**S.E. (Civil) (Semester – II) Examination, 2010**
**SURVEYING – I**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain with a neat sketch, the two peg method of testing and adjustment of a dumpy level. **6**

b) Explain in detail the procedure of levelling of a dumpy level. Draw a neat sketch to justify your answer. **6**

c) The following observations were made during the testing of a dumpy level. **6**

| **Instrument at** | **Staff readings on** | |
|---|---|---|
| | **A** | **B** |
| A | 2.400 | 1.300 |
| B | 2.300 | 1.400 |

Is the instrument in adjustment ? If not determine the error. If R.L. of A is 200.00 m, determine the R.L. of B.

OR

2. a) Explain in brief the permanent adjustment of making the axis of bubble tube perpendicular to vertical axis. **6**

b) Write in brief about special points of Auto level. **6**

c) Explain in detail the procedure of measurement of Horizontal angle by repetition method using $20''$ vernier transit theodolite. **6**

**P.T.O.**

3. a) Differentiate between Bowditch's Rule and Transit Rule for adjustment of a closed traverse. **4**

b) How would you determine omitted measurement when length and bearing of one side of closed traverse is omitted ? **6**

c) Define Deflection angle. Also write in detail the procedure of measurement of deflection angle using $20''$ vernier transit theodolite. (Draw a neat sketch). **6**

OR

4. a) Define the following terms : **6**

1) Vertical Axis
2) Double sighting
3) Plunging the Telescope
4) Trunion Axis

b) Write a short note on checks in an open Traverse survey. **6**

c) State the functions of following parts of a Theodolite : **4**

i) Optical plumet
ii) Clip screw
iii) Shifting head
iv) Lower tangent screw.

5. a) Define Interpolation of contours. State various methods of interpolation. Explain any one in brief. **6**

b) What considerations would you have while selecting the contour interval ? **4**

c) A staff was held vertically at a distance of 125 m and 50 m from the centre of a tachometer. The staff intercepts with the telescope horizontal were 1.248 and 0.498 respectively. Calculate the constants of a tachometer. **6**

OR

6. a) What do you understand by tacheometric survey ? What is the utility of this method in the field ? **4**

b) Describe in detail the field procedure of determining the constants of a tacheometer. **4**

c) A tacheometer was set up at an intermediate point between two stations A and B and the following observations were made on a vertically held staff

| Staff station | Vertical Angle | Staff readings |
|---|---|---|
| A | $+ 4° 30'$ | 1.605, 2.400, 3.195 |
| B | $- 2° 45'$ | 0.805, 1.345, 1.885 |

The instrument is fitted with an anallatic lens having a multiplying constant of 100. Compute the length AB and the R.L. of point B, if that of A was 395.400 m. The instrument and staff points are in one straight line. **8**

SECTION – II

7. a) Draw the neat sketches of the following : **4**

1) Simple circular curve
2) Compound curve
3) Reverse curve
4) Transition curve

b) Write a note on obstacles in setting out curves. **4**

c) Two straights of a road intersect at a chainage of 110°. Taking chord length of 30 m, calculate the following : **8**