV) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*V) Assume suitable data, **if necessary.***

SECTION – I

1. a) The iron metal whose weight is 500 pounds occupies a volume 29.25 litres, calculate the density of iron metal expressed in kg / m^3. **4**

b) Determine the weight percentage of the constituent elements of potassium sulphate. **4**

c) Carburetted water gas has the following composition by volume : Hydrogen 35.2 %, Methane 14.8 %, Ethylene 12.8 %, Carbon dioxide 1.5 %, Carbon monoxide 33.9 % and Nitrogen 1.8 %. The gas is available at 101.3 kN / m^2 and 300 K. Express the composition by wt % and determine the average molecular weight and density of the gas. **8**

OR

2. a) A compound is found to contain 62.4 % Ca and 37.6 % C.
i) How many gram atoms of Ca and C present in 100 gm of the compound ?
ii) Suggest an empirical formula for the compound. **6**

b) Calculate the molality of a solution of 93 % H_2SO_4 (W/V). The density of the solution is 1840 kg / m^3. **5**

c) A sample of limestone is found to contain 54.5 % CaO (by mass). If this CaO is present as $CaCO_3$ in the limestone, find the content of $CaCO_3$ in the limestone. **5**

P.T.O.

3. The feed to an absorption column consists of 20 % H_2S and the balance inert. Only H_2S is removed from the gas by absorbing in an alkaline solution. The gas enters the absorber at 600 kPa and 310 K and leaves at 500 kPa and 290 K containing 2 % H_2S. If H_2S is removed at the rate of 100 kg / hr, calculate i) the volume of gas (in m^3) entering per hour, ii) the volume of gas (in m^3) leaving per hour, iii) percentage recovery of H_2S. **16**

OR

4. a) Crystals of $MgCl_2.6H_2O$ have solubility of 190 gm per 100 gm ethanol at 298.15 K. It is desired to make 1000 kg of saturated solution. Calculate the quantities of the crystals and ethanol required to make the above solution. Also, find the composition of saturated solution by mass. **8**

   b) A mixture of $CuSO_4.5H_2O$ and $FeSO_4.7H_2O$ weighs 100 gm. It is heated in an oven at 378 K to evaporate water of hydration. The mass of mixture after removal of water is 59.78 gm. Calculate the mass ratio of $CuSO_4$ to $FeSO_4$ in the mixture. **8**

5. Pure sulphur is burnt in a burner at the rate of 0.3 kg/sec. Fresh dry air is supplied at 303 K and 100 kPa. The gases from the burner contain 16.5 % SO_2, 3.5 % O_2 and rest N_2 on SO_3 - free volume basis. The gases leave the burner at 1073 K and 101.3 kPa absolute. Calculate (a) the fraction of sulphur burnt into SO_3 (b) the percentage excess air over the amount required to oxidise the sulphur to SO_2 and (c) the volume of dry air in m^3/sec. **18**

OR

6. A mixture of pure carbon dioxide and hydrogen is passed over a nickel catalyst. The temperature of the catalyst bed is 588 K and the reactor pressure is 2 MPa g. The analysis of the gases leaving the reactor showed CO 57.1 %, H_2 41.1 %, CH_4 1.68 % and CO 0.12 % (by volume) on a dry basis. The reactions taking place in the reactor are :

$$CO_2 + 4\,H_2 = CH_4 + 2\,H_2O$$

and $CO_2 + \quad H_2 = CO + H_2O$

Find (a) the conversion of CO_2 per pass (b) yield of CH_4 in terms of CO_2 reacted and (c) the composition of the feed. **18**

SECTION – II

7. a) Heat capacity of gaseous SO_2 is given by

$$C^{0}_{mp} = 43.458 + 10.634 \times 10^{-3}\,T - 5.945 \times 10^{5}\,T^{-2}\ \text{kJ / kmol.K}$$

Calculate the heat required to raise the temperature of 1.0 kg pure SO_2 from 300 to 1000 K. **8**

b) In the ferrite process for the manufacture of caustic soda, soda ash and gangue from pyrites roaster are mixed and heated. The following reaction takes place and CO_2 evolves. Calculate the standard heat of reaction at 298.15 K.

$$Na_2CO_{3\,(s)} + Fe_2O_{3\,(s)} = Na_2O.Fe_2O_{3\,(s)} + CO_{2\,(g)}$$

Given Data : Std Heat of formation at 298.15 K

Component	ΔH_f kJ / mol
1. Na_2CO_3 (s)	– 1130.68
2. Fe_2O_3 (s)	– 817.30
3. $Na_2O.Fe_2O_3$ (s)	– 1412.20
4. CO_2 (g)	– 393.51

8

OR

8. Oil is to be extracted from meal by a continuous counter-current extractor. The unit is charged with 1000 kg/hr meal based on oil-free solids. Untreated meal contains 0.4 kg oil and 0.025 kg benzene per kg oil-free meal. A fresh solvent is benzene containing 1.5 % oil (mass %). The ratio of the fresh solvent to the oil-free meal is kept at 0.065 kg/kg. The solid meal retains 0.507 kg solution per kg solid. The solution retained by the meal contains 11.83 % oil (by mass). Make a complete material balance and find the composition and the amount of overflow from the extractor. **16**

9. An air conditioning plant is employed to maintain 300 K DBT and 50 % RH in an auditorium. The air flow rate to the auditorium is measured to be 5.806 m^3 / sec at 290 K at 83.5 % RH. The effluent air from auditorium is partially recycled and is mixed with the incoming fresh air. The fresh air is fed at the rate of 1.25 m^3 / sec at 308 K having 70 % RH. The mixed air is found to have 302.5 K at DBT and 54 % RH and is passed through a/c plant to make it suitable for auditorium. The total pressure can be assumed to be 101.3kPa.

Calculate :

a) Moisture added in auditorium / removed in a/c plant.

b) The recycle ratio.

c) Moles of air recycled per mole of fresh ambient air. **18**

OR

10. a) A solution of ethyl alcohol containing 8.6 % alcohol is fed at the rate of 1000 kg / h to a continuous distillation column. The product (distillate) is a solution containing 95.5 % alcohol. The waste solution from the column carries 0.1 % of alcohol. All percentages are by mass. Calculate the mass flow rates of top
and bottom products in kg / h and the percentage loss of alcohol. **10**

b) A crystallizer is charged with 7500 kg of an aqueous solution at 377 K, 29.6 % by mass 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 $Na_2SO_4.10\ H_2O$ crystallize out. If the mother liquor is found to contain 18.3 % (by mass) anhydrous Na_2SO_4. Calculate the yield of crystals and the quantity of mother liquor. **8**

11. A coal sample from Godavari colliery has the following proximate and ultimate analyses.

Proximate Analysis	**mass %**	**Ultimate Analysis**	**mass %**
Moisture	7.0	Carbon	54.0
Volatile matter	26.0	Hydrogen	3.0
Fixed Carbon	46.0	Sulphur	0.4
Ash	21.0	Nitrogen	2.2
		Ash	21.0
		Oxygen (by diff)	19.4

The gross calorific value = 23392 kJ / kg at 298.15 K.

Calculate :

a) The net hydrogen in the coal,

b) The combined water in the coal,

c) GCV based on the Dulong formula, and

d) NCV of the coal. **16**

OR

12. The purge gas obtained from ammonia synthesis loop has the composition H_2 – 69 %, N_2 – 23 %, Ar – 2.7 %, and CH_4 – 5.3 % (mole basis). It is burnt with 20 % excess air. Calculate (a) the GCV and NCV at 298.15 K of the purge gas, (b) theoretical air required, and (c) the molar composition of the flue gases.

GCV and NCV of CH_4 is 890.65 and 802.62 kJ / mol respectively.

Latent heat of water vapour at 298.15 K = 2442.5 kJ / kg. **16**

Atomic weights : Fe = 55.8, Ca = 40, Na = 23, K = 39, S = 32, Mg = 24, Cu = 63.5.

———————

[3962] – 336

S.E. (Chemical) (Semester – II) Examination, 2011
CHEMISTRY – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *i) Answer **3** questions from Section **I** and **3** questions 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) Give classification of carbohydrates. **6**

b) Explain secondary structure of proteins with proper figure. **6**

c) Define the following terms with one example
i) Zwitter ion
ii) Co-enzyme. **4**

OR

2. a) Draw Hawarth's projection formula for
i) Maltose ii) Amylopectin iii) Cellulose **6**

b) Write short note on **any two** :
i) Isoelectric point
ii) Enzyme specificity
iii) Tertiary and quarternary structure of proteins. **6**

c) Starting from glucose how will you prepare **4**
i) Saccharic acid ii) Sorbitol

P.T.O.

3. a) How will you synthesize

i) Acetylene from ethylene

ii) Acetone from acetaldehyde

iii) Acetic acid from methyl chloride. **6**

b) Explain synthesis of alkene from

i) Alkynes

ii) Alkylhalides

iii) Alcohols. **6**

c) Complete the following reactions stepwise

i) $H-\underset{\underset{O}{\|}}{C}-H \xrightarrow[\text{(ii) } H^{+}/H_2O]{\text{(i) } CH_3MgBr}$ (iii) $K_2Cr_2O_7/H_2SO_4$

ii) $CH_3-\overset{\overset{Br}{|}}{C}H-CH_3 \xrightarrow[\text{(ii) } O_3]{\text{(i) alcoholic KOH}}$ (iii) $Zn–H_2O$ **4**

OR

4. a) Explain synthesis of alcohol from

i) Ketones

ii) Acids

iii) Alkenes. **6**

b) How will you synthesize the following compounds from acetic acid ?

i) Ethyl alcohol

ii) Ethyl acetate

iii) Acetamide. **6**

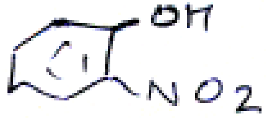
c) Complete the following reaction stepwise

i) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3 \xrightarrow[\text{(ii) } SOCl_2]{\text{(i) } ZiAlH_4}$

ii) $CH_3-\overset{\overset{\displaystyle OH}{|}}{CH}-CH_3 \xrightarrow[\text{(ii) } H_2/Ni]{\text{(i) } H_2SO_4}$ **4**

5\. a) Explain the electronic transitions responsible for absorption in the u.v. region. **7**

b) How will you distinguish the following pairs with the help of IR spectroscopy ?

i)  and 

ii) CH_3CH_2COOH and $CH_3CH_2COOCH_3$ **4**

c) Predict the product

i) $CH_3\ CH = CH_2 \xrightarrow{B_2H_6}$

ii) $C_2H_5\ COCH_3 \xrightarrow{KOCl}$

iii)  $\xrightarrow{Na/Ethanol}$

iv) $CH_3\ CH_2\ NO_2 \xrightarrow[HCl]{SnCl_2}$ **4**

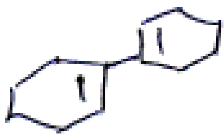
d) Explain one use of

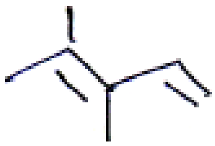
i) Potassium dichromate

ii) Tollen's reagent. **3**

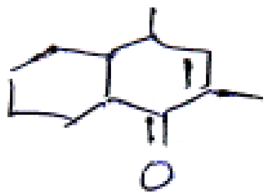
OR

6. a) Using Woodward-Fisher rule calculate λ_{max} for the following :

i) 

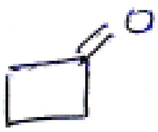
ii) 

iii) 

iv)  **6**

b) i) Following two ketones show carbonyl IR absorption at 1784 and 1664 cm^{-1} which is which and why ? **4**

A



c) Predict the product for the following reactions

i)  $\xrightarrow[\text{ethanol}]{\text{Na}}$

ii) $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_3 \xrightarrow{SeO_2}$

iii) $CH_3-NO_2 \xrightarrow{ZiAlH_4}$

iv) $CH_3-CH_2-OH \xrightarrow[\text{Chlorochromate}]{\text{Pyridinium}}$ **4**

d) Explain one use of the following reagents
   i) Aluminium tertiary butoxide
   ii) Copper chromite. **4**

SECTION – II

7. a) i) Give shapes of d-orbitals.

   ii) State quantum numbers of last electron in chromium atom and Ni^{++}. **4**

b) Explain the postulates of extended VBT by Pauling-Slator with respect to electron exchange and resonance. **4**

c) Give basic principles of molecular orbital theory. **4**

d) Explain the structure of BCl_3 on the basis of hybridization theory. **4**

OR

8. a) Draw the MO energy level diagram of O_2 molecule and calculate bond order of O_2^- ion. **4**

b) Compare the bonding molecular orbital and antibonding molecular orbital. **4**

c) Give the pictorial representation of BMO and ABMO for σ and π bonds formed by p-orbitals. **4**

d) Explain structure of SF_6 molecule. **4**

9. a) Calculate O.S. and EAN of central metal ion in
   i) $[Cr\ (NO_2)_2\ (H_2O)_4]^+$ ion
   ii) $[Fe\ (CN)_6]^{-4}$ ion. **4**

b) Draw the structures of :
   i) Trinitrito-triammine cobalt (III)
   ii) Penta carbonyl iron (0)
   iii) Hexa-amido manganate (II) ion
   iv) Di-ethylenediamine copper (II) ion. **4**

c) Calculate CFSE for $[CoF_6]^{-3}$ and $[Cr\ (NH_3)]^{+3}$ **4**

d) Explain structure of $[Cu(NH_3)_4]^{+2}$ on the basis of VBT. **4**

OR

10. a) Calculate 'spin only' magnetic moment of

i) Fe^{+3}

ii) Ni^{+2} **4**

b) Explain how CFT is applicable for magnetic character and colours of co-ordination complexes. **4**

c) Explain structure and magnetic nature of $[Mn\ Cl_4]^{-2}$ on the basis of VBT. **4**

d) Give a note on "crystal field splitting in tetrahedral complexes". **4**

11. a) Shortly account on "Redox Indicators". **4**

b) Explain the titration curve for pH-metric titration of weak acid – strong base. **5**

c) Calculate weight of $K_2Cr_2O_7$ required to prepare 2.5 litres of 0.25 N solution.

(At wt K = 39, Cr = 52, O = 16 and change in O.S. of chromium atom = 3 each) **4**

d) Calculate the pH of the mixture when 40 ml of 0.1 N HCl is added to 60 ml of 0.125 N NH_4OH, if dissociation constant of NH_4OH is 1.8×10^{-5}. **5**

OR

12. a) Explain a potentiometric titration curve in redox titration with suitable example. **4**

b) 25 ml of a solution containing Na_2CO_3 and NaOH, requires 10.5 ml of 0.1 N HCl upto phenolphthalein end point and further 3.9 ml upto methyl orange end point, in the titration. Calculate amounts of Na_2CO_3 and NaOH in the solution. **4**

c) 50 ml of 0.2 N acetic acid solution is titrated against 0.15 N NaOH solution. Dissociation constant of acetic acid is 2×10^{-5}. Calculate the pH of titration mixture at following stages of titration :

i) When 30 ml of NaOH solution added. **3**

ii) At equivalence point of titration. **2**

iii) When 75 ml of NaOH solution added. **2**

d) What volume of stock solution of 0.5 N $KMnO_4$ will be required to prepare 5 litres 0.025 N $KMnO_4$ solution, by dilution. **3**

B/I/11/180

S.E. (Chemical) (Semester – II) Examination, 2011
HEAT TRANSFER
(Common to Bio-Tech.)
(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**, Q.**7** or Q.**8**, Q.**9** or Q.**10** and 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 **righ**t 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 : **9**
   i) Fourier's law ii) Newton's law of Cooling iii) Stefan-Boltzmann's law.

   b) Give the physical significance of the following dimensionless groups : **9**
   i) Reynolds number ii) Prandtl number iii) Nusselt number.

OR

2. a) Explain in detail "Modes of Heat Transfer". **6**

   b) Calculate temperature at an interior point of the wall at a distance 15 cm from inner surface of wall. The temperatures of the inner and outer surface are 200°C and 80°C respectively. The thickness of the wall is 0.5 m. **6**

   c) Explain any one method of Dimensional Analysis. **6**

3. a) Derive the heat flow equation for steady state heat conduction through composite cylinder. **8**

   b) A hollow sphere of 24 mm inner diameter and 36 mm outer diameter is subjected to constant heat flow of 2.12 kW. In inner surface temperature is 390°K, find the temperature of outer surface and temperature at a distance of 16 mm from the centre of the sphere. Thermal conductivity of the material is 85 W/m°K. **8**

OR

4. a) Derive the heat flow equation for steady state heat conduction through composite wall. **8**

   b) A hollow cylinder of 20 mm inner diameter and 30 mm outer diameter is maintained at 350°k (outer surface temperature) and 420°k (inner surface temperature). Determine the heat loss per unit length and also determine the temperature at a distance of 3 mm from outer surface towards the center. (Thermal conductivity of material is 50 W/m°K). **8**

5. a) Distinguish between : **8**

   i) Individual and overall heat transfer coefficient

   ii) Natural convection and Forced convection.

   b) Air at 300°C and atmospheric pressure is heated as it flows through a tube with a diameter of 25 mm at a velocity of 12 m/sec. Calculate the heat transfer rate per unit length of tube if a constant heat flux condition is maintained at the wall which is at 32°C above the air temperature, over entire length of the tube. Calculate the rise in bulk temperature over a 3.3 m length of the tube. **8**

   Properties of air are

   i) Dynamic viscosity = 29.7×10^{-6} Kg/m.sec.

   ii) Thermal conductivity = 0.0461 W/m°K.

   iii) Prandtl Number = 0.674

   iv) Cp = 1.047 KJ/Kg°K

   v) Density = 0.615 Kg/m^3.

OR

6. a) Derive Nusselt's equation of condensation. **8**

   b) Air at 27°C and 1 atm. Flow over a flat plate at a velocity of 2 m/sec. The viscosity of air at 27°C is 1.85×10^{-5} Pa.s. Assume unit depth. If the plate is maintained at 60°C. Calculate the heat transferred per unit time in the first 0.4 m of the plate. Properties of air are **8**

   i) Kinematic Viscosity = 17.36×10^{-6} m^2/sec.

   ii) Thermal conductivity = 0.0275 W/m°K.

   iii) Prandtl Number = 0.7

   iv) Cp = 1.006 KJ/Kg°K.

SECTION – II

7. a) A 50 mm internal diameter iron pipe at 423°K passes through a room in which the surroundings are at temperature of 300°K. If the emissivity of the pipe metal is 0.8, what is the net interchange of radiation energy per meter length of pipe ? The outside diameter of pipe is 60 mm. **9**

b) Explain the following : **9**

i) Specular and Diffuse Reflection

ii) Radiation shields

iii) Wien's displacement law.

OR

8. a) It is observed that the value of the radiation emitted by the sun is maximum wavelength of 0.58 microns. Estimate the temperature of surface of sun and emissive power. Consider sun to be a black body. **8**

b) Discuss the following : **10**

i) Electromagnetic spectrum

ii) Black body

iii) Emissive power

iv) Opaque body

v) Emissivity.

9. a) What is LMTD ? Derive LMTD for counter current flow heat exchanger. **8**

b) 20 kg/s of water at 360°K entering a heat exchanger is to be cooled to 340°K by using cold water at 300°K flowing at rate of 25 kg/sec. If the overall heat transfer coefficient is 1500 $w/m^{2}°k$ and c_p for water is 4187 J/Kg°K. Calculate heat transfer area required in **8**

i) Co current flow concentric pipe heat exchanger

ii) Countercurrent flow concentric pipe heat exchanger.

OR

10. a) What is Heat exchanger ? Give the detail classification of heat exchangers. **8**

b) In oil cooler 60 gm/sec of hot oil enters a thin metal pipe of diameter 25 mm, an equal mass of cooling water flows through the annular space between the pipe and a large concentric pipe, the oil and water moving in opposite directions. The oil enters at 420°K and is to be cooled to 320°K. If water enters at 290°K, what length of pipe is required ? Take heat transfer coefficient of 1.6 kW/m^2K on the oil side and 3.6 kW/m^2K on water side. Specific heat capacity of oil is 2 kJ/kg°K and that of water is 4.18 kJ/kg°K. **8**

11. a) A solution of organic colloids in water is to be concentrated from 8% to 45% in a single effect evaporator. Steam is available at a gauge pressure of 1.03 atm. A pressure of 102 mm Hg absolute is to be maintained in the vapor space. The feed rate to the evaporator is 12,000 kg/hr. The overall heat transfer coefficient can be taken as 2800 W/m^2.°C. The solution has a negligible elevation in boiling point and a negligible heat of dilution. Calculate (a) steam consumption (b) the economy and (c) the heating area required. **8**

b) What is Evaporation ? Draw a neat sketch and explain any one evaporator. **8**

OR

12. a) 1000 kg/hr of a dilute solution is to be concentrated from 10% to 40% by weight in a single effect evaporator. The feed is available at 25°C. Boiling point of the solution may be considered as 100°C. Specific heat capacity of dilute solution is 4180 J/kg°K; Latent heat of vaporization of water is 2239 kJ/Kg, saturated steam corresponding to 1.8 bar pressure and 117°C is available for heating purpose. Latent heat of condensation of steam is 2212 kJ/kg. If the overall heat transfer coefficient for the system is 850 W/m^2°K. **12**

Calculate :

i) The quantity of water evaporated

ii) Steam consumed and steam economy

iii) Surface area of the evaporator.

b) Explain multiple effect evaporator with different feed arrangements. **4**

———————

S.E. (Chemical) (Semester – II) Examination, 2011
PRINCIPLES OF DESIGN
(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 nature of machine design problem. Also explain the process of machine design. **6**

b) An equilateral triangular bar of 15 mm side and 2.5 m long is found to contract in length by 2 mm. Calculate the push on the bar if $E = 2 \times 10^5$ MPa. **6**

c) A mild steel flat 150 mm wide, 20 mm thick and 6 m long carries an axial push of 200 KN. Find compressive stress and strain with $E = 2 \times 10^5$ MPa. **6**

OR

2. a) Classify machine designs based on :

i) Nature of new idea, and

ii) The method used. **6**

b) A metal rod having 16 mm diameter fractured at a tensile force of 90 KN. Another hollow circular rod of 25 mm id made of same metal has to withstand a tensile force of 40 KN. Adopting a F.O.S. of 3, determine the required wall thickness. **6**

c) A tie bar 25 mm in diameter carries an axial force which causes stress of 120 MPa in it. It is attached to a rigid bracket by means of 4 bolts, each of which can be stressed to 90 MPa. Find the suitable diameter for bolts. **6**

3. a) A singly overhang beam 'ABC' is simply supported at 'A' and 'B' with AB = 9 m and BC = 3 m. ('C' is free end). The beam carries u.v.l. on portion 'AB' with zero intensity at 'A' and $6\frac{\text{KN}}{\text{m}}$ load at 'B'. The end 'C' carries C.W. moment of 18 KN-m :

i) Draw SFD and BMD for the beam

ii) Find maximum sagging and hogging BM alongwith their positions

iii) Find the point of contraflexure if any. **8**

b) At a point in a bracket, the stresses on two mutually perpendicular planes are 600 MPa (t) and 400 MPa (c) along with complementary shear stress of 100 MPa. Find using Mohr's circle method :

i) The position of principal planes with respect to the plane carrying 600 MPa stress.

ii) Magnitudes and nature of principal stresses.

iii) The position of plane carrying maximum shear stress and value of maximum shear stress.

iv) The normal, tangential and resultant stress on the plane at 30° with plane carrying 600 MPa stress. Also find angle of obliquity. **8**

OR

4. a) A cantilever of 2 m span has central downward load of 4 KN, an upward force of 1.5 KN at free end and U.D.L. of 1.5 KN / m between two point loads.

   i) Construct SFD and BMD for the beam.

   ii) Find maximum sagging and hogging BM values along with their positions.

   iii) Find point of contraflexure if any. **8**

   b) At a point in strained material, there are two planes at right angles to each other on which normal stress intensities are 75 MPa (t) and 45 MPa (c) accoMPanied by complimentary shear stress. (τ). The major principal stress is 105 MPa (t). Find using Mohr's circle method or otherwise :

   i) Shearing stress (τ) and minor principal stress.

   ii) Maximum shearing stress and the plane on which it acts.

   iii) The normal, tangential and resultant stress on the plane at 35° with the plane carrying 75 MPa. **8**

5. a) A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld. Find the length of weld if maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. **6**

   b) i) Draw neat sketch of socket and spigot cotter joint showing all parts and their dimensions. **2**

   ii) Design a cottered joint to resist safely a load of 40 KN that acts along the coincident axes of the rods connected by the cotter. The material of the cottert and rods will permit the stresses of 50 MPa in tension, 105 MPa in compression and 40 MPa in shear. **8**

OR

6. a) A plate 100 mm wide and 10 mm thick is to be welded with another plate by means of transverse welds at the ends. If the plates are subjected to load of 70 KN, find the length of the weld for static as well as fatigue loading. Take permissible shearing stress of 70 MPa and stress concentration factor of 2.7. **6**

   b) i) Draw neat sketch of knuckle joint showing various parts along with their dimensions. **2**

   ii) Design a knuckle joint for a tie rod of circular section to sustain a maximum pull of 70 KN. The ultimate strength of rod in shear is 420 MPa, while that for pin material is 510 MPa in tension and 396 MPa in shear. Taking F.O.S. of 6, determine tie rod section and pin section. Also determine other dimensions of the joint and check shear resistance of pin, tensile resistance of rod end and forked end of the joint for safety. **8**

SECTION – II

7. a) The shaft running at 120 rpm transmits 430 KW. The working conditions to be satisfied by the shafts are :

   i) The shear stress must not exceed 56 MPa

   ii) The angle of twist must not be more than 1° in a length of 16 diameters.

   Calculate the safe diameter of the shaft.

   Take $G = 0.85 \times 10^5$ MPa. **4**

   b) The shaft of uniform diameter is supported in bearings at 'C' and 'D' which are 800 mm apart. The shaft carries pulleys 'A' and 'B' at the ends at distances 150 mm and 250 mm from 'C' and 'D' respectively. Pulley 'A' weighs 200 N, which carries belt with tight side tension 2 KN while pulley 'B' weighs 400 N with tight side tension 900 N. The shaft transmits 7.5 KW at 400 rpm. Estimate a suitable shaft diameter for the shaft, adopting a working shear stress of 40 MPa (Use maximum shear stress theory of elastic failure). **6**

c) A muff coupling is used to connect two steel shafts of 55 mm diameter, transmitting 40 KW at 350 rpm. The allowable shear and crushing stresses for shaft and key material are 40 MPa and 80 MPa respectively, while the sleeve material has shear stress of 15 MPa. Design suitable key and sleeve based on safety in crushing and shearing. **6**

OR

8. a) Three pulleys 'A', 'B' and 'C' are mounted on a shaft and are at distances of 1200 mm, 2100 mm and 2700 mm respectively from the left hand bearing. The bearings are 3600 mm apart. Pulley 'A' is 500 mm, 'B' 750 mm and 'C' 375 mm in diameter. A power unit supplies 15 KW to 'A' and machinery takes 9 KW from 'B' and 6 KW from 'C'. A horizontal drive is arranged to 'A', while the drive 'B' has to be vertically downwards. The drive from 'C' is taken off at 45° to drive 'A' and in a downward direction. The speed of the shaft is 200 rpm and the allowable shear stress in the shaft is 32 MPa. The angle of lap of belt on pulley is 180° in each case, and the coefficient of friction between belt and pulley is 0.32. Obtain the shaft diameter. **12**

b) Draw neat sketch of bushed pin type flexible coupling. **4**

9. a) 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° and the stress in tight side is 2 N / mm^2, find the power capacity of the belt. The density of leather is 980 kg / m^3 and coefficient of friction of leather on cast iron is 0.35. **8**

b) The load on journal bearing is 150 KN due to turbine shaft of 300 mm diameter running at 1800 rpm. Determine :

i) Length of the bearing if the allowable bearing pressure is 1.6 N / mm^2 and

ii) Amount of heat to be removed by the lubricant per minute if the bearing temperature is 60° C and viscosity of oil at 60° C is 0.02 kg / m-s and the bearing clearance is 0.25 mm. Take K = 0.002. **8**

OR

10. a) A compressor, requiring 90 KW, is to run at about 250 rpm. The drive is by V-belts from an electric motor running at 750 rpm. The diameter of the pulley on the compressor shaft must not be greater than 1 m while the centre distance between the pulleys is limited to 1.75 m. The belt speed should not exceed 1600 m / min. Determine the number of V belts required to transmit the power if each belt has a cross-sectional area of 375 mm^2 and the angle of pulley is 35°. The coefficient of friction between the belt and the pulley is 0.25. Calculate the length required for each belt. **10**

    b) A journal bearing 60 mm in diameter and 90 mm long runs at 450 rpm. The oil used for hydrodynamic lubrication has absolute viscosity of 0.06 kg / m-s. If the diametral clearance is 0.1 mm, find the safe load on the bearing. Take Sommerfield number = 14.3×10^6. **6**

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

    a) Globe valve

    b) Steam trap

    c) Centrifugal pump.

OR

12. Write short notes on : **18**

    a) 3-way valve

    b) Diaphragm valve

    c) Fans and blowers.

———————

[3962] – 339

S.E. (Chemical) (Semester – II) Examination, 2011
CHEMICAL ENGG. THERMODYNAMICS – 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** 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 first law of thermodynamics with its scope and limitations. **6**

b) 1 kg of air is heated at constant pressure from an initial state of 300 K and 1 bar untill its volume triples. Calculate W, Q, ΔH, ΔU for the process. Assume that air obeys the relation PV/T = R = 83.14 cm^3/mol.k, C_p = 29 J/mol.k. **10**

OR

2. a) Air at 1 bar and 298°C is compressed to 5 bar and 298 K by two mechanically reversible processes.

a) Cooling at constant pressure followed by heating at constant volume.

b) Heating at constant volume followed by cooling at constant pressure

Calculate the heat and work requirements and ΔE and ΔH of the air for each path. C_V = 20.78 J/mol.k, C_P = 29.10 J/mol.k for air PV/T = constant. At 298 K and 1 bar the molar volume of air is 0.026 m^3/mol. **16**

3. a) Explain the P-T diagram for pure water showing clearly all the phase regions. **8**

b) State the importance of Van der Walls equation of state. Explain how this equation was developed. **8**

OR

P.T.O.

4\. a) Calculate the molar volume and compressibility factor for methanol vapor at 500 k and 10 bar by using the following equations of state

i) Virial equation

ii) Redlich-Kwong equation

Virial coefficients are $B = -2.19 \times 10^4\ m^3/mol$,

$C = -1.73 \times 10^{-8}\ m^6/mol^2, T_c = 512.6\ k,\ P_c = 81$ bar. Constants for Radlich-Kwong equation

$A = 21.7181\ Nm^4\ k^{0.5}/mol^2,\ B = 4.5617 \times 10^{-5}\ m^3/mol.$ **10**

b) Derive an equation for work done for the reversible adiabatic process. **6**

5\. Methanol is synthesized according to the following reaction.

$CO(g) + 2H_2\ (g) \rightarrow CH_3OH\ (g)$

The standard heats of formation at 298 K are – 110.125 KJ/mol for CO and – 200.660 KJ/mol for methanol. The specific heats (J/mol.k) are

$C_p\ (CH_3OH) = 19.382 + 101.564 \times 10^{-3}\ T - 28.683 \times 10^{-6}\ T^2$

$C_p\ (CO) = 28.068 + 4.631 \times 10^{-3}\ T - 2.5773 \times 10^{+4}\ T^{-2}$

$C_p\ (H_2) = 27.012 + 3.509 \times 10^{-3}\ T + 6.9006 \times 10^4\ T^{-2}$

a) Calculate the standard heat of reaction at 1073 K

b) Express the heat of reaction as a function of temperature. **18**

OR

6\. It is desired to carry out the following reaction at 600°C.

$CO(g) + H_2O(g) \rightarrow CO_2(g) + H_2(g)$

Estimate the standard enthalpy change of the reaction at 600°C if the standard heat of reaction at 298 K is – 41.116 kJ. Use the following data :

$C_P^\circ = a + bT + cT^2 + dT^3 + eT^{-2}$ J/mol.k

Compound	a	$b \times 10^3$	$e \times 10^{-5}$
CO	28.068	4.631	– 0.258
H_2O	28.850	12.055	1.006
CO_2	45.369	8.688	– 9.619
H_2	27.012	3.509	0.690

18

SECTION – II

7. a) Derive the following relation for the efficiency of carnot heat engine.

$$\eta = {}^{TH - TL}\!/_{TH}$$ **8**

b) A nuclear power plant generates 750 MW, the reactor temp. is 588.15 k, and a river with water temperature of 293.15 is available.

a) What is the maximum possible thermal efficiency of the plant, and what is the minimum rate at which heat must be discarded to the river ?

b) If the actual thermal efficiency of the plant is 60% of the maximum, at what rate heat must be discarded to the river, and what is the temperature rise of the river if it has a flow rate of 165 m^3/sec. **10**

OR

8. a) Explain the concept of entropy. For irreversible thermodynamic process, show that the total entropy change is positive. **8**

b) Two compartments each of $1m^3$ capacity are connected by a valve and insulated from the surrounding and from each other. One compartment contains saturated steam at 683.6 KPa and the other contains steam at the same but at a pressure of 101.3 KPa. The valve is opened and the pressure is allowed to equalize. Determine the change in entropy of the system consisting of the two vessels. Comment on irreversibility of the process.

The thermodynamic properties of steam are as follows : **10**

Pressure (KPa)	**H(KJ/kg)**	**S(KJ/kgK)**	**V(m^3/kg)**	**V(KJ/kg)**
683.6 (T = 437.2 k)	2761	6.7133	278.9×10^{-3}	2570.4
101.3 (T = 437.6 k)	2804	7.6712	1976.2	2603.3

9. a) Explain residual properties. Derive the fundamental residual property relation for 1 mol of substance for closed thermodynamic system **8**

$$d\left(G^R/RT\right) = V^R/RT \, dp - \frac{H^R}{RT^2} dT$$

b) Derive the Clausius – Clapeyron equation for a two phase system. **8**

OR

10. a) Show that

i) $dE = C_V dT + \left(\beta/_{K}\, T - P \right) dV$

ii) $dS = \frac{CV}{T} dT + \frac{\beta}{K} dV$ **10**

b) Explain thermodynamic diagrams. **6**

11. a) Explain absorption refrigeration cycle with neat sketch. **8**

b) A vapor compression cycle using ammonia as refrigerant is employed in an ice manufacturing plant. Cooling water at 288 k enters the condenser at a rate of 0.25 kg/sec and leaves at 300 k. Ammonia at 294 k condenses at a rate of 0.50 kg/min. Enthalpy of liquid ammonia at 294 k is 281.5 KJ/kg. The compressor efficiency is 90%. Saturated ammonia vapor at 258 k and the enthalpy of 1426 kJ/kg enters the compressor. What is the power requirement of the compressor and refrigeration capacity in tons ? **8**

OR

12 a) Explain Linde process for gas liquefaction. **6**

b) A carnot engine is coupled to carnot refrigerator so that all the work produced by the engine is produced by the engine is used by the refrigerator in extraction of heat from a heat reservior at 0°C at the rate of 35 KW. The source of energy for the carnot engine is a heat reservior at 250°C. If both devices discard heat to the surrounding at 25°C how much heat does the engine absorb from its heat source reservior ? If the actual coefficient of performance of the refrigerator, $COP_{actual} = 0.60\ COP_{carnot}$ and if thermal efficiency of the engine is $\eta_{actual} = 0.60\ \eta_{carnot}$, how much heat does the engine absorb from its heat source reservoir ? **10**

[3962] – 340

S.E. (Chemical) (Semester – II) Examination, 2011
MECHANICAL OPERATIONS
(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) Differentiate differential and cumulative analysis with proper examples. **6**

b) The screen analysis shown applies to a sample crushed quartz. Estimate :

i) Average particle size of the product

ii) Specific surface area for the product using both differential and cumulative analysis :

Data : Density of sample = 2.65 gm/CC, a = 2, b = 3.5. **10**

Mesh No.	4/6	6/8	8/10	10/14	20/28	28/35
Aperture size (CMS)	0.4013	0.2844	0.206	0.1409	0.0711	0.0503
Mass Fraction retained on screen	0.0251	0.125	0.3207	0.257	0.0538	0.021

c) Explain the need of size reduction in process industries. **2**

OR

P.T.O.

2. a) Why the gyratory crushers are more widely used than jaw crushers ? **4**

   b) Differentiate crushing efficiency and mechanical efficiency. **4**

   c) In a certain blake jaw crusher it is necessary to apply a maximum force of 1000 Kgs. at a toggle point. The toggle block is 80 cms from the pivot point. The angle between pitman and toggle is 85°, what will be the force on pitman ? What is the force on particle at distance 35 cm from the pivot ? Derive the expression that you have used. **10**

3. a) Describe the working of belt conveyor with suitable sketches. List advantages and disadvantages of belt conveyors and typical applications. **8**

   b) Describe with a sketch the working of a screw conveyor. List advantages and disadvantages. **8**

OR

4. Write short notes on :

   a) Closed loop pneumatic conveying system.

   b) Chain and flight conveyor.

   c) Bucket elevator.

   d) Apron conveyor. **16**

5. a) Describe the types of mixers for pastes and plastic mass. **8**

   b) With the help of neat sketches distinguish the axial flow and radial flow impeller. **8**

OR

6. a) A silty soil containing 14% moisture was mixed in a large muller mixer with 10 weight percent of a tracer consisting of dextrose and picric acid. After 4 min. of mixing 10 random samples were taken from the mixture and analysed for tracer material. The measured concentrations in the same were, in weight percent tracer 10.28, 9.20, 7.8, 11.03, 10, 11.51, 9.25, 9.65, 10.65, 10.77. Calculate the mixing index Ip of the operation. **8**

   b) What is degree of mixing and rate of mixing in case of mixing of dry solids and derive the expressions. **8**

SECTION – II

7. a) A plate and frame press filtering a slurry, gave a total of 25 m^3 of filterate in 30 minutes and 35m^3 in 60 minutes when filtration was stopped. Estimate the washing time in minutes if 10m^3 of wash water are used. The resistance of the cloth can be neglected and a constant pressure is used through-out. **10**

b) Explain construction, working and applications of Rotary Drum vacuum filter. **8**

OR

8. a) Explain leaf filter and filter press in detail. **8**

b) A constant pressure filtration tests gave data that can fit an expression :

$$\frac{dt}{dV} = 9.3V + 8.5$$

where t in seconds, V in liters. If the resistance of the filter medium is assumed unaffected with pressure drop and the compressibility cofficient of the filter cake is 0.3, what will be the time taken for the collection of 3.5 liters of filtrate at a filtration pressure twice that used in the test ? **10**

9. a) Explain the sink and float method and differential settling method in sorting classifiers. **8**

b) Explain principle, construction and working of the electrofloation plant. **8**

OR

10. a) Describe aggregative and particulate fluidization. If fine catalyst particles are fluidized in water then which type of fluidization would be observed ? **8**

b) A tube of $0.05 m^2$ cross-sectional area is packed with spherical particles up to a height of 0.25 m. The porosity of the bed is 0.35. It is desired to fluidize the particles with water $(\rho = 1000\ kg/m^3,\ \mu = 10^{-3}$ Pa-sec). Calculate minimum velocity of fluidization by Ergun's equation.

Data : Diameter of particles = 0.01 m

Density of solid particles = 2600 kg/m^3. **8**

11. a) Describe with neat sketches the operation of a patch centrifuge and continuous centrifuge. **8**

b) Describe with a neat sketch the sedimentation operation. Also sketch typical commercial equipment. **8**

OR

12. Write short notes :

a) Cyclone separator

b) Scrubbers

c) Fabric filter

d) Mineral Jig. **16**

———————

[3962] – 341

S.E. (Petro./Petrochem./Poly.) (Sem. – I) Examination, 2011
ENGINEERING CHEMISTRY – 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

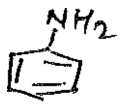
1. a) What is inductive effect ? Explain + I and –I effect with suitable example. **6**

b) Define and explain :

i) Huckel's Rule.

ii) Homolysis and Heterolysis. **6**

c) Draw all possible resonating structure for each of the following : **4**

i) 

ii) 

OR

P.T.O.

2. a) What is mesomeric effect ? Explain +M and – M effect with suitable example. **6**

b) Give reason :

i) Guanidine is stronger base.

ii) Chloroacetic acid is stronger than acetic acid. **6**

c) Write a note on : Hyper conjugative effect. **4**

3. a) What is sulphonation ? Discuss the sulphonation of benzene. **6**

b) Explain the use of Grignard's reagent in the preparation of 1°, 2° and 3° alcohols. **6**

c) Give the mechanism of addition of HCl on propane. **4**

OR

4. a) Explain the mechanism of SN_1 and SN_2 reactions with suitable example. **6**

b) Explain why – COOH group is deactivating and m-directing. **6**

c) Predict the products :

i) $\text{Aniline} \xrightarrow[\text{CH}_2\text{SO}_4]{\text{CHNO}_3} ?$

ii) $CH_3 - CH = CH_2 \xrightarrow[H_2O_2]{HBr} ?$

iii) $CH_3 - \overset{\overset{\displaystyle O}{\|}}{C} - CH_3 \xrightarrow[\text{dil NaOH}]{\text{warm}} ?$

iv) $CH_3 - CH_2 - \overset{\overset{\displaystyle OH}{|}}{CH} - CH_3 \xrightarrow[100°C]{60\% H_2SO_4} ?$ **4**

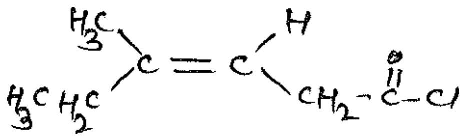
5. a) Discuss the conformation of cyclohexane with the help of energy profile diagram. **6**

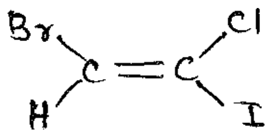
b) Give reasons :

i) Staggered conformation of n-butane is stable

ii) Pyrrole is more reactive than Furan. **6**

c) What is geometrical isomerism ? Assign the E and Z configuration to each of the following. **6**

i) 

ii) 

OR

6. a) Give one method for synthesis of :

i) Pyrrole

ii) Indole. **6**

b) Explain optical isomerism with suitable example. **6**

c) Predict the product : **6**

i) Thiophene + $CH_2\ SO_4 \longrightarrow$?

ii) Pyridine + Acetyl chloride $\xrightarrow{AlCl_3}$?

iii) Quinoline $\xrightarrow[KMnO_4]{Alkaline}$?

iv) Pyrrole + $H_2 \xrightarrow{Ni}$?

SECTION – II

7. a) Explain what is meant by parachore of liquid. Explain its relation with surface tension of liquids. **7**

b) Define : **6**

i) Boiling point of liquid.

ii) Melting point of solid.

Also explain process of evaporation.

c) Find surface tension of ethylene at 30°C if parachore for C, H, O are 4.80, 17.10 and 20.00 respectively, if density of ethylene is 0.742 g/cc. **4**

OR

8. a) Derive 'viscosity' of liquids. Explain how relative viscosity can be determined using Ostwald's viscometer. **7**

b) Derive Bragg's equation for crystals. **6**

c) Normal B.P. of benzene is 80°C, while ΔHv for benzene is 30.8 kJ/mole. Find V.P. of benzene at 20°C. **4**

9. a) Derive kinetic gas equation $PV = \frac{1}{3} n^1 mu^2$. **7**

b) State Boyl's law and Charle's law. Deduce them from kinetic gas equation. **6**

c) Certain light bulb containing argan at 1.2 atm. pressure and 18°C is heated to 85°C at constant volume. Calculate final pressure inside the bulb. **4**

OR

10. a) Derive Vander Waal's equation. **7**

b) Give assumptions of kinetic gas equation. **6**

c) Critical temperature and pressure for oxygen are –118.6°C and 50.8 atm. Find Van der Waal's constants a and b for oxygen. **4**

11. a) What is Osmosis ? Derive $\pi = \dfrac{w_2RT}{M_2C}$ for dilute solutions. **6**

b) Explain experimental determination of osmotic pressure. **6**

c) If concentration of cane sugar (M = 342) is 3.525g/100 ml calculate osmotic pressure of the solution at 24°C. **4**

OR

12. a) Explain experimental set up for determination of molecular weight. **6**

b) State Raoult's law. Derive relation between vapour pressure lowering and molecular weigh of solute. **6**

c) Solution of 17.8 g of solute per 200 g of solvent has V.P. = 4.582 mm of Hg at 0°C. V.P. of pure solvent at some temperature is 4.62 mm of Hg. Calculate molecular weight. **4**

———————

S.E. (Polymer/Petroleum/Petrochemical) (Semester – I) Examination, 2011
STRENGTH OF MATERIALS
(2003 Course)

Time: 3 Hours Max. Marks: 100

Instructions : *1) Answer Q* ***1*** *or* ***2****,* ***3*** *or* ***4, 5*** *or* ***6*** *questions from Section* ***I*** *and Q* ***7*** *or* ***8, 9*** *or* ***10, 11*** *or* ***12*** *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 electronic pocket calculator is* ***allowed****.*
7) Assume suitable data, ***if necessary****.*

SECTION – I

1. a) Explain briefly the various elastic constants. State the relationship between them. **8**

b) Derive the expression for the maximum intensity of axial stress produced in a bar when a load ‘P’ is dropped from a height ‘h’ on a vertically held bar. **10**

OR

2. a) Derive the expression for the elongation of a tapering bar of rectangular cross section subjected to an axial load. Use usual notations. **8**

b) A vertical steel rod 1200 mm long is rigidly secured at the upper end and a weight of 1 kN is allowed to slide freely along the rod through a distance of 35 mm on the stop at the lower end. The upper 700 mm length of the rod has a dia of 28 mm while the lower 500 mm length is 15 mm in diameter. Calculate

i) maximum instantaneous stress.

ii) maximum elongation of the rod

iii) strain energy at maximum elongation. **10**

3. a) Write the assumptions in the theory of torsion. Write also the torsion formula and explain each term. **8**

b) An element in a 2-D stress system is subjected to σ_x = 200 MPa (T) and σ_y = 120 MPa(T). They are accompanied by shear stress of 100 MPa. Find principal stresses and locate principal planes. Also find max. shear stress. **8**

OR

4. a) A solid steel shaft 100 mm in diameter transmits 136 kW at 150 r.p.m. Calculate the torque on the shaft, the angle of twist in a length of 600 mm and the max shear stress developed in the shaft. Take G = 80 GPa. **8**

b) Show that the sum of the normal components of stresses on any two planes at right angles to each other, is constant in a two dimenstional stress system. **8**

5. a) A cylindrical thin drum 800 mm in diameter and 3 m long has a thickness of 10 mm. If the drum is subjected to an internal pressure of 2.5 N/mm^2. Determine (i) change in diameter (ii) change in length and (iii) change in volume. Take E = 200 GPa, υ= 0.25. **8**

b) Derive Lame's equation for thick cylinders. **8**

OR

6. a) A thin seamless spherical shell of 1.5 m diameter is 8 mm thick. It is filled with a liquid so that the internal pressure is 1.5 N/mm^2. Find the increase in diameter and volume of the shell υ=0.3, E = 200 GPa. **8**

b) A pipe of 400 mm internal diameter and 100 mm thickness contains a fluid at a pressure of 8 N/mm^2. Find the maximum and minimum hoop stress across the section. **8**

SECTION – II

7\. a) The beam is loaded as shown in fig. 7(a). The cross section of the beam is as shown in fig. 7(b). Draw bending stress diagram. **8**

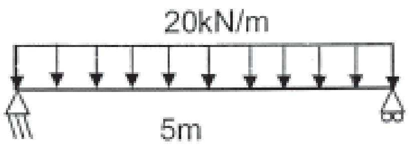


fig. 7(a)

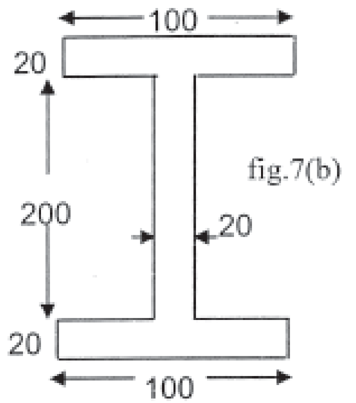


fig.7(b)

All dimensions are in mm

b) Draw S.F.D. and B.M.D. for the beam AB supported and loaded as shown in fig. 7(c). **8**

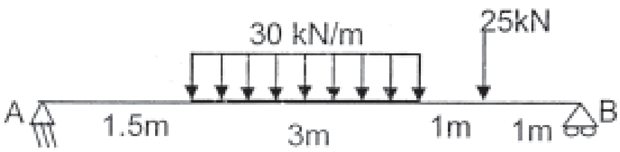


fig. 7 (c)

OR

8\. a) Derive the flexural formula. **8**

b) Draw S.F.D. and B.M.D. for the beam shown in fig. 8(b) **8**

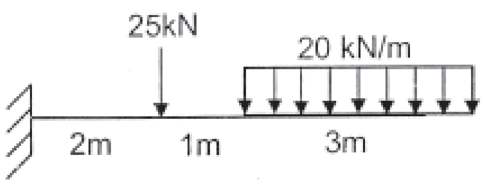


fig. 8(b)

9. a) A solid round bar 50 mm in diameter, 2.5 m long is used as a strut. Find the crippling load by Euler's formula, both the ends of column are hinged. Take E = 200 GPa. **9**

b) Derive the expression for shear stress. **8**

OR

10. a) Draw shear stress distribution diagram for a rectangular section having width 200 mm and depth 400 mm. Shear force at the section is 50 kN. **9**

b) Derive the expression for crippling load when both the ends of the column are pinned or hinged. **8**

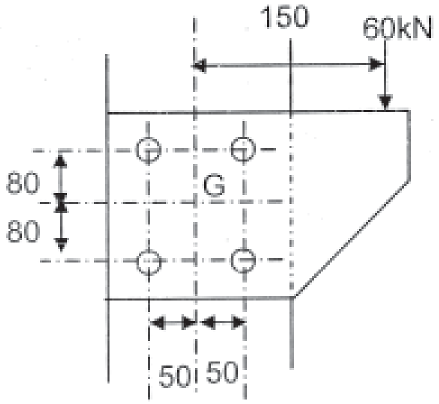
11. a) A hollow shaft is subjected to a torque of 300 kN-m and bending moment of 150 kN-m. Internal diameter of shaft is 0.5 times the external diameter. If maximum normal stress is not to exceed 150 MPa and shear stress is not to exceed 80 MPa, design the cross section of shaft. **9**

b) A concentrated load P is applied at the free end B of a cantilever AB of span L. Find the slope and deflection at B. Take EI constant. **8**

OR

12. a) What is core of a section. Derive and show the core of the circular section. **8**

b) Fig. 12 (b) shows an eccentric riveted bracket connection supporting a load of 60 kN at an eccentricity of 150 mm. Find the size of the rivet required. Thickness of the bracket plate is 10 mm. **9**



All dimensions are in mm

Fig. 12(b)

[3962] – 345

S.E. (Petro/Petrochem./Poly) (Semester – II) Examination, 2011
ENGINEERING CHEMISTRY – 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) Explain in brief the physical and chemical properties of amino acids. **6**

b) Discuss in detail, the cyclic structure of glucose. **6**

c) Predict the product :

i) $R-\underset{\underset{NH_2}{|}}{CH}-COOH \xrightarrow{LAH} ?$

ii) Glucose + $Br_2 \xrightarrow{H2O} ?$

iii) Glucose + $HIO_4 \longrightarrow ?$

iv) Glycine + Nitrosylchloride $\longrightarrow ?$ **4**

OR

2. a) Explain in brief the primary and secondary structure of proteins. **6**

b) Explain :

i) Isomerization of sugars.

ii) Inversion of sucrose. **6**

c) What are carbohydrates ? Give their classification. **4**

P.T.O.

3. a) Give the synthesis of the following compounds from acetic acid.
   i) Acetamide
   ii) Acetophenone
   iii) Ethyl alcohol. **6**

   b) Give the synthesis of alcohol from :
   i) Carboxylic acid
   ii) Carbonyl compounds
   iii) Alkene. **6**

   c) Explain Koch reaction for the synthesis of carboxylic acid. **4**

OR

4. a) Discuss the various methods used for the preparation of :
   i) Aldehyde ii) Imine. **6**

   b) Write the balance equations for each of the following reactions
   i) n-propanol is treated with
      a) PCl_3, b) $SOCl_2$, c) $K_2Cr_2O_7/H^+$
   ii) Carboxylic acid is treated with **6**
      a) PCl5, b) P_2O_5/H^+, c) LAH

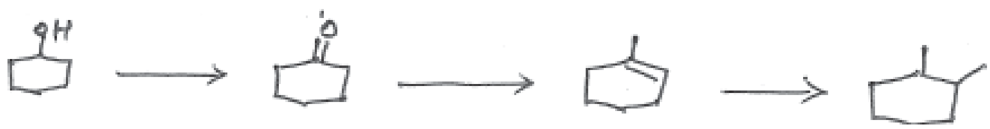
   c) Identify the product A and B and rewrite the reactions. **4**

   i) $CH_2 = CH_2 \xrightarrow{HBr} A \xrightarrow{NaCN} B$

   ii) $H - \overset{\overset{O}{\|}}{C} - H \xrightarrow[2.\ H_3O^+]{1.\ RMgBr} A \xrightarrow[H_2SO_4]{K_2Cr_2O7} B$

5. a) Discuss in detail the various types of electronic transition in organic molecules. **6**

   b) Give the characteristic IR frequency for the following sequence of reaction. **6**

   i) 

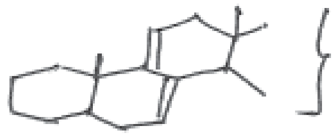
   ii) $CH_3 - C \equiv C - CH_3 \longrightarrow$ 

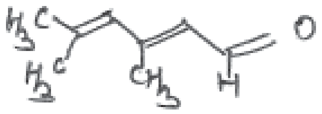
   c) Solve the following :
   i) Explain hydroboration of alkenes.
   ii) Explain why ethyl acetoacetate shows IR band at 1750, 1720, 1660, 1620 cm^{-1}. **6**

OR

6. a) Calculate the λ_{max} for the following compounds. **6**

i) 

ii) 

iii) 

b) Using IR spectroscopy, how will you distinguish between :

i) Inter and Intramolecular hydrogen bonding in organic compound.

ii) Aldehydes and Ketone in organic molecules. **6**

c) The molecular formula of an organic compound is $C_6H_{10}O$. Its IR spectra shows a peak at 1690 cm^{-1}, in UV, it absorbs at 240 nm and it also shows positive iodoform test. Suggest the probable structure. **6**

SECTION – II

(Atomic weights : Mn = 25, Fe = 26, Co = 27, Ni = 28, Cu = 29).

7. a) Explain Hunds rule and Aufbau principle. **6**

b) Explain quantum numbers. What do each quantum number describe ? **6**

c) Explain bonding in nitrogen molecule using valance bond approach. **4**

OR

8. a) Explain molecular orbital diagram for nitrogen molecule. Write bond order and magnetic behavior. **6**

b) Define hybridization. Explain type of hybridization and geometry of methane molecule. **6**

c) Give drawbacks of V.B.T. **4**

9. a) With help of proper example, explain. **6**
   i) Co-ordination compounds
   ii) Ligand
   iii) Complex ion

   b) Find O.S., C.N. and EAN of metal in following : **6**
   i) $[Mn(CN)_6]^{4-}$
   ii) $K_4[Fe(CN)^6]$
   iii) $[Cu(NH_3)_4]Cl_2$

   c) Explain crystal field theory in tetrahedral complexes. **4**

OR

10. a) Explain O.S. of members of I^{st} transition series. **6**

   b) What is CFSE ? Calculate it for $[CoF_6]^{3-}$ and $[Co(H_2O)_6]^{3+}$ which is more stable. **6**

   c) Explain bonding in BCl_3 and $BeCl_2$ on the basis of VBT. **4**

11. a) Draw titration curve for strong acid and a strong base. Discuss various steps involved. **6**

   b) Explain Mohr's method for determination of Cl^- content of sample. **6**

   c) Calculate p^H of solution which is prepared by adding 30 ml of 0.2 M NaOH to 25 ml of 0.2 m acetic acid. **6**

OR

12. a) What is meant by iodometry ? Explain how the percentage of copper in brass can be determined iodometrically. **6**

   b) What is meant by standard solution ? How is it prepared ? **6**

   c) Find the amount of NaOH (M = 40) required to prepare 500 ml 0.4 N and 0.4 M NaOH. **6**

———————

S.E. (Petrochemical/Petroleum/Polymer) (Semester – II) Examination, 2011
SOLIDS HANDLING OPERATIONS
(2003 Course)

Time : 3 Hours Max. 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, steam table is **allowed**.*
*4) Draw **neat** sketch **wherever** necessary.*

SECTION – I

1. a) Explain how particle shape and particle size are expressed. Define each term with proper expression. **8**

b) A solid mixture is screened through a standard 20-mesh screen. Calculate the mass ratios of the overflow and underflow to feed and the overall effectiveness of the screen. Data : 1) the solid mixture comprises materials A and B only. 2) the mass fractions of material A in feed, overflow and underflow are 0.775, 0.89 and 0.73 respectively. **10**

OR

2. a) Define the laws of size reduction with expression. **8**

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

1) Effect of mesh size on capacity of screens

2) Capacity and effectiveness of screens.

3. a) Define angle of nip and give the relationship between angle of nip, feed size, gap between rolls and diameter of rolls. **8**

b) Explain various magnetic separation methods with the help of neat sketch. **10**

OR

4. a) Distinguish between

 1) Crushing and Grinding operation

 2) Open-circuit and closed circuit grinding. **8**

 b) Explain the Ball mill operation with all its construction and performance details. **10**

5. a) Define Filtration and state factors affecting filtration. What is constant rate filtration and constant pressure filtration ? **8**

 b) Classify industrial cake filters with examples and give the working principle of each of them. **8**

OR

6. a) Write short notes on :

 1) Choice of filter medium

 2) Filter aid. **8**

 b) Explain the utility of laboratory batch sedimentation data in design of a continuous thickener. **8**

SECTION – II

7. a) Explain with proper sketch the Axial flow impellers and Radial flow impellers with reference to the flow patterns generated and their performance. **12**

 b) State the methods of avoiding vortex in agitated vessel. **4**

OR

8. a) Derive and explain the relationship for the power consumption of impellers. **10**

 b) Write short note on Pug mill. **6**

9. a) Write short notes on 'Types of Fluidization'. **8**

 b) Derive Ergun's Equation and give its utility. **10**

OR

10. a) Derive an expression for Drag and Lift forces exerted by a flowing fluid on stationary body. **10**

b) Write a short notes on Types of Drag. **8**

11. a) Explain different types of industrial Conveyers. **8**

b) Write a short note on cyclone separators. **8**

OR

12. a) Explain what do you mean by Centrifugation. **8**

b) Explain the significance or fractional voidage of packed bed. **8**

B/I/11/120

[3962] – 348

S.E. (Petroleum/Petrochemical/Polymer) (Sem. – II) Examination, 2011
PROCESS CALCULATIONS
(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 tables is **allowed**.*
*6) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Small animals such as mice can live at reduced air pressures down to 20 kPa. In a test mercury manometer attached to a tank inside which a mouse is kept, reads differential pressure of 64.5 cm. Hg. The barometer reading of the room is 100 kPa. Will the mouse survive ? **6**

b) 164.5 gm of barium chloride ($BaCl_2$) is dissolved in 135 ml of water. Obtain the salt concentration in wt % and in normality. **6**

[Atomic Weight of Ba = 137.34, Cl = 35.45]

c) Define : Molality and Normality. **4**

OR

2. a) An binary mixture contains 92% (by weight) of ethanol and rest water. Obtain the composition in mol percentage. Also evaluate mol fraction of water present. **6**

b) If 6.5 gm of sugar (sucrose) be dissolved in 135 ml of water, what will be concentration in wt% and in terms of molarity ? **4**

c) An aqueous solution of oxalic acid of 32% concentration (by weight) has density of 1.34 kg/lit at 25°C. Calculate normality, molality and molarity of the solution. **6**

P.T.O.

3. a) A mixed acid containing 65% (by wt) H_2SO_4, 20% HNO_3 and rest water is to be made by blending following liquids : **10**

i) A spent acid containing 10% HNO_3, 60% H_2SO_4 and rest water.

ii) A concentrated nitric acid containing 90% HNO_3, rest water.

iii) Concentrated sulfuric acid containing 98% H_2SO_4 and rest water.

How many kgs of each of the three available acid streams must be used to obtain 1000 kg of mixed acid ?

b) A mixture of gases contains 10.5% CO_2, 13.0% Cl_2, 12.7% N_2 and rest hydrogen (all in mol %). **6**

i) Determine average molecular weight of the gas.

ii) Calculate the gas composition in weight fractions.

OR

4. a) To prepare a solution of 50% sulfuric acid, a dilute waste acid containing 28% H_2SO_4 is fortified with a purchased acid of 96% H_2SO_4. How many kilograms of purchased acid must be bought for each 100 kg dilute acid ? **4**

b) Acetylene gas is produced according to the following reaction : **6**

$CaC_2 + 2\ H_2O \rightarrow C_2H_2 + Ca(OH)_2$.

Calculate number of hours of service that can be derived from 1 kg of calcium carbide in an acetylene lamp burning 0.1 m^3 of gas per hour at temperature of 298 K and pressure of 99.32 kPa.

c) Define : Limiting Reactant, Yield and Selectivity. **6**

5. a) Define : Saturation Pressure, Relative Humidity, Humid Volume. **6**

b) An air-tight room having volume of 17.86 m^3 at 1 atm pressure. Calculate partial volume of components in the room and partial pressures of individual components. **6**

c) Define Bubble Point and provide stepwise procedure of obtaining Bubble Point for a multi-component mixture. **6**

OR

6. a) The solubility of barium nitrate at 100 °C is 34g/100 g of water. And at 0 °C is 5.0g/100 g of water. If you start with 100 g of Ba $(NO_3)_2$ and make a saturated solution in water at 100 °C, how much water is required ? The precipitated crystals carry along with them on their surface 4 g of water per 100 g of crystals. **10**

   [Atomic Weight of Ba = 137.34].

   b) 100 kg of mixture F containing 50% Ethanol, 40% water and rest Methanol (all in wt. %) flashed to produce P kg of 80% Ethanol, 5% water and rest Methanol and W kg of 5% Ethanol, 92.5% water and 2% Methanol. Evaluate P and W. **8**

SECTION – II

7. a) Discuss Proximate and Ultimate analysis of coal. **6**

   b) Propane is mixed with oxygen to obtain a gas containing 67.80% C_3H_8 and rest O_2 that is burned in an engine with 200% excess air. 82% of the propane produces CO_2, 12.5% goes to CO and rest remains unburned. Calculate composition of the exhaust gas on a wet basis. **10**

OR

8. a) If 300 kg of air and 24 kg of carbon are fed to a reactor at 460°C and after complete combustion no material remains in the reactor, how many kgs of carbon will have been removed ? How many kgs of oxygen ? How many kgs total ? **8**

   b) Aviation gasoline is iso-octane C_8H_{18}. If it is burned with 20% excess air and 30% of the carbon forms carbon monoxide, what is Orsat analysis ? **8**

9. a) A synthesis gas analyzing 6.4% CO_2, 0.2% O_2, 40% CO and 50.8 % H_2 and rest N_2 is burned with 40% dry excess air. What is the composition of the flue gas ? **8**

   b) The molar heat capacity of Cumene is given by **10**

   $C_p = 139.2 + 53.76 \times 10^{-2}\ T - 39.79 \times 10^{-5}\ T^2$ where C_p is in kJ/(kmol.K) and T is in K.

      i) Calculate the mean molar heat capacity in the temperature range of 300 – 1000 K.

      ii) Cumene enters a heat exchanger at a rate of 450 m^3/hr at STP. Calculate the heat to be supplied to the gas to raise its temperature from 400 to 700 K.

OR

10. a) What is adiabatic flame temperature ? How it is determined ? Discuss its importance. **6**

b) Discuss following :Combustion, Orsat, Analysis. **6**

c) A stream flowing at rate of 132.5 mol/hr containing 72.5 mole % N_2 and rest H_2 is to be heated from 25°C to 230°C . Calculate total quantity of heat to be transferred. C_p data are as follows : **6**

Gas	**a**	**b×10³**	**c×10⁶**
N_2	25.591	–5.41	13.183
H_2	28.61	1.02	– 0.15

11. a) An irn pyrite ore containing 85% FeS_2 and 15% gaunge (inert, dirt, rock etc.) is roasted with an amount of air equals to 200% excess air according to the reaction

$4FeS_2 + 11\ O_2 \rightarrow 2\ Fe_2O_3 + 8\ SO_2$

In order to produce SO_2. All the gauge plus Fe_2O_3 end up in the solid waste product (cinder), which on analysis shows 4% FeS_2. Determine the standard heat of reaction per kilogram of ore. **8**

b) A tank contains 10 m^3 of fresh water. Brine having a concentration of 10 kg salt/m^3 is sent into the tank at the rate of 250 lit/min. The mixture is kept uniform by mixing and runs out at a rate of 120 lit/min. Calculate the exit brine concentration when tank contains 20 m^3 of brine. **8**

OR

12. a) Hydrochloric acid is an important industrial chemical. To make aqueous solution of it of commercial grade (called muriatic acid), purified HCl (g) is absorbed in water in a tantlum absorber in a continuous process. How much heat is to be removed from the absorber per 100 kg of product if hot HCl (g) at 120°C is fed into water in the absorber. The feed water can be assumed to be at 25 °C and the exit product HCl (aq.) is 25% HCl (by wt) at 35°C

Data: C_p for HCl (g) = $29.13 - 0.1341\times10^{-2}\ T + 0.9715\times10^{-2}\ T^2$

where, C_p is in kJ/ (kmol. K) with T in K

C_p for product is approximately 2.7 kJ/ (kg. K) **8**

b) A square tank 4 m on a side and 10 m high is filled to the brim with water. Find the time required for it to empty through a hole in the bottom 5 cm^2 in area. **8**

———————

S.E. (Polymer/Petroleum/Petrochemical) (Semester – II) Examination, 2011
ELEMENTS OF SOCIAL SCIENCES
(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 in brief the problems of Economic Organisation. **8**

b) Explain in short : **8**

i) Concept of Wealth

ii) Value and Price.

OR

a) State and explain the different types of Markets. **8**

b) Discuss the importance of Engineering Economics. **8**

2. a) Explain the salient features of Mixed Economy. **8**

b) Explain the various factors of Production. **8**

OR

a) Explain the functions of Government in Macro economic Growth. **8**

b) Explain Perfect and Imperfect Competition. **8**

3. a) Write short notes on : **18**

   i) Vision of India 2020

   ii) Industrial Policy of India

   iii) Economic Reforms after year 1990

OR

Describe the Economic Policies adopted by Govt. of India for the Economic Growth in Post Independence Period. **18**

SECTION – II

4. a) Explain the concept of Civilization. **8**

   b) Discuss the social impact of Globalization on third world countries. **8**

OR

   a) Discuss the problem of Casteism in India. **8**

   b) Discuss the importance of Census of India. **8**

5. a) Technology is the tool for Social Change. Discuss. **8**

   b) Explain the need for Sustainable Consumption and Development. **8**

OR

   a) Explain in brief the problem of Ecological Crisis of Modern Times. **8**

   b) Discuss the impact of IT Revolution in the modern society. **8**

6. Write short notes on : **18**

   i) Functions of Religion

   ii) Salient features of Indian Philosophy

   iii) Union of Science and Religion.

OR

Harmonious co-existence of different religious is a key for World Peace and Economic Development. Discuss. **18**

———————

[3962] – 351

S.E. (Computer Engg.) (Semester – I) Examination, 2011
DISCRETE STRUCTURES (Common to IT)
(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) Assume suitable data, **if necessary**.*

SECTION – I

1\. a) Express the contrapositive, converse, inverse and negation forms of the conditional statements given below :

"If x is rational, then x is real". **4**

b) Construct truth table for the following expressions, to find if each of the following is a tautology, contradiction or contingency.

i) $(p \to (q \to r)) \to ((p \to q) \to (p \to r))$

ii) $(p \wedge q) \wedge \sim (p \vee q)$ **8**

c) Consider a set of integers 1 to 500. Find,

i) How many of these numbers are divisible by 3, 5 or by 11 ?

ii) Also indicate how many are divisible by 3 or by 11 but not by all 3, 5 and 11 ?

iii) How many are divisible by 3 or 11 but not by 5 ? **6**

OR

P.T.O.

2. a) Prove that for any positive integer n, the number $n^5 - n$ is divisible by 5. **6**

b) Using Venn diagram, prove or disprove : **6**

i) $A \oplus (B \oplus C) = (A \oplus B) \oplus C$

ii) $A \cap B \cap C = A - [(A - B) \cup (A - C)]$

c) Obtain a disjunctive normal form and conjunctive normal form of the formula $P \wedge (p \to q)$. **3**

d) Prove that the conclusion "Sita is a mortal" follows from the premises "All human beings are mortal" and "Sita is a human being". **3**

3. a) A menu card in a restaurant displays four soups, five main courses, three desserts and 5 beverages. How many different menus can a customer select if

i) He selects one item from each group without omission.

ii) He chooses to omit the beverages, but selects one each from the other groups.

iii) He chooses to omit the desserts but decides to take a beverage and one item each from the remaining groups. **6**

b) Find the number of distinct permutations that can be formed from all the letters of each word **6**

i) RADAR

ii) UNUSUAL

c) Two cards are drawn at random from an ordinary deck of 52 cards. Find the probability that

i) Both are spades

ii) One is spade and one is heart **4**

OR

4. a) How many ways can one fill a box holding 100 pieces of candy from 30 different types of candy ? **6**

b) How many integer solutions are there to

$a + b + c + d = 15$ when $a \geq -3, b \geq 0, c \geq -2$ and $d \geq -1$? **6**

c) A man is informed that when a pair of dice were rolled, the result was a seven. How much information is there in this message ? **4**

5. a) Use Warshall's algorithm to find transitive closure of R where

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix} \text{ and } A = \{1, 2, 3\}.$$ **6**

b) Let functions f and g be defined by

$f(x) = 2x + 1$ and

$g(x) = x^2 - 2$ find

i) g of (4) and fog (4)

ii) g of (a+2) and fog (a+2) **6**

c) Draw the Hasse diagram of the following sets under the partial ordering relation 'divides' and indicate, which are chains.

i) {2, 4, 12, 24}

ii) {1, 3, 5, 15, 30} **4**

OR

6. a) Let R be the relation on set A

A = {5, 6, 8, 10, 28, 36, 48}

Let R = {(a, b)|a is a divisor of b}. Draw the Hasse diagram. Compare with digraph. Determine whether R is an Equivalence relation. **8**

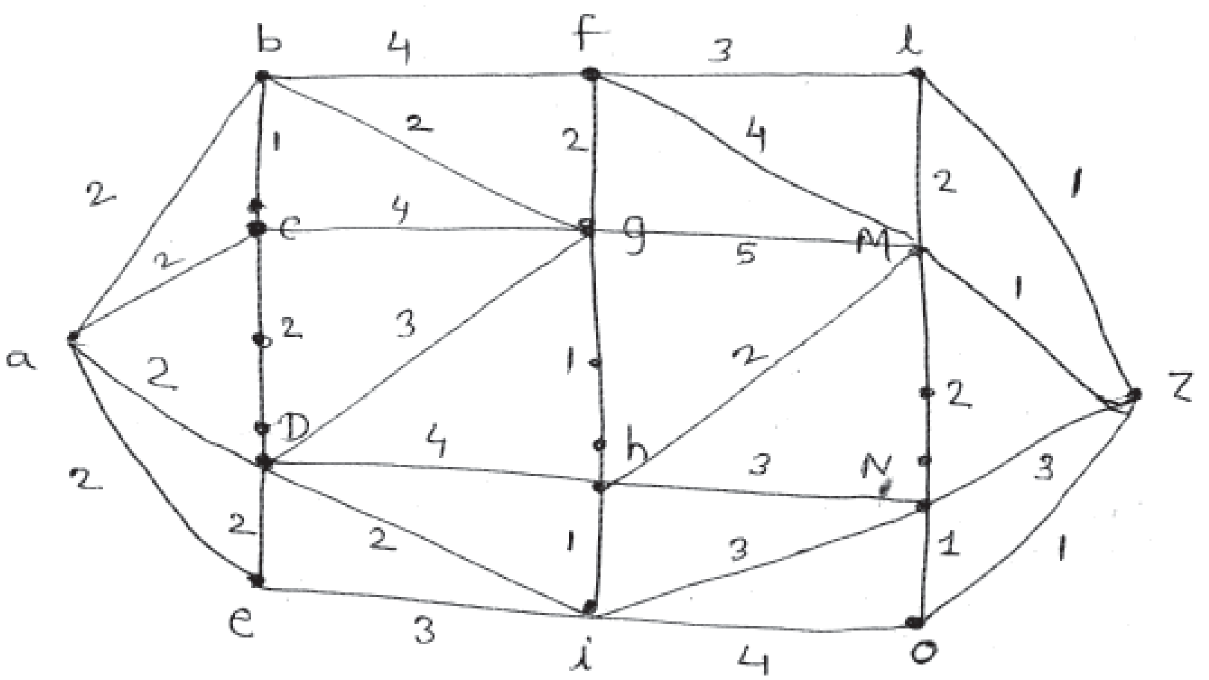
b) i) Define recurrence relation **2**

ii) Solve the following recurrence rotation;

$a_r - 3a_{r-1} = 2, r \geq 1, a_0 = 1.$ **6**

SECTION – II

7. a) State the Dijkstra's algorithm to obtain the shortest path (distance) between two vertices in the given graph and apply the same to obtain the shortest path between a and z in the following graph.



10

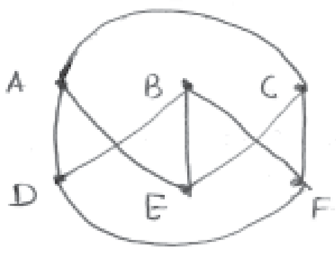
b) Define Eulerian path and Eulerian circuit, find under what conditions $K_{m,n}$, the complete bipartite graph will have an Eulerian circuit. **8**

OR

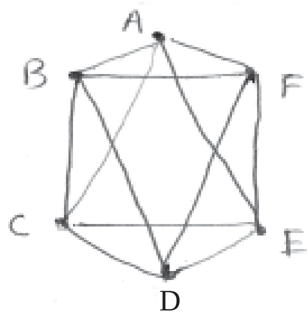
8. a) Hamiltonian circuit exists in complete bipartite graph. Justify your answer. **6**

b) Justify Euler's theorem with proof. If G = (V, E) is simple connected planar graph then $e \leq 3v-6$ where e is total number of edges and v is total number of vertices in graph G. **4**

c) Define planar graph and draw a planar representation of each graphs for the following figures. **8**



(i)



(ii)

9. a) Build the Huffman tree for the following frequencies of six letters. **8**

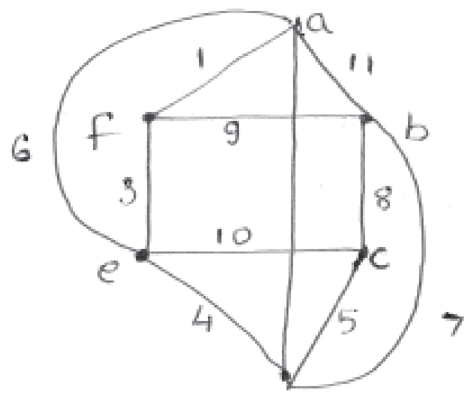
E	29
I	5
O	7
P	12
S	4
T	8

b) Define tree, Eccentricity of vertex, center of a tree. **3**

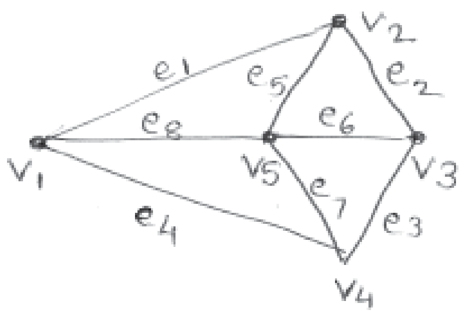
c) Draw all nonisomorphic trees with six points. **5**

OR

10. a) Determine minimum spanning tree for the given graph using prims algorithm. **6**



b) Define fundamental system of circuits and fundamental cut sets. **6**



Give fundamental circuit for the given figure

c) Explain Prim's algorithm for obtaining minimal spanning tree. **4**

11. a) Define Group. Explain in details properties of algebraic systems applicable to Group. **8**

b) Set 2I of all integers with zero is an abelian group with respect to addition. Prove. **8**

OR

12. a) State and explain following properties of cyclic group. **8**

i) Every group of prime order is cyclic

ii) Every cyclic group is an abelian group.

b) Define Ring, Commutative Ring and explain properties of Ring. **8**

———————

[3962] – 352

S.E. (Computer Engg.) (Semester – I) Examination, 2011
ELECTRONICS DEVICES AND CIRCUITS
(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 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) What do you understand by Q-point ? What is its significance ? Which biasing method provides more stabilization amongst the three types of biasing methods ? **8**

b) A voltage divider CE amplifier circuit as shown in fig. 1-b, has $\beta = 100$, $V_{BE} = 0.3$ V. Find I_β, I_C, V_{CEQ} and S'. **10**

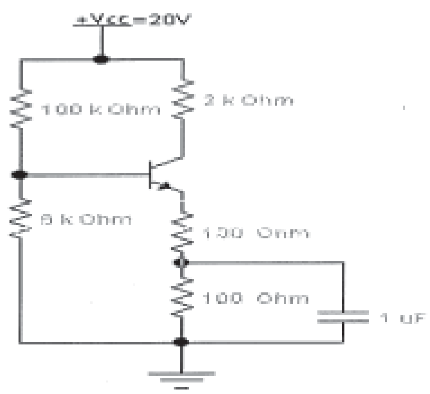


Fig. 1-b

OR

P.T.O.

2. a) Compare fixed bias, collector to base bias and self bias circuits with respect to : **8**
   i) Circuit diagram
   ii) Biasing resistances and its location
   iii) Negative feedback
   iv) Equation for stability factors.

   b) Draw neat circuit diagram of a Self bias circuit and derive equations for I_C & Vce. Explain with diagram, how temperature stability is insured in above circuit. Also define s' and s". **10**

3. a) What do you mean by small signal ? State advantages of h-parameters. Under what condition approximate analysis is used ? Draw approximate model of CC amplifier. **10**

   b) Write a short note on Bootstrapped emitter follower circuit. **6**

OR

4. a) Draw Approximate h-parameter model for common emitter transistor circuit with Re. Also derive expression for Ri, Ro, Av, Avs and Ai. **10**

   b) Write a short note on Miller's theorem. **6**

5. a) Explain need for multistage amplifier, its merits and demerits. Draw and explain working of a two stage transformer coupled amplifier using transistors. **10**

   b) Derive expression of voltage gain in terms of F_L for Low frequency region of an amplifier. **6**

OR

6. a) What do you understand by large signal amplifier ? Classify them on the basis of Q point position and compare them. **8**

   b) Four identical stages are cascaded. The lower and upper 3 db frequencies of each stage are 40 Hz and 20 kHz respectively. Calculate the overall bandwidth of the cascaded amplifier. **8**

SECTION – II

7. a) What is meant by pinch-off voltage in FET ? Draw and explain Static output characteristic for n-Channel FET. **8**

b) Why BJT is called current operated device ? Also give comparison between FET and BJT. **4**

c) The p-channel FET has an I_{DSS} = –20 mA, V_P = 10V, V_{GS} is 8.32 V. Calculate drain current, transconductance. **4**

OR

8. a) With the help of neat diagram, explain the operation of n-channel JFET. Also Draw symbol of p-channel JFET, p-channel enhancement type MOSFET. **8**

b) For the circuit shown in fig. 8-b, p-channel JFET has V_P = 6V, I_{DSS} = 15 mA. **8**

Calculate :

1) I_{DSQ}

2) V_{GSQ}

3) V_{DSQ}

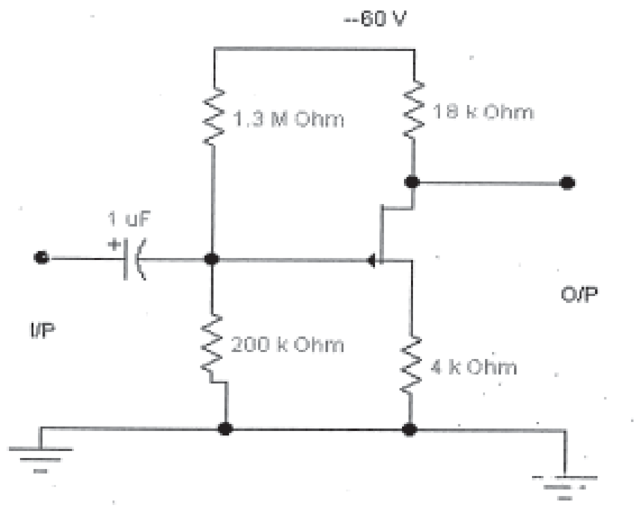


Fig. 8-b

9. a) Draw the block schematic of an Op-Amp and briefly explain each block. **8**

b) Draw and explain Triangular wave form generator by using Op-Amp. **8**

OR

10. a) What is an Instrumentation amplifier ? Explain three Op-Amp instrumentation amplifier. **8**

b) Draw and explain Differentiator circuit using Op-Amp 741. Also draw input, output waveform. **8**

11. a) Draw and explain two transistor model of SCR. Also explain regenerative action in SCR operation. **8**

b) Draw and explain neat circuit diagram of the operation of Buck Boost SMPS. Why it is called inverting regulator ? **6**

c) Sketch V-I characteristic of SCR. Explain latching current, holding current and forward breakover voltage. **4**

OR

12. a) Draw and explain line interactive UPS. What operating changes are required if the UPS is to be operated as on-line UPS ? **8**

b) Explain the construction, operation of Triac and V-I characteristic of Triac with the help of euqivalent circuit of it. **10**

———————

S.E. (Computer Engineering) (Sem. – I) Examination, 2011
DIGITAL ELECTRONICS AND LOGIC DESIGN
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : 1) *Answer Q. No.* ***1*** *OR* ***2****,* ***3*** *OR* ***4****, and* ***5*** *OR* ***6*** *from Section I and Q.No.* ***7*** *OR* ***8****,* ***9*** *OR* ***10*** *and* ***11*** *OR* ***12*** *from Section* ***II****.*
2) *Answers to the* ***two*** *Sections must be written in* ***separate*** *answer books.*
3) ***Neat*** *diagram must be drawn* ***whenever*** *necessary.*
4) *Figures to the* ***right*** *indicate* ***full*** *marks.*
5) *Assume* ***suitable*** *data, if* ***necessary****.*

SECTION – I

1. a) What is property of gray code ? Find equations to convert binary code into gray code. **6**

b) Convert following numbers, show all the steps **6**

1) $(101101.10101)_b = (?)_d$
2) $(12.6875)_d = (?)_b$
3) $(247)_d = (?)_o$

c) Perform the following hexadecimal subtraction 2's complement method. **6**

1) 3F H-5C H
2) C0 H-7A H

OR

2. a) Which are universal gates ? Draw AND, OR, and NOT gates using universal gates. **6**

b) Convert following number into octal number **6**

1) $(111110001.10011001101)_b$
2) $(3287.5100098)_d$
3) $(0.BF85)_h$

c) Implement the following function using NAND only gates. **6**

Use K-map to minimize your circuit

$f(A, B, C, D) = \sum(0, 2, 5, 6, 8, 10, 13, 15)$

3. a) With the help of 4-bit full adder as a building block and few logic gates how will you implement BCD adder ? Explain your design using circuit diagram and truth table. **10**

$Y(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 10, 12, 13, 15)$

b) Compare TTL and CMOS logic family. **6**

OR

4. a) Draw and explain 2-input NAND TTL logic gate with totem output driver. **8**

b) What is tri-state ? What is the use of tri-state buffers ? Explain with suitable circuit diagram. **4**

c) Design full adder using 8:1 mux. **4**

5. a) Design 2-bit magnitude comparator using logic gates to give output $A>B$, $A=B$, $A<B$ inputs are A(2-bit) and B(2-bit). **12**

b) Explain working of IC 74180. **4**

OR

6. a) Draw 4:1 mux using strobe input using NAND gates. Implement the expression using 8:1 multiplexer **8**

$F(A, B, C, D) = \sum m(2, 4, 6, 7, 9, 10, 11, 12, 15)$

b) Implement 8 line to 256 line decoder using 4 line to 16 line decoder. **8**

SECTION – II

7. a) Draw and explain 3-bit asynchronous UP-counter. Also draw the necessary timing diagram. What is the difference between Synchronous counters and Asynchronous Counter ? **10**

b) Design following using IC 7490

i) MOD 7 counter

ii) MOD 46 counter. **8**

OR

8. a) Design sequence detector using JK flip flop to detect the following sequence.
-------1101------ **12**

b) Explain different modes of universal shift register with application of each. **6**

9. a) Design sequence generator using JK –FFs. **8**

$1 \rightarrow 2 \rightarrow 4 \rightarrow 7 \rightarrow 1$

b) What is race-around condition ? Explain with the help of timing diagram. How is it removed in basic flip flop circuit ? **8**

OR

10. a) Draw an ASM chart for the 2-bit counter with the following specifications:

1) It will count UP if x = 1
2) It will maintain same state if x = 0
3) Produces output = 1 if the counter bits are equal unconditionally. Otherwise output = 0 unconditionally. **8**

b) Implement 4:1 multiplexer using suitable PAL **8**

11. a) Design the data section and control section circuit for the following RTL sequence:

MODULE:	DATA MOVER _ 2
MEMORY:	A[3];B[3];C[3];D[3]
INPUTS:	X[3]
OUTPUT:	Z[3]

1. A<- X
2. C<-A
3. B<-C[0],C[1],C[2]
4. $C \leftarrow A \vee B$ ->(A[0],A[0]/(4,6)
5. Z <-C ->(1)
6. ~~D<-A∧B~~, $D \leftarrow A \wedge B$
7. Z<-D ->(1)

16

OR

12. a) Explain difference between CPLD and FPGA. **8**

b) Consider a simple example of a half adder. How will you write a VHDL entity declaration for half adder ? Also write an architecture of half adder in structuralStyle of Modelling and Data flow Style of Modelling. **8**

[3962] – 358

S.E. (Computer Engg.) (Semester – II) Examination, 2011
COMPUTER GRAPHICS
(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 **righ**t indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Explain three methods of character generation. **8**

b) Explain the functioning of CRT display device. **10**

OR

a) Explain different line styles along with one application each. **8**

b) With the help of block diagram explain graphics primitives in interactive devices and data generation devices (one each). **10**

2. a) Explain with example, scan conversion algorithm for convex polygons. **8**

b) Write with example, 2D transformation matrix for translation, scaling, rotation and shear transform. **8**

OR

a) Explain with example functioning of seed fill and edge fill algorithms. **8**

b) With the help of example, explain the rotation about arbitrary 2D point. **8**

P.T.O.

3. a) Explain with example, operations on segments. **8**

   1) Segment creation 2) Segment deletion 3) Segment renaming.

   b) Explain with example, Cohen-Sutherland outcode algorithm. **8**

OR

   a) Explain with example, advantages of segment tables. **8**

   b) Explain with example, generalized clipping algorithm. **8**

SECTION – II

4. a) With the help of axis system diagram explain advantages of 3D transformations. **10**

   b) Explain parallel projections with example (any two). **8**

OR

   a) A 3D square box with vertex A at origin and vertex B(2,2,2) in 3D space, is shifted such that vertex A becomes A(1,1,1). Give necessary transformation treatment. **10**

   b) Explain perspective projection with examples (any two). **8**

5. a) Write short notes on : **8**

   1) Z-buffer algorithm 2) Painter's algorithm

   b) Explain RGB and HSI color models with the help of diagrams. **8**

OR

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

   1) Back-face removal algorithm 2) Binary space partitioning.

   b) What is diffused illumination and point source illumination ? **8**

6. Write short note on B-splines. Give necessary mathematical formulation. **16**

OR

Write short note on Bezier curve. Give necessary mathematical formulation. **16**

OR

Write short note on fractal lines. Give two examples of fractals. Give necessary mathematical formulation. **16**

S.E. (Semester – II) (Computer Engineering) Examination, 2011
COMPUTER ORGANIZATION (Common to I.T.)
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instruction**: Answer **three** questions from Section-**I** and **three** questions from Section-**II**.*

SECTION – I

1. a) Explain Booth's Algorithm to multiply the following pair of numbers :
A = 110011 (multiplicand) B = 101100 (multiplier). **10**

b) Represent (178.1875) in single and double precision floating point format. **8**

OR

2. a) Explain in details the non-restoring division algorithm with the help of an example. **10**

b) Draw and explain the flowchart for floating point multiplication. **8**

3. a) Write control sequence for execution of the instruction MOV (R3), R1. **8**

b) Explain detail Horizontal and Vertical organization of microinstructions. **8**

OR

4. a) Draw the single bus organization of the CPU, showing all the registers and data paths. **8**

b) What are the different design methods for hardwired control units ? Explain any one. **8**

5. a) Explain any four addressing modes of Intel processor along with one example. **8**

b) Draw and explain Register Architecture of Motorola processor in detail. **8**

OR

6. a) Explain the design of ALU. **8**

b) Explain instruction format of Pentium Processor. **8**

SECTION – II

7. a) State cache mapping techniques. Draw and explain them with their merits and demerits. **10**

   b) Explain RAID in details. **8**

OR

8. a) What is Virtual Memory ? Explain with the help of neat diagram the virtual memory address translation. **10**

   b) Explain the following : **8**

      i) DAT ii) DRAM.

9. a) Explain PCI Bus with diagram. **8**

   b) Explain Synchronous and asynchronous bus in an input operation with timing diagram. **8**

OR

10. a) Explain with suitable diagram types of IO channels. **8**

    b) Explain the following : **8**

       i) Scanner ii) Dot Matrix Printer.

11. a) Explain loosely coupled system with the help of diagram. **8**

    b) Explain with neat diagram inter-processor communication between 8086 and 8087. **8**

OR

12. a) Explain the following : **8**

       i) Daisy Chaining ii) Polling method of arbitration.

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

       i) RISC Architecture ii) Superscalar Architecture.

S.E. (Information Technology) (Semester – I) Examination, 2011
DIGITAL ELECTRONICS AND MICROPROCESSOR
(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 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) Convert the following numbers in to equivalent decimal numbers **6**

i) $(ABC.13)_{16}$

ii) $(673.62)_8$

iii) $(110110110.1101)_2$

b) What is parity check bit ? Why it is necessary in digital communication ? How will you generate an odd parity for a 4 – bit number ? Explain. **6**

c) What are Excess-3 and Gray codes ? Explain with help of two examples. And also explain the self-complementing property of Gray code. **6**

OR

2. a) Perform the following arithmetic's using 2's compliment form (show step-by-step process): **8**

i) +6 +13

ii) –6 +13

iii) +6 –13

iv) –6 –13

Also justify your result.

b) Convert the following number into its equivalent Octal number and equivalent Binary number. (Show step-by-step process). **4**

$(127.4)_{10}$

c) Convert the following number into its equivalent Hexadecimal number and equivalent Decimal number. (Show step-by-step process). **4**

$(673)_8$

d) How Weighted codes are different than non-weighted codes ? Give examples. **2**

3. a) Compare TTL and CMOS families based on the following characteristics. Define the characteristics before comparison. **12**

i) Propagation delay time

ii) Power dissipation

iii) Fan-out

iv) Noise margin

b) Draw two input TTL-NAND gate and explain its operation. **4**

OR

4. a) What do you mean by Tri-state ? Draw and explain the circuit diagram of tri-state TTL NAND GATE. **8**

b) Give advantages and disadvantages of Totem Pole output-stage arrangement. Why such two stages cannot be connected together except Open collector Logic ? **8**

5. a) Draw and explain the basic circuit of single digit BCD adder using IC 7483. How will you make two digit BCD adder ? Explain the logic of the circuit. **8**

b) Implement full adder using 8 : 1 multiplexer. Draw and explain the circuit diagram. **4**

c) Reduce the following function using K-map techniques. Also implement using basic logic gates. **4**

$Y = \pi M(4, 5, 6, 7, 8, 12, 13) + d(1, 15)$

OR

6. a) Design and implement BCD to Gray code convertor using logic gates. Starting with truth table show K-maps and circuit diagram of your design. **8**

b) Draw and explain internal architecture of IC 7490 and design divided by 84 counter using IC 7490. **8**

SECTION – II

7. a) Draw and explain Master Slave JK FF using NAND gates. What advantages it has over normal JK-FF ? **4**

b) What do you mean by synchronous and asynchronous sequential circuit ? State merits and demerits of both the circuits. **4**

c) Draw the circuit diagram and timing diagram of 3 bit ripple Down counter using JK flip flops. How will you convert this counter as Up-counter ? Explain. **10**

OR

8. a) Draw and explain Ring Counter using 4-bit shift register. Also draw the waveforms. **8**

b) Design a circuit to generate the following sequence. How will you avoid lock-out condition ? Use D-flip flop. **10**

$\rightarrow$8 -5-3-9-11-12-

9. a) What is the purpose of sample and Hold circuit at the input stage of analog to digital converter ? Justify your answer with the help of suitable circuit diagram. **8**

b) Explain with the help of suitable block diagram the logic of 4-bit Single-Slope analog to digital conversion. **8**

OR

10. a) Draw and explain the circuit diagram of : **8**

i) R-2R 4 bit DAC

ii) Weighted Register 4-bit DAC

Which is more advantageous ? why ?

b) What are the various specifications one need to observe while deciding an ADC for a specific application ? Explain. **8**

11. a) Draw and explain the block diagram of 8085 microprocessor . **8**

b) Explain the following terms : **4**

i) Memory Mapped I/O

ii) I/O Mapped I/O

c) What is multiplexed data bus of 8085 processor ? How can we demultiplex it ? **4**

OR

12. a) Explain the following pins of 8085 microprocessor. **6**

i) ALE ii) HOLD

iii) SID

b) Explain the following instructions of 8085 processor : **6**

i) RIM ii) DAA

iii) LHLD

c) Draw and explain control word register of 8255. What is BSR mode of 8255. **4**

———————

[3962] – 363

S.E. (Information Technology) (Semester – I) Examination, 2011
MANAGEMENT AND FINANCE
(2003 Course)

Time : 3 Hours	Max. Marks : 100

Instructions : *1) Answer **any one** question 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

UNIT – I

1. a) Define Management. What are the characteristics and objectives of management ? **9**

   b) "Planning is the basis of control, action is the essence of control, delegation is key to control and information is the guide to control". Explain. **9**

OR

2. a) What are the different levels of management and their functions ? **9**

   b) Explain in brief the contribution of F.W. Taylor to the scientific management. **9**

UNIT – II

3. a) Define the law of demand and supply. Explain in brief the income and price elasticity of demand. **10**

   b) Explain the following : **6**

      i) Utility and value

      ii) Characteristics of wants.

OR

P.T.O.

4. a) Explain the role of chamber of commerce and industries in Indian context. **8**

   b) Explain the following : **8**

      i) Patents ii) Copy rights iii) Trademarks.

UNIT III

5. a) Define 'Organization'. Explain in brief the principles of Organization. **8**

   b) Explain the following :

      i) MOA ii) AOA. **8**

OR

6. a) What are the various forms of ownership organizations ? State the factors to be considered before deciding the form of ownership to be started. **6**

   b) Explain the following organizational structures with neat line diagrams. **10**

      i) Line and staff organization

      ii) Functional organization.

SECTION – II

UNIT – IV

7. a) What is scientific selection of manpower ? Explain the process of manpower planning with a neat line diagram. **8**

   b) Explain with a neat diagram Maslow's need priority model. **8**

OR

8. a) Define communication. Explain the process of communication. State and explain verbal and non-verbal communication along with advantages and disadvantages. **12**

   b) What are the objectives of training the employees ? **4**

UNIT – V

9. a) Define capital. What are the different types of capital ? State its importance in business enterprise. **12**

   b) Distinguish between budget and budgetary control. **6**

OR

10. a) What is a balance sheet ? Illustrate the forms and contents of a balance sheet. **12**

    b) Distinguish between money market and capital market. **6**

UNIT – VI

11. a) Explain the term depreciation with suitable examples. Differentiate between depreciation and obsolescence. Explain any two methods of evaluating depreciation. **12**

    b) What are the phases involved in capital budgeting ? **4**

OR

12. a) Explain the following in connection with the break even chart with a neat sketch :

    i) Break-Even point

    ii) Margin of safety

    iii) P/V ratio.

    Also explain the limitations of break even chart. **16**

———————

B/I/11/570

[3962] – 364

S.E. (Information Technology) (Semester – I) Examination, 2011
PROGRAMMING PARADIGMS AND METHODOLOGY
(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 drawn **wherever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) Assume suitable data, **if** necessary.*

SECTION – I

1. a) What are the characteristics of good programming language ? Explain each in brief. **8**

   b) Discuss the various programming language paradigms with their computational models. Give the suitable diagrammatic representation of the same. **10**

OR

2. a) Discuss the various expression notations used by the programming languages to solve the expression. **10**

   b) How is context free grammar used to develop programming language ? Explain the various components of context free grammar. **8**

3. a) Demonstrate early binding and late binding with an example. **6**

   b) What are advantages of user defined enumeration types ? **4**

   c) Explain structured, non-structured, derived and abstract data types with example. **6**

OR

4. a) Explain the following control flow statements with any programming language code : **10**
   i) Sequencing statement
   ii) Selection statement
   iii) Loop structure
   iv) Iterative statement
   v) Nested loop structure.

   b) Compare the scalar data type and composite data type. **6**

5. a) Define the following terms related to variable : **8**
   i) Life time
   ii) Scope
   iii) Static scope
   iv) Dynamic scope.

   b) Define the term function and macro. How do they differentiate from each other ? **8**

OR

6. a) Explain in brief general characteristics of sub-program. **4**

   b) What are different benefits of procedure ? **4**

   c) What do you mean by recursion in the program ? Give the example of program that can be solved recursively as well as non-recursively. **8**

SECTION – II

7. a) What is meant by constructor and destructor ? What are the different types of constructors ? For what purpose will constructor and destructor be used in a program ? **10**

   b) Explain the distinction between private, protected and public class members and same distinction for base class in C++. **8**

OR

8. a) What is a friend function ? What are the merits and demerits of using friend function ? **6**

   b) Explain how compile time and run time polymorphism is achieved. **6**

   c) Write all the data types supported by LISP. **6**

9. a) Explain the difference between facts, rules and queries in PROLOG. **6**

b) What is concurrent programming ? Why do we write concurrent program ? **6**

c) What are the applications of functional language ? **4**

OR

10. a) Write a short note on basic concepts in object-oriented programming. **8**

b) Write LISP code for appending string and to find length of string. **8**

11. a) Compare the different control structures available in C++ and PROLOG. Give suitable example. **8**

b) How is the file handling in C++ different than file handling in C ? **8**

OR

12. a) Explain the following with respect to C++ : **6**

i) Primitive data types

ii) User defined data types

iii) Storage representation

iv) Standard input-output function.

b) Compare functional and logic programming languages with respect to the following issues : **6**

i) Syntactic structure

ii) Semantics

iii) Data types.

c) What is association list in LISP ? **4**

———————

[3962] – 365

S.E. (Information Technology) (Semester – II) Examination, 2011
MICROPROCESSOR SYSTEMS
(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) Assume **suitable** data, if **necessary.***

SECTION – I

1. a) With the help of block diagram, explain the basic architecture of 8086 processor in detail. **12**

   b) Draw functional diagram of 8086 in minimum mode. **6**

OR

2. a) Draw timing diagram of memory read cycle for 8086 and explain. **8**

   b) Draw functional diagram of 8086 in maximum mode. Describe signals / pins used in maximum mode. **10**

3. a) Draw programmers model of 8086. Explain. **8**

   b) Explain any two addressing modes of 8086. **8**

OR

4. a) Explain difference between :
   i) far and near procedure.
   ii) .exe and .com. **8**

   b) Explain the following directives :
   i) EXTRN ii) PUBLIC
   iii) DB iv) .STACK. **8**

P.T.O.

5. a) Explain the different types of interrupts in 8086. **8**

   b) Draw block diagram of 8259. Explain. **8**

OR

6. a) Draw block diagram of 8253. Explain. **8**

   b) Explain IVT of 8086 in detail. **8**

SECTION – II

7. a) Draw block diagram of 8255. Explain. **8**

   b) Explain various operating modes of 8255. **8**

OR

8. a) Give difference between synchronous and asynchronous communication. **8**

   b) Draw block diagram of 8251. Explain. **8**

9. a) Explain how 80386 converts logical address to physical address when 80386 is operating in real mode and protected mode with the help of all descriptors and registers. **18**

OR

10. a) Explain how 80386 will access code from PL1 if it is running at PL3. Explain with the help of CALL GATE. **12**

    b) What is the meaning of privileged instructions ? Give examples. **4**

    c) How 80386 switches from RM to VM ? **2**

11. a) What is exceptions ? Explain its types. **8**

    b) Explain TSS (Task State Segment) with the help of diagram. **8**

OR

12. a) What are the features of Pentium ? Draw architecture diagram of Pentium Processor. **12**

    b) Explain significance of TS bit and NT bit. **4**

———————

[3962] – 366

S.E. (Information Tech.) (Semester – II) Examination, 2011
DATA STRUCTURES AND FILES
(2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any 3** questions from **each** Section.*
*2) Answer to the **two** Section should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **righ**t indicate **full** marks.*
*5) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Define sparse matrix. Show the sparse matrix representation of any matrix. Compare simple and fast transpose in terms of space and time complexity. **6**

   b) With diagrams represent how insertion, deletion and creation of a doubly linked list takes place. Write pseudocode for the same. **10**

OR

2. a) Define frequency count. For any piece of code find the frequency count. Express the frequency count in terms of Big O, theta and gamma notations. **8**

   b) Write the algorithm/program for fast transpose of sparse matrix. **8**

3. a) Define a binary search tree. Draw the BST for the given data : **6**

   100, 170, 55, 95, 125, 130, 60, 35, 180, 30, 200.

   Write down all the three traversals for the above tree.

   b) For the tree drawn in Q. 3a) perform in order threading of the tree and write the non-recursive algorithm for post order traversing of the tree. **6**

   c) Define the following terms w.r.t. trees : **6**

   i) Height of tree

   ii) Predecessor and successor of a node

   iii) Leaf node.

OR

P.T.O.

4. a) Elaborate on the different ways in which a binary tree can be represented. Draw the binary tree from the given sequential representation. **6**

A	B	E	C	D	--	F

b) Sort the following data in ascending order using heap sort. **12**

23, 7, 92, 6, 12, 14, 40, 44, 20, 21.

5. a) Define a graph. Define the following terms with examples : **8**

Adjacent node, path, cycle and connected graph.

b) For the given adjacency matrix draw the graph and find the MST using Prim's algorithm. Write the algorithm for the same. **8**

	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
A	0	4	3	0	0	0	1	0
B	4	0	0	0	3	0	0	0
C	3	0	0	8	0	5	0	0
D	0	0	8	0	0	0	0	5
E	0	3	0	0	0	0	6	0
F	0	0	5	0	0	0	2	7
G	1	0	0	0	6	2	0	0
H	0	0	0	5	0	7	0	0

OR

6. a) For the adjacency matrix of Q.5b) draw the graph and find the MST using Kruskal's algorithm. Write the algorithm for the same. **8**

b) For the above graph find the shortest path from every node to every other node in the graph using Dijkstra's algorithm and write the algorith for the same. **8**

SECTION – II

7. a) With examples define balance factor and elaborate on the different types of rotations used in AVL trees. **8**

b) Draw a Huffman's tree for the given data set and find the corresponding Huffman codes. **10**

Character	**Weight**	**Character**	**Weight**
A	10	H	3
B	3	I	6
C	4	J	8
D	15	K	7
E	2	L	5
F	4	M	12
G	2	N	5

OR

8. a) Write a note on static and dynamic trees. **6**

b) Describe characteristics of a good hash function. Consider a hash table of size 10 and a hash function of X mod 10. Implement hashing using linear probing with and without replacement for the following data :

44, 25, 88, 09, 19, 35, 04, 22, 36, 01. **12**

9. a) Describe the following file operations with all options and examples : **8**

fseek(), ftell(), fopen(), fclose()

b) Implement all primitive file operations for sequential files. **8**

OR

10. a) Compare sequential, simple index and direct access files. **8**

b) With example explain chaining with and without replacement as a collision resolution technique for hashing. **8**

11. a) Sort the given list using quick sort, indicate the pivot and sublists after each pass. Explain the algorithmic strategy used here. **10**

44, 78, 22, 7, 98, 56, 34, 2, 38, 35, 45

b) Explain the graph coloring problem and the algorithmic strategy used with it. **6**

OR

12. a) Sort the given list using merge sort, Indicate the sublists after each pass. Explain the algorithmic strategy used here. **10**

44, 78, 22, 7, 98, 56, 34, 2, 38, 35, 45

b) Explain the 0-1 knapsack problem with the algorithmic strategy used with it. **6**

———————

B/I/11/735

S.E. (Information Technology) (Semester – II) Examination, 2011
PRINCIPLES OF COMMUNICATION ENGINEERING
(2003 Course)

Time: 3 Hours Max. Marks: 100

SECTION – I

1. a) With neat block diagram explain the operation of the basic communication system. **8**

   b) State and prove the following properties of Fourier transform :
      1) Time shifting
      2) Frequency shifting
      3) Scaling. **10**

OR

2. a) Define modulation and explain the necessity of the same. **6**

   b) What is spectrum of signal ? **4**

   c) Draw magnitude and phase spectrum of x(t) = $\sin(\omega_0 t)$ where $-\infty < t < +\infty$ **8**

3. a) An amplitude modulated carrier is viewed on an oscilloscope and has a crest voltage of 55 V_{pp}. The bottom point of the wave measures 10 V_{pp}.
      i) What is modulation factor ?
      ii) What is percentage of modulation ?
      iii) What is the peak to peak unmodulated carrier voltage ?
      iv) Explain concept of over modulation. **8**

   b) Explain wideband and narrowband frequency modulation. **8**

OR

4. a) A modulation signal 20 $\sin(2\pi \times 10^3 t)$ is used to modulate a carrier signal 40 $\sin(2\pi \times 10^4 t)$

Find

i) Modulation index

ii) Percentage modulation

iii) Sideband frequencies and their amplitude

iv) Bandwidth. **8**

b) Compare AM and FM signal. **8**

5. a) Draw and explain the CW transmitter. Also draw the neat waveform for dotdash-dot type of signal. **8**

b) Write short note on :

i) Superheterodyne receiver.

ii) Noise in communication system. **8**

OR

6. a) Draw and explain the simple technique of SSB generation. **8**

b) Explain the terms :

i) Sensitivity

ii) Selectivity

iii) Fidelity

iv) Image frequency. **8**

SECTION – II

7. a) In PCM system the signal to quantization noise ratio is expected to have minimum value of 60 dB. Calculate number of bits per word and number of quantization levels. **8**

b) Define and explain local loop. **4**

c) Write short note on DTMF signalling. **6**

OR

8. a) Explain operation of Fax machine with neat diagram. **8**

b) Describe types of links between telephone exchange. **4**

c) Explain difference between TDM and FDM. **6**

9. a) What is fading ? What are its causes ? **8**

b) Write a short note on :

i) NTSC standards

ii) PAL standards

iii) SECAM standards. **8**

OR

10. a) Explain characteristic impedence of transmission lines. **8**

b) Explain concept of "Interlaced scanning". **8**

11. a) Explain Shannon's channel capacity theorem. **8**

b) Explain the following properties of light with respect to optic communication :

i) Reflection

ii) Refraction. **8**

OR

12. a) Draw and explain basic digital communication system. **8**

b) What is WDM and its advantages ? **8**

S.E. Biotechnology (B.Tech.) (Semester – I) Examination, 2011
FLUID FLOW OPERATIONS AND SOLID HANDLING
(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) Explain the affect of temperature on viscosity of fluids. **4**

b) Determine the intensity of shear of an oil having a viscosity of 1 poise. The oil is used for lubricating the clearance between a shaft of diameter 10 cm and its journal bearing. The clearance is 1.5 mm and the shaft rotates at 150 rpm. **6**

c) Calculate the pressure due to a column of 0.3 m of
i) Water
ii) An oil of specific gravity 0.8 and
iii) Mercury of specific gravity 13.6

Take density of water as 1000 kg/m^3. **6**

OR

2. a) Define the following terms along with their units : **4**
i) Kinematic viscosity
ii) Specific gravity
iii) Vapour pressure
iv) Gauge pressure.

b) A liquid has a viscosity of 0.06 poise and a specific gravity of 0.9. Find the kinematic viscosity in stokes and m^2/s. **4**

c) A U tube manometer is used to measure the pressure of water in a pipe line, which is in excess of the atmospheric pressure. The right limb of the manometer contains mercury and is open to the atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference of level of mercury in the limbs of U tube is 10 cm and the free surface of mercury is in level with the centre of the pipe. If the pressure of water in the pipe line is reduced to 9810 N/m^2, calculate the new difference in the level of mercury. Sketch the arrangements in both the cases. **8**

3. a) What is the significance of Bernoulli's equation in fluid flow ? Derive the Bernoulli's equation without friction. **8**

b) A 30 cm diameter pipe conveying water branches into two pipes of diameter 20 cm and 15 cm respectively. If the average velocity in the 30 cm pipe is 2.5 m/s, find the discharge in the pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s. **5**

c) With the help of a neat sketch, explain the construction and working of a venturimeter. **5**

OR

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

i) Laminar and turbulent flow

ii) Steady and unsteady flow.

b) Water is flowing through a pipe having a diameter of 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the upper end is 9.81 N/cm^2. Determine the difference in the datum head if the rate of flow through the pipe is 40 lit/sec. **6**

c) An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 60 mm and length 200 m. The rate of flow of fluid through the pipe is 3.5 lit/s. Find the pressure drop in a length of 200 m and also the shear stress at the pipe wall. **8**

5. a) State and explain the following laws of communition : **6**
   i) Kick's law
   ii) Rittinger's law.

   b) Describe in brief the various factors affecting screen effectiveness and capacity. **5**

   c) Explain the principle of operation and construction of any one fine crusher. **5**

OR

6. a) Calculate the operating speed of the ball mill from the following data : **6**
   i) Diameter of the ball mill = 800 mm
   ii) Diameter of the ball = 60 mm

   if operating speed is 55% less than the critical speed and when the critical speed is 40% more than the operating speed.

   b) Derive an expression for calculating the screen effectiveness. **6**

   c) Describe gyratory screen in brief. **4**

SECTION – II

7. a) What is agitation ? Explain the purpose of agitation in Biotech industries. **5**

   b) Differentiate between the two types of impellers giving examples of each type. **5**

   c) What is kneading ? Explain any one kneading equipment in detail. **6**

OR

8. a) Explain the formation of swirling pattern in an unbaffled agitated tank. Why is it undesirable in mixing ? **6**

   b) Explain the procedure for calculating power consumption of an impeller in an agitated tank. **5**

   c) Describe the construction and operation of pug mills used for mixing viscous materials. **5**

9. a) What will be settling velocity of a spherical particle of 0.4 mm diameter in an oil of specific gravity 0.82 and viscosity of 10^{-3} Ns/m^2 ? The specific gravity of steel is 7.87. **6**

b) What is the batch sedimentation test ? Explain the different zones in this test. **6**

c) Describe any one equipment used for centrifugal sedimentation. **6**

OR

10. a) Derive the Stoke's law for a spherical particle falling in a viscous fluid. **6**

b) A slurry containing 5 kg water per kg of solids is to be thickened to a sludge containing 1.5 kg of water per kg of solids in a continuous operation. Laboratory tests using five different concentration of the slurry yielded the following results : **12**

Conc. (kg water/kg solids)	5	4.2	3.7	3.1	2.5
Rate of sedimentation (mm/s)	0.17	0.10	0.08	0.06	0.042

Calculate the minimum area to effect the separation of 0.6 kg of solids per sec.

11. a) What is fluidization ? What are its salient characteristics ? **6**

b) Explain the different industrial applications of fluidized bed system. **6**

c) Enlist the characteristics of a good filter medium. **4**

OR

12. a) Differentiate between aggregative and particulate fluidization. **6**

b) Write expressions for calculating pressure drop through filter cake for constant pressure and constant volume filtration. **4**

c) Describe any one filtration equipment in detail. **6**

———————

[3962] – 374

S.E. Biotechnology (B.Tech.) (Semester – I) Examination, 2011
MICROBIOLOGY
(2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. Describe the structure of peptidoglycan. How do lysozyme and penicillin act on the cell wall of bacteria ? What are protoplasts ? **18**

OR

2. Explain structure and function of flagella and pili. Give examples of bacteria having flagella. **18**

3. Explain in detail growth curve of Bacteria. How will you grow psychrophillic bacteria ? **16**

OR

4. Write mechanism of action and application of the following : **16**

   a) UV Rays

   b) Formaldehyde

   c) β-propiolactone

   d) X-rays.

5. Differentiate between following (**4** marks **each**). **16**

   a) Sterilization and disinfection

   b) Dry-Heat sterilization and steam sterilization,

   c) Gram positive and Gram negative bacteria.

   d) Enrichment media and enriched media.

P.T.O.

SECTION – II

6. Describe MPN test for detection of quality of water. **18**

OR

7. Describe pathogenesis and lab diagnosis of Mycobacterium Tuberculosis. **18**

8. Write in detail on Food Preservation. **16**

OR

9. Explain in detail about size, shape, classification and morphology of viruses. **16**

10. Write a short note on **any four** (**4** marks **each**) : **16**

a) Interferon

b) Canning

c) Antagonism

d) Fungal disease with example

e) Epidemic

f) Carbon cycle

g) Acidophiles

h) Agrobacterium

i) Structure of HIV.

———————

[3962] –379

S.E. (Semester – II) (Biotechnology) (B.Tech.) Examination, 2011
THERMODYNAMICS
(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) Neat diagrams must be drawn **whenever** necessary.*
*4) Assume suitable data, if **necessary**.*
*5) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator is **allowed**.*
*6) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) What is the first law of thermodynamics ? Explain it with respect to steady state flow process. **10**

b) Heat is transferred to 10 kg of air which is initially at 100 kPa and 300 K until its temperature reaches 600 K. Determine the change in internal energy, the change in enthalpy, the heat supplied, and the work done in the following processes :

i) Constant volume process

ii) Constant pressure process.

Assume that air is an ideal gas for which the P-V-T relationship is PV = n RT, where, n is number of moles of the gas and R is the ideal gas constant. R = 8.314 kJ/mol K. Take C_p = 29.099 kJ/mol K, C_v = 20.785 kJ/kmol K and molecular weight of air =29. **8**

OR

2. a) What is the change in entropy when 1 kmol of an ideal gas at 335 K and 10 bar is expanded irreversibly to 300 K and 1 bar ? Cp = 29.3 kJ/kmol K. **4**

   b) Explain the concept of 'Entropy' in detail. **6**

   c) State and explain the Clausius inequality. **8**

3. a) Given the latent heat of vaporization of water at 100°C is 2257 J/g, estimate the latent heat at 300°C. **4**

   b) Write short notes on :

      i) Standard heat of formation

      ii) Standard heat of reaction and

      iii) Standard heat of combustion. **12**

OR

4. a) Calculate the standard heat at 25°C for the following reaction

   $4HCl\ (g) + O^2\ (g) \rightarrow 2H_2O\ (g) + 2Cl_2\ (g)$

   Standard heats of formation at 25°C are HCl (g) = – 92.307 J

   H_2O (g) = – 241818 J. **4**

   b) State and explain the effect of temperature on heat capacity of substances with relevant equations. **12**

5. a) A 30% by mole methanol-water solution is to be prepared. How many cubic meters of pure methanol (molar volume, 40.727×10^{-6} m^3/mol) and pure water (molar valume, 18.068×10^{-6} m^3 / mol) are to be mixed to prepare 2 m^3 of the desired solution ? The partial molar volumes of mathanol and water in a 30% solution are $38.632{\times}10^{-6}$ m^3/mol and $17.765{\times}10^{-6}$ m^3/mol, respectively. **6**

   b) Prove that if Henry's law is obeyed by component 1 in a binary solution over a certain concentration range, Lewis-Randall rule will be obeyed by component 2 over the same concentration range. **10**

OR

6. a) The van Laar constants A and B for the system nitromethane (1)/CCl_4 at 45°C are 2.230 and 1.959, respectively. Calculate the activity coefficients of the components in a solution containing 30 mol percent nitromethane. **6**

b) Write a note on : **10**

i) Fugacity and fugacity coefficient

ii) Ideal solutions

iii) Activity and activity coefficients

iv) Excess properties

v) Chemical potential.

SECTION – II

7. a) State and explain Duhem's theorem. **6**

b) Explain the criteria of phase equilibrium. **12**

OR

8. a) Using the criteria of phase equilibrium show that the change in entropy during phase change can be calculated from the latent heat of phase change and the absolute temperature as $\Delta S = \Delta H/T$. **6**

b) Explain the vapor-liquid equilibrium in ideal solutions. **12**

9. a) Ammonia synthesis reaction is represented by

$N_2 + 3\,H_2 \rightarrow 2\,NH_3$

The reactant stream consists of 1 mol N_2, 3 mol H_2 and 2 mol argon . The temperature and pressure of the reaction are 675 K and 20 bar. The equilibrium constant for the reaction is 2×10^{-4}. Determine how the conversion of nitrogen is affected by the presence of argon. **6**

b) Explain the phase rule for reacting systems. **4**

c) Calculate the equilibrium constant at 298 K of the reaction,

$N_2 + 3\,H_2 \rightarrow 2\,NH_3$ given that the free energy of formation of ammonia t 298 K is –16,500 J/mol. **6**

OR

10. a) Explain the evaluation of equilibrium constants. **8**

b) One mole steam undergoes the water-gas shift reaction at a temperature of 1100 K and a pressure of 1 bar.

$CO\,(g) + H_2O\,(g) \rightarrow CO_2\,(g) + H_2\,(g)$

The equilibrium constant for the reaction is K = 1. Assuming ideal gas behaviour calculate the fractional dissociation of steam in the following cases and discuss the effect of the presence of excess reactant on the extent of reaction.

i) CO supplied is 100% excess of the stoichiometric requirement.

ii) CO supplied is only 50% of the theoretical requirement. **8**

11. a) Explain the laws of thermodynamics in relation with biological systems. **16**

OR

12. a) Explain the Gibb's free energy and its relevance to biology. **8**

b) Explain the types of biochemical reactions. **8**

———————

B/I/11/110

[3962] – 380

S.E. (Biotechnology) (B.Tech.) (Semester – II) Examination, 2011
MOLECULAR BIOLOGY AND GENETIC ENGINEERING
(2003 Course)

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. Describe the pathway for synthesis of purines. **18**

OR

2. How do you differentiate nucleotides and nucleosides ? Also discuss the salvage pathway. **18**

3. Depict details of Watson-Crick model for DNA structure. Write short notes on
   a) A DNA
   b) B DNA and
   c) Z DNA. **16**

OR

4. What is melting of DNA ? Explain C-value paradox and hyperchromicity. **16**

5. Describe the experiment leading to semiconservative nature of DNA replication. **16**

OR

6. What are the roles of various enzymes in replication of DNA ? **16**

SECTION – II

7. Describe various types of RNA with structural and functional features. **16**

OR

8. What is splicing ? Describe RNA splicing in detail. **16**

9. Explain in detail structure of genes. Write short note on regulation of gene expression in prokaryotes. **16**

OR

10. Write short notes on : **(8 Marks each)**

   1) Oncogenes

   2) Transposons

11. Write short notes on **any two** : **(9 Marks each)**

   1) Genetic code

   2) Protein Biosynthesis

   3) Translation

   4) Heat shock proteins.

S.E. (Mechanical) (Semester – II) Examination, 2011
MANUFACTURING PROCESSES – II
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instrcutions : *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) Answers to the **two** Sections should be written in **separate** answerbook.*

*iii) **Neat** diagrams must be drawn **wherever** 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) A tool with 18° rake angle is making an orthogonal cut, 3 mm wide, at a speed of 31 m/min and feed of 0.25 mm/rev. The chip thickness ratio is 0.55, cutting force is 1392 N and feed force is 363 N. Find

1) Chip thickness

2) Shear plane angle

3) Coefficient of friction on tool face

4) Shear force on shear plane

5) Energy consumed in kW-min per cubic centimeter of metal removal. **8**

b) Describe various types of chips produced during metal cutting. **6**

c) What is importance of tool wear in metal cutting ? **4**

2. a) The following equation for tool life is given for a turning operation.

$VT^{0.13} f^{0.77} d^{0.37} = C$

A 60 min tool life was obtained while cutting at V = 30 m/min, f = 0.30 mm/rev and d = 2.5 mm.

Calculate the change in tool life if the cutting speeds, feed and depth of cut are increased by 25% individually and also taken together. **10**

b) What are the function of cutting fluid and discuss various types of cutting fluid ? **8**

3. a) Describe **any three** of the following in short :

1) Gear skiving
2) Gear lapping
3) Thread hobbing
4) Thread whirling. **9**

b) State the advantages and limitations of thread rolling process. **3**

c) Compare rack cutter and pinion cutter gear shaping. **4**

OR

4. a) Write short note on :

i) Thread milling
ii) Types of broaching machine. **10**

b) Explain various elements of a broach. **6**

5. a) What are the basic component of a CNC system ? Explain the function of each. **6**

b) Discuss the advantages and limitations of CNC machines. **6**

c) What are 'G' and 'M' codes ? Explain with two examples each. **4**

OR

6. a) Explain the meaning of every word written in following line.

G01 X25 M08 M03 T01 F45 **6**

b) Write short note on :

i) FMS
ii) Machining Center. **10**

SECTION – II

7. a) Explain with neat sketch the principle of EDM and state its advantages, disadvantages and application. **8**

b) Explain with neat sketch the principle of USM and state its advantages, disadvantages and application. **8**

OR

8. Write short note on :

i) EBM **5**

ii) LBM **6**

iii) AJM. **5**

9. a) Design a progressive dic for a washer with OD = 30 mm, ID = 10 mm, thickness = 2 mm and shear stress = 250 MPa.

i) Find out cutting force and press tonnage. **4**

ii) Calculate die opening size and punch size for blanking and punching station. **4**

iii) Draw neat sketch of press tool. **4**

b) Define following terms :

i) Die shut height

ii) Punching

iii) Blanking

iv) Stripper. **4**

OR

10. a) Draw neat sketch of :

i) Combination die

ii) Compound die. **6**

b) A cup of 50 mm diameter and 40 mm height is to be drawn from 1 mm thick cold rolled steel with UTS 410 MPa. Find the following

i) Blank size

ii) % reduction

iii) Number of draws

iv) Punch and die radii

v) Die clearance

vi) Drawing pressure. **10**

11. a) Discuss six point principle for location used in jigs and fixture. **6**

b) Write short note on : types of clamps used in drill jigs. **6**

c) Draw neat sketch of renewable bushes and screw bushes also differentiate with reference to its function and applications. **6**

OR

12. Write short notes on **any three** :

i) Drill jig

ii) Broaching fixture

iii) Quick acting clamp

iv) Turning fixture. **18**

[3962] – 282

S.E. (Production & Industrial Engg.) (Semester – I) Examination, 2011
STRENGTH OF MATERIALS
(Common to Production S/W)
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *1) Answer Q.No.**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 **two** Sections should be drawn in **separate** answer books.*

*3) Use of non-programmable calculator is **allowed**.*

*4) Figures to **right** indicate **full** marks.*

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

*6) Due credit will be given to the **correct** solution procedure and **not** to the final answer alone.*

*7) Draw **neat** diagrams **wherever** necessary.*

*8) Use of cell phone is **prohibited** in examination hall.*

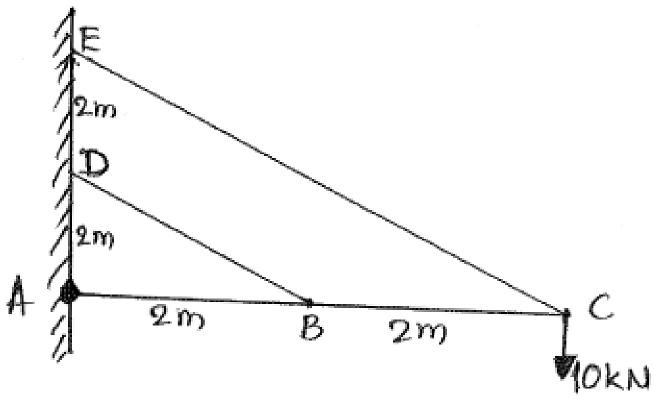
SECTION – I

1. a) In a tensile test on a steel tube of external diameter 18 mm and internal diameter 12 mm and an axial pull of 2 kN produced a stretch of 6.72×10^{-3} mm in a length of 100 mm and a lateral contraction of 3.62×10^{-4} mm in the outer diameter. Calculate the three moduli and Poisson's ratio for the material of the tube. **10**

b) Describe in detail, "stress-strain curve for mild steel". **8**

P.T.O.

2. a) A rigid bar ABC is hinged at ‘A’ and supported by two wires each 10 mmϕ (E = 200 GPa). Determine the vertical displacement of point ‘C’ when load of 10 kN is applied. **10**



b) Define : **8**

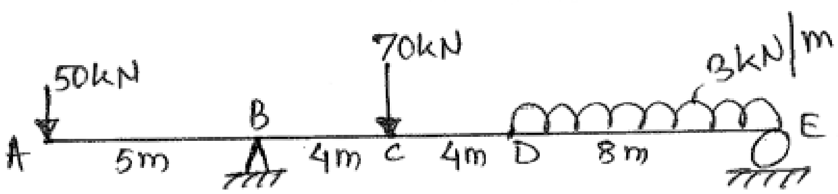
i) Factor of safety

ii) Bulk modulus

iii) Volumetric strain

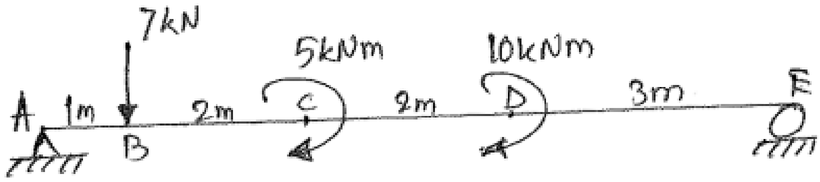
iv) Modulus of rigidity.

3. a) Draw shear force and bending moment diagrams for the beam shown below : **8**



b) A simple steel beam of 4 m span carries a udl of 6 kN/m over its entire span and a point load 2 kN at its centre. If the permissible stress does not exceed 100 MPa, find the cross-section of the beam assuming depth to be twice of breadth. **8**

4. a) Draw S.F.D. and B.M.D. for the beam shown below : **8**



b) A simply supported beam of cross-section 50 mm×50 mm having a length of 800 mm is capable of carrying a point load of 3 kN at its centre. The beam is required to be replaced by a cantilever beam of the same material having cross-section 50 mm×100 mm and length 1500 mm. Determine the maximum point load that can be placed at free end of cantilever. **8**

5. a) A T-section beam has flange of size 500 mm×20 mm and that of web is 20 mm × 600 mm is subjected to a shear force of 10 kN. Draw shear stress distribution diagram. **8**

b) A plate 250 mm wide and 20 mm thk transmits an axial pull of 300 kN. A hole of 40 mm is drilled through the plate with its centre 50 mm from the axis of plate. Find the maximum and minimum stresses induced in the material. **8**

6. a) For a rectangular cross-section, prove $\tau_{max} = \frac{3}{2}\tau_{av}$. **8**

b) A short hollow cylindrical column has external diameter of 20 cm and internal diameter of 14 cm. In casting the bore got eccentric so that the thk. varies 2 cm at one end and 4 cm at the other end. If the column carries a load of 450 kN along its axis of the bore, calculate the extreme intensities of stresses induced in the section. **8**

SECTION – II

7. a) Show that the sum of normal stresses on any set of two perpendicular planes at a point in a strained material is constant. **10**

   b) A thick cylindrical shell has 150 mm internal diameter. It is subjected to an internal pressure of 8 MPa. Determine the thk. of shell if the permissible tensile stress is 20 N/m^2. **8**

8. a) The principal stresses at a point across two perpendicular planes are 60 MPa and 50 MPa. Find the normal and tangential and resultant stress and its obliquity on a plane at 20° with major principal plane. **8**

   b) A hollow cylinder open at ends has 150 mm internal dia and 200 mm external dia. It is subjected to an internal pressure of 25 MPa. Determine

   i) Maximum hoop stress and maximum radial stress.

   ii) Maximum shear stress.

   iii) Increase in internal and external dia. Take $E = 2 \times 10^5$ MPa, $\mu = 0.25$. **10**

9. a) A hollow steel shaft of outside dia. 75 mm is transmitting a power of 150 kW at 1000 rpm. Find the thk. of shaft, if the maximum shear stress in shaft is limited to 40 MPa. Take G = 80 GPa. **8**

   b) Prove that stress due to impact loading is $\sigma_{max} = \frac{W}{A}\left[1 + \sqrt{1 + \frac{2AEh}{Wl}}\right]$. **8**

10. a) A hollow shaft of dia. ratio $\left(\frac{3}{8}\right)$ is required to transmit 588 kW at 110 rpm. The maximum torque being 20% greater than mean torque. The shear stress is limited to 63 MPa and twist to 0.0081 rad per unit length. Calculate the external diameter of shaft, satisfying both conditions. **8**

   b) A 12 mm diameter mild steel bar of length 2 m is stressed by a weight of 140 N dropping freely through a height of 24 mm. Find the maximum instantaneous stress and the elongation produced in the bar.

   Take $E = 2 \times 10^5$ MPa. **8**

[3962] – 292

S.E. (Electrical) (Semester – I) Examination, 2011
MATERIAL SCIENCE
(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) Describe various materials used for photoconductive cells. With neat sketch explain its construction. **9**

b) Define :

i) Dielectric constant

ii) Dipole moment

iii) Polarization

iv) Polarizability. **8**

OR

2. a) Explain with a neat sketch principle of operation and applications of photo emissive cell. **9**

b) Explain ionic polarization. **8**

3. Give detail classification of insulating materials. Describe properties and applications of any four classes. **16**

OR

4. Explain breakdown process in detail with primary and secondary ionization. What are different factors which affect on breakdown voltage ? **16**

P.T.O.

5. a) Differentiate between Ferro-magnetism and Anti-ferromagnetism. **8**

b) Explain diamagnetism and para magnetism. **9**

OR

6. a) Explain Ferro-magnetism and Ferri-magnetism. **8**

b) Differentiate between soft and hard magnetic materials. **9**

SECTION – II

7. a) Describe various materials of high and low resistivity. **9**

b) Describe materials used for lamp filaments and transmission lines. **8**

OR

8. a) Describe electrical conducting materials – Copper, Aluminum and their applications. **9**

b) Describe thermal bimetal and thermocouple. **8**

9. With neat diagrams describe :

i) Carbon nano-structures and carbon molecules **4**

ii) Carbon clusters **4**

iii) Carbon Nano-tubes **4**

iv) Nano wires. **4**

OR

10. a) Write down applications of Carbon Nano-tubes and BN nano tubes. **8**

b) What do you mean by Single Electron Transistor, Molecular Machines ? **8**

11. a) Explain measurement of P.F. and partial discharge of high voltage cables. **9**

b) Explain various tests carried on high voltage bushing. **8**

OR

12. a) Explain measurement of Tangent of Dielectric Loss Angle ($\tan\delta$) by Schering Bridge as per IS 13585 – 1994. **9**

b) Describe measurement of dielectric strength of solid insulating material with reference to IS 2584. **8**

———————

S.E. (Electrical) (Semester – II) Examination, 2011
NETWORK ANALYSIS
(2003 Course)

Time : 3 Hours Total Marks : 100

SECTION – I

1. a) With the help of sample circuits explain super mesh and super node analysis. **10**

b) Explain :

i) Ideal and practical voltage source

ii) Ideal and practical current source

iii) Active and passive network

iv) Dependent and independent sources. **8**

OR

2. a) Determine the V_b in the circuit shown in fig. 2(a) using mesh analysis and confirm by node analysis. **10**

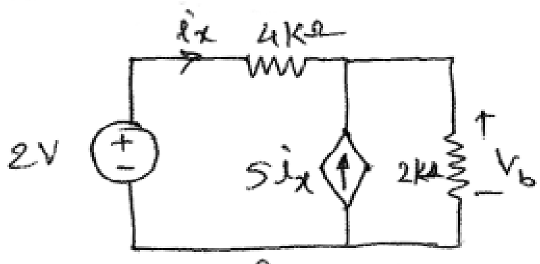


fig. 2(a)

b) Explain Dof rules applicable to coupled circuits. **4**

c) Find the current through 5Ω resistance using mesh analysis (fig. 2c). **4**

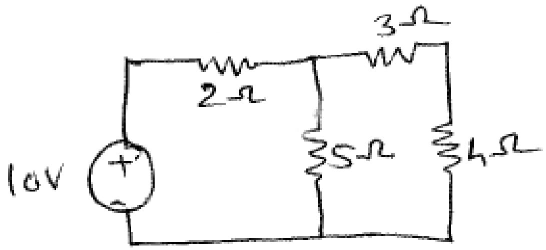


Fig.2c

3. a) Write short note on natural and forced response of RC circuit. **6**

b) Discuss initial and final conditions in network element R, L and C. **4**

c) Write down the properties of RC circuit and hence explain the procedure to find voltage across capacitor. **6**

OR

4. a) Find $i_c(t)$ for $t > 0$ (Ref. fig. 4a). **8**

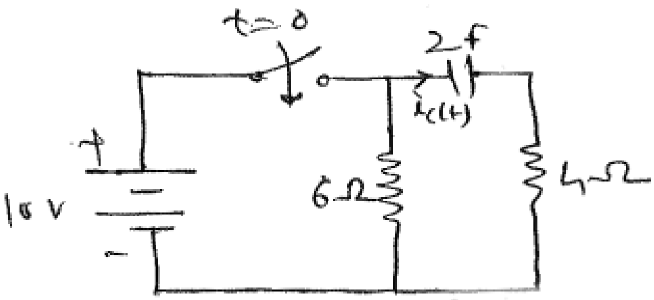


Fig.4a

b) Find $i_c(t)$ for $t > 0$ (Ref. fig. 4b). **8**

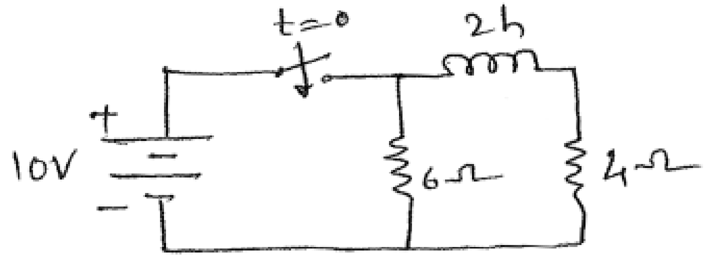


Fig.4b

5. a) In the circuit find the expression for i(t) for $t > 0$ (Refer fig. 5a). **8**

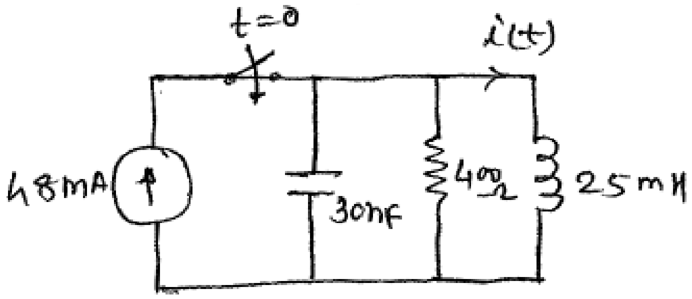


Fig.5a

b) Explain standard time signals with their Laplace transform. **8**

OR

6. a) Write the properties of Laplace transform and hence explain the procedure to find the response of parallel RLC circuit. **8**

b) Find the Laplace transform of the given function. (Ref. fig.6b). **8**

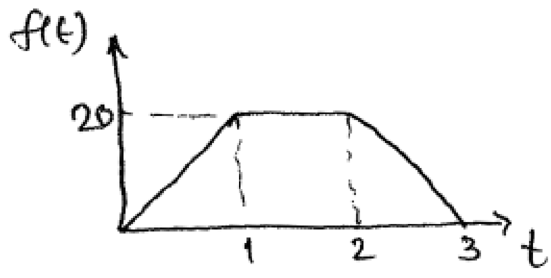


Fig.6b

SECTION – II

7. a) State and explain : **(4×3)**

i) Norton's theorem

ii) Thevenin's theorem

iii) Super position theorem.

b) Verify Tallegen's theorem shown in fig. 7b. **6**

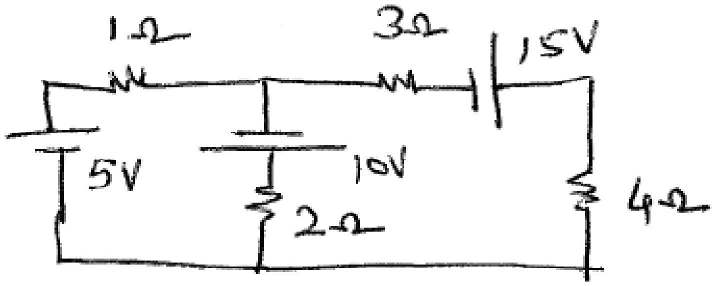


fig 7b

OR

8. a) State and explain : **(4×3)**

i) Millman's theorem

ii) Compensation theorem

iii) Maximum power transfer theorem.

b) Using superposition theorem, find power in 2 Ω resistor in the circuit shown in fig. 8b. **6**

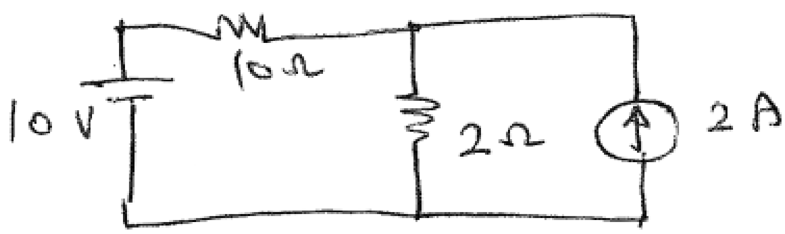


Fig 8b

9. a) Discuss 2-port network parameters, **8**

   i) z – Impedance parameters

   ii) y – Admittance parameters

   iii) h – hybrid parameters.

   b) Find Z-parameters of 2-port network shown in fig. 9b. **8**

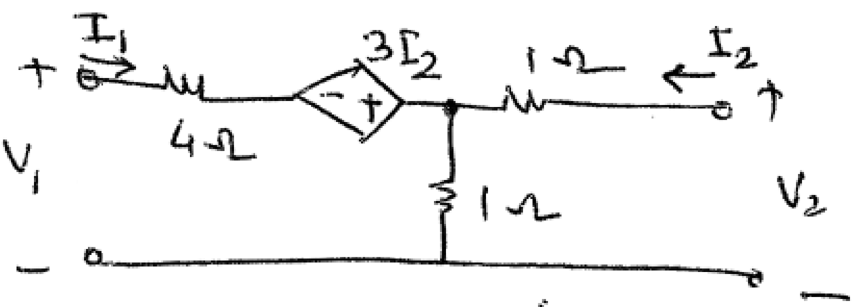


Fig 9b

OR

10. a) Derive the expression for resonant frequency in a parallel RLC circuit. **8**

   b) For the network of fig. 10b, find R when circuit is under resonance. **8**

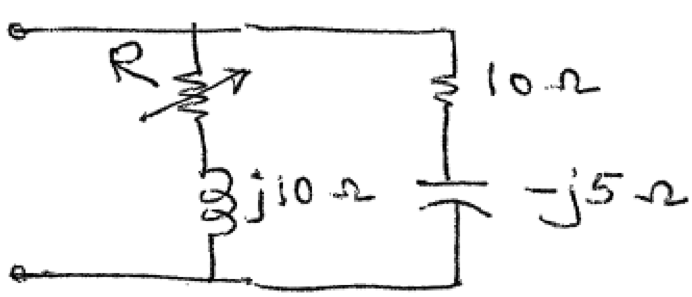


Fig 10b

11. a) Write short note on Evaluation of Fourier Coefficients. **8**

b) Explain trigonometric Fourier series for the periodic signal. Also explain symmetry. **8**

OR

12. Write short notes on :

i) Fourier transform of periodic signals **6**

ii) Properties of Fourier transform **4**

iii) Analysis of non-periodic signal over entire interval using Fourier transform. **6**

———————

S.E. (Elex. & E&TC) (Semester – II) Examination, 2011
ELECTRICAL CIRCUITS AND MACHINES
(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 must be drawn* ***wherever*** *necessary.*

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

v) ***Use*** *of logarthmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*

vi) ***Assume*** *suitable data if* ***necessary****.*

vii) ***All*** *questions are* ***compulsory****.*

SECTION – I

1. a) With the help of a neat sketch describe the construction of a dc motor. State clearly materials used for each part. **8**

b) A 120 V, dc shunt motor has an armature resistance of 0.2 Ω and field resistance of 60 Ω. It runs at 1800 rpm, when it is taking a full load current of 40 A. Find the speed of the motor, when it is operating with half load. **8**

OR

2. a) What are different methods of speed controlling of dc shunt motor ? Explain in brief with diagram. **8**

b) A dc series motor with series field and armature resistances of 0.06 Ω and 0.04 Ω respectively is connected across 220 V mains. The armature takes 40 A and its speed is 900 rpm. Determine its speed when the armature takes 75 A, and excitation is increased by 15% due to saturation. **5**

c) Differentiate the constructional difference between shunt and series field winding. **3**

P.T.O.

3. a) Explain in detail the OC and SC tests of a single phase transformer and their use to find regulation and efficiency of transformer. **8**

b) A single phase, 50 KVA, 2400/120 V, 50 Hz transformer gave the following results.

OC test with instruments on LV side – 120 V, 9.65 A, 386 W.

SC test with instruments on hv side – 92 V, 20.8 A, 810 W.

Calculate :

i) The equivalent circuit constants and draw the equivalent circuit.

ii) The efficiency when rated KVA is delivered to a load having a power factor of 0.8 lagging.

iii) The voltage regulation. **10**

OR

4. a) What do you mean by efficiency of a transformer ? Derive the condition for maximum efficiency. **5**

b) Derive an expression for the saving of copper affected by using an auto transformer instead of a two winding transformer. **5**

c) The following test data is obtained in a 5 KVA, 220/440 V single phase transformer.

OC test : 220 V, 2 A, 100 W on LV side

SC test : 40 V, 11.4 A, 200 W on HV side.

Determine :

i) The percentage efficiency and

ii) Regulation at full load 0.9 p.f. lagging. **8**

5. a) With the help of connection diagram and phasor diagram explain the two wattmeter method of measuring the power in a 3 phase balanced load. Assume star connected load with lagging p.f. **8**

b) A 400 V, 3 phase motor has a full load output of 25 HP the efficiency being 88 percent, and the power factor 0.8 lag. Find the reading on each of two wattmeters connected to measure the input. What is the full load line current ? **8**

OR

6. a) Explain with neat connection and phasor diagram how total reactive power can be measured using single wattmeter in a 3 phase balanced load circuit. **8**

b) Three identical coils, connected in delta, take 45 A current from a 3 phase, 400 V, 50 Hz supply. A wattmeter is connected in the circuit in such a way that its current coil is in the line R, while its pressure coil is across the lines Y and B. If the wattmeter reads 9000 W, calculate

i) Power factor of the load

ii) Resistance and inductance of the coil, and

iii) Active power, reactive power and apparent power consumed by the load. **8**

SECTION – II

7. a) With a diagram explain the operation of star-delta starter used for starting 3 phase induction motor. **6**

b) A 50 Hz, 8 pole induction motor has a full load slip of 2%. The rotor resistance is 0.001 Ω/ph and the standstill reactance per phase is 0.005 Ω/ph. Find the ratio of maximum to full load torque and the speed at which maximum torque occurs. **5**

c) Explain various power losses taking place in a three phase induction motor. **5**

OR

8. a) Derive the torque equation of three phase induction motor in terms of parameters of the rotor circuit and obtain the condition for maximum torque and also obtain the expression for maximum torque. **8**

b) A 18.65 kW, 4 pole, 50 Hz, 3 phase induction motor has friction and windage losses of 2.5% of the output and the full load slip is 4%. Calculate
i) Rotor copper loss ii) Rotor input iii) Output torque iv) Gross torque. **8**

9. a) Compare salient pole and non salient pole construction of three phase alternator. **5**

b) What are the three voltage drops occuring in an alternator on load ? Explain the term synchronous impedance. **5**

c) A 3 phase, 800 KVA, 11 KV, star connected alternator has resistance of 1.5 Ω/phase and synchronous reactance of 25 Ω/phase. Find the percentage regulation for a load of 600 kW at 0.8 leading power. **6**

OR

10. a) Explain why a three phase synchronous motor is not self starting. How it is made self starting ? **6**

b) What is hunting in a synchronous machine ? How it can be minimised ? **6**

c) Explain the use of three phase synchronous motor as a synchronous condenser. **4**

11. a) Why single phase induction motor is not self starting ? How it is made self starting ? **6**

b) With neat circuit diagram explain construction and working of any one type of servo motor. **6**

c) With the help of neat diagrams explain the operation of the capacitor start and capacitor run induction motor. **6**

OR

12. Write short notes on **any three** : **18**

a) Shaded pole motor

b) Single phase AC series motor

c) Reluctance motor

d) Universal motor

e) Stepper motor.

———————

[3962] – 324

S.E. (PTG. Engg. & Communi. Tech.) (Semester – I) Examination, 2011
PRINTING DIGITAL ELECTRONICS
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. *: 1) Assume suitable data* ***wherever*** *necessary.*

*2) Attempt Q.**1** or Q.2; attempt Q.**3** or Q.**4**; attempt Q.**5** or Q.**6** from Section –* ***I*** *and attempt Q.**7** or Q.**8**; attempt Q.**9** or Q.**10**; attempt Q.**11** or Q.**12** from Section –* ***II**.*

SECTION – I

1. Perform the following conversions (**any four**) : **16**

a) $(1263)_{10}$ to hexadecimal

b) $(32)_{8}$ to Decimal

c) $(42)_{10}$ to Binary

d) $(74)_{10}$ to Octal

e) $(427)_{8}$ to Hexadecimal.

OR

2. a) Explain BCD codes and Excess-3 codes. **8**

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

i) Bar code and its applications

ii) ASCII code.

3. a) Implement using NOR-NOR logic **8**

Y = AC + BC + AB + D

P.T.O.

b) The functionality of a hand held machine is expressed as : **10**

$$f(A, B, C, D) = \sum m(4, 6, 10, 12, 13, 15)$$

Minimize using k-map and draw the simplified diagram.

OR

4. a) Compare TTL, CMOS and ECL logic families on the basis of the following : **6**

i) Propagation delay

ii) Noise margin

iii) Fan in/Fan out.

b) Prove that **12**

i) $A.(B+C) = (A.B) + A.C$

ii) $A + \overline{A}.B + A.\overline{B} = A + B$

iii) $A + (B+C) = (A+B) + C$

5. a) Design a full adder using 2 half adders. **4**

b) Design a one bit comparator. **4**

c) A design a logic circuit that has 3 inputs and one output. The output is high when the binary value of the input is less than 3. The output is low otherwise. **8**

OR

6. a) Design half subtractor. **4**

b) Perform the following (**any three**) : **12**

i) $(101101)_2 - (110001)_2$

ii) Perform BCD addition

$(99)_{10} + (99)_{10}$

iii) Perform BCD addition

$(5337)_{10} + (7538)_{10}$

iv) $01110100(BCD) = (?)_2$

SECTION – II

7. a) Explain clocked SR Flip-Flop with the help of truth table. **8**

b) Design and explain mod 3 counter. Draw timing diagrams. **8**

OR

8. a) Draw a NAND logic J-K flip flop and explain J-K with the help of truth table and timing diagram. **8**

b) State 4 applications of digital counters. Explain one application of a digital counter in printing application. **8**

9. a) State the need of a DAC. Explain the working of any one type of DAC with a neat diagram. **8**

b) Explain Programmable array logic with example. **10**

OR

10. a) State the various display devices. Explain seven segment LED display. **8**

b) What are memories ? State and explain various types of memories. **10**

11. a) Applications of digital electronics in printing. **8**

b) Write short notes on (**any two**) : **8**

i) Joystick

ii) Floppy Disk

iii) Digital camera.

OR

12. Write short notes on (**any four**) : **16**

a) Digital scanner

b) Operation of mouse

c) Input-Output devices of a computer

d) Serial and Parallel ports

e) Keyboard.

———————

S.E. (Chemical) (Semester – I) Examination, 2011
CHEMICAL ENGINEERING MATERIALS
(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) 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) Define the following terms : **6**
   i) Ductility
   ii) Malleability
   iii) Hardness.

   b) Draw stress-strain curve for the following materials : **8**
   i) Polymers
   ii) Rubbers
   iii) Soft metal
   iv) High carbon steel.

   c) Give the classification of engineering materials. **2**

OR

2. a) The piston rod of a steam engine is 50 mm in diameter and 600 mm long. The diameter of the piston is 400 mm and the maximum steam pressure is 0.9 N/mm^2. Find the compression of the piston rod, if the Young's modulus for the material of the piston rod is 210 kN/mm^2. **6**

b) Explain the following terms : **6**

i) Poisson's ratio

ii) Factor of safety.

c) Draw and explain stress-strain curve for ductile materials. **4**

3\. a) Write the difference between destructive and non-destructive testing of materials. **6**

b) Write short notes on : **10**

i) Brinell Hardness Test

ii) Durometers.

OR

4\. a) Explain any two types of non-destructive testing methods for materials. **10**

b) Explain fatigue test for materials in detail. **6**

5\. Draw Iron-Iron carbide diagram and explain various phases with different reaction involved. **18**

OR

6\. a) Write short notes on : **8**

i) Bending

ii) Rolling

iii) Riveting

iv) Central punching.

b) Write the various methods for welding. **6**

c) Discuss the different non-ferrous alloys. **4**

SECTION – II

7\. a) What do you understand by the term "corrosion" and explain the different types of corrosion ? **10**

b) What are the effects of corrosion on metal properties ? **4**

c) What do you understand by electrochemical series of metal ? Explain with suitable example. **4**

OR

8. a) Write short notes on the following : **16**

   i) Mechanism of dry corrosion

   ii) External factors affecting corrosion

   iii) Wet corrosion

   iv) Pitting corrosion.

   b) Discuss use of "inhibitors" to prevent corrosion. **2**

9. a) What do you understand by the word 'polymer' ? **3**

   b) Discuss various methods of polymer formation. **4**

   c) Distinguish between thermosetting and thermoplastic polymers. **6**

   d) Explain the elastic deformation of polymer. **3**

OR

10. a) Write the application of polymers. **4**

   b) Write short notes on :

   i) Stress relaxation

   ii) Vulcanization of rubber

   iii) Teflon in engineering. **12**

11. a) Define ceramic material. Discuss significant properties of ceramic materials. **8**

   b) Explain the process of vetrification. **4**

   c) Discuss the different types of glass. **4**

OR

12. Write short notes on (**any four**) : **16**

   i) Refractories

   ii) Clays

   iii) Cement

   iv) Glass

   v) Types of ceramics

   vi) Borosilicates.

———————

S.E. (Computer Engg.) (Semester – I) Examination, 2011
DATA STRUCTURES AND ALGORITHMS
(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) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain the following terms with an example :
1) Pseudocode
2) Non primitive data structures
3) Abstract Data Type
4) Dynamic Data Structures. **8**

b) Write an algorithm and flow chart for finding the sum and average of numbers in an array of size 'n'. **8**

OR

2. a) Define algorithm. Explain the characteristics of an algorithm with an example. **8**

b) Differentiate between the follwoing :
1) Pseudocode and flowchart
2) Static and dynamic data structures
3) Persistent and Ephemeral data structures
4) Linear and non linear data structures. **8**

3. a) Derive the address calculation formula for two dimensional array in column major representation and calculate the address of an element X[2] [3] in an array of integers X[5] [4] using the same. **10**

b) How do you represent a polynomial using an array ? Write an algorithm to add two polynomials. **8**

OR

4. a) What is a sparse matrix ? Write a pseudo 'C' code for finding the simple transpose of a sparse matrix and analyze the time complexity. **10**

b) Write array as an ADT. Explain the representation of arrays in memory. **8**

5. a) What is a stack ? Write a pseudo 'C' code to evaluate a postfix expression using a stack. **8**

b) Write a pseudo 'C' code to convert a given infix expression into postfix expression. **8**

OR

6. a) How do you represent multiple stack using an array ? Write the pseudocode for operations on multiple stack. **8**

b) Convert the following infix expressions into postfix form and show the contents of the stack.

1) (A – B) /(C * D) ^ A

2) A*B/D – C + E. **8**

SECTION – II

7. a) What is a circular queue ? Write pseudocode for operations on circular queue. **8**

b) Explain the application of queue in job scheduling problem. **8**

OR

8. a) Write Queue as ADT and write pseudocode for operations on linear queue. **8**

b) Write short notes on :

1) Double ended queue

2) Priority queue. **8**

9. a) Explain the concept of index sequential search and compare with sequential search. **6**

   b) Write pseudo ‘C’ code for insertion sort and determine the time complexity for best and worst cases. **8**

   c) What do you mean by efficiency of sorting ? **4**

OR

10. a) Write an algorithm for binary search and determine the time and space complexity. **6**

    b) Write pseudo ‘C’ code for quick sort and determine the time complexity. **8**

    c) Sort the following list of numbers using radix sort.

    87, 45, 56, 34, 72, 92 **4**

11. a) Explain the asymptotic notations for finding the efficiency of an algorithm. **8**

    b) Write short note on greedy strategy used in design of an algorithm. **8**

OR

12. a) How do you determine the efficiency of an algorithm using frequency count ? Explain with an example. **8**

    b) Explain the divide and conquer strategy using quick sort. **8**

———————

[3962] – 362

S.E. (Information Technology) (Semester – I) Examination, 2011
FUNDAMENTALS OF DATA STRUCTURES
(2003 Course)

Time : 3 Hours Max. Marks : 100

Instructions : *a) Answer to the* ***two*** *Sections should be written in* ***separate*** *books.*
b) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
c) Assume suitable data, if ***necessary****.*

SECTION – I

1. a) Explain the concept of Inline functions and macros with suitable example. **6**

   b) What is difference between structure and union ? Explain with suitable example. **6**

   c) Explain various operators in 'C' language. **4**

OR

2. a) Which are bitwise operators in 'C' language ? Explain each bitwise operator with example. **6**

   b) What is the need of enumerated data type ? Explain with suitable example. **6**

   c) What is the meaning of local, global and static scope of variable ? Give example of each one. **4**

3. a) Determine the output of the following 'C' statements. Assume a = 13, b = 25 and C = 5. **8**

   1) Z = a ^ b
   2) X = + + a – b
   3) y = b + + + c
   4) X = C > b ? 1 : 0.

   b) What is a pointer variable ? Explain declaration, initialisation and accessing a pointer variable with an example. **8**

OR

P.T.O.

4. a) Write suitable 'C' program that creates different results after passing a parameter by reference and by value. **8**

   b) Explain the usage of command line arguments with an example. **6**

   c) State whether the following statements are true/false.

   The expression + + p+r $\rightarrow$ number, increments p+r but not number. **2**

5. a) Write an iterative binary search function to find an input number in a list of sorted numbers. **8**

   b) Consider the following set of numbers. Sort them using bubble sort and show all passes

   20 24 48 37 12 92 86 07

   Write an algorithm for bubble sort. **10**

OR

6. a) Explain linear, binary and fibonacci search with an example. **10**

   b) Write a pseudo c routine to sort number using selection sort. **8**

SECTION – II

7. a) Define the following with an example : **10**

   1) Data type
   2) Data structure
   3) Abstract data type
   4) Classification of data structure
   5) Data objects.

   b) How a polynomial having maximum three variables can be represented in computer memory by using an array ? Represent the following polynomial in computer memory using structure defined by you :

   $5x^3y^2z + 3x^2y^3z^2 + 6xyz^3 + 10.$ **6**

OR

8. a) Explain the address calculation of the position of element in arrays in row major and column major representation. **8**

b) What is purpose of sparse matrix ? Write an algorithm for sparse matrix addition. **8**

9. a) Explain insertion of node in doubly linked list at : **6**

1) the start of the list

2) the end of the list

3) after the position.

b) Consider the following polynomials represented using linked lists. **6**

$P_1 = 5X^{12} + 2X^6 + 3$

$P_2 = 6X^{12} - 5X^8 + 12X^5$

Show the addition process of above polynomials diagrammatically.

c) Discuss one application of circular singly linked list in detail. **4**

OR

10. a) What is skip list ? How do we represent the skip list ? What is its application ? **6**

b) Write a function that removes all duplicates elements for a linear singly linked list. **6**

c) Compare the linked and sequential organisation of data structures. **4**

11. a) Implement stack using array to perform the following operation : **8**

a) Push b) POP

c) Display top d) Stack empty

e) stack full.

b) List the applications of queues. What are advantages of circular queue over linear queue ? **5**

c) What is priority queue ? Give a function to add an element in priority queue. **5**

OR

12. a) Clearly indicate the content of stack during the evaluation of the following prefix expression **6**

$1 + a - b * cde$

where a = 7, b = 3, c = 1, d = 2 and e = 2.

b) What is double ended queue ? Give its pictorial representation. What is its use ? **6**

c) Explain the concept of multistack and multiqueue with suitable example. **6**

B/I/11/520

S.E. (Semester – II) (Biotechnology) (B.Tech.) Examination, 2011
BIOCHEMISTRY – I
(2003 Course)

Time : 3 Hours Max. Marks : 100

N.B. : *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) VLDL
   2) Apolipoproteins
   3) Tertiary structure of protein.

OR

2. Answer the following (**9**M **each**) : **18**

   1) Lipoproteins
   2) α-helix and β-pleated sheet.

3. Illustrate the pay off phase of glycolysis in detail with all enzymes and coenzymes involved in it. **16**

OR

4. Give the detail account of three bypass reactions involved in the gluconeogenesis. **16**

5. Answer in detail the hormonal regulation of glucose metabolism. **16**

OR

6. Answer the following (**8**M **each**) : **16**

   1) Elucidate the function of insulin in glucose metabolism.
   2) Role of glucagon in glucose homeostasis.

SECTION – II

7. Answer the following (**9**M **each**) : **18**

   1) Role of acetyl - CoA in the formation of ketone bodies.

   2) Explain in detail the terms acidosis and ketosis.

OR

8. Explain the oxidation of unsaturated fatty acids in detail with account of all enzymes and coenzymes. **18**

9. Explain in detail the production of urea from ammonia. **16**

OR

10. Describe the following (**8**M **each**) : **16**

    1) Catabolism of phenylalanine

    2) Flow chart for catabolism of tryptophan to acetyl - CoA.

11. Write short notes on (**4**M **each**) : **16**

    1) Role of lipids in the diet

    2) Role of carbohydrates in the diet

    3) Consequences of protein deficiency

    4) Name different essential fatty acids, their types, and dietary sources.

OR

12. Explain the role and deficiency of following (**8**M **each**) : **16**

    1) Any two water soluble vitamins.

    2) Any two fat soluble vitamins.

———————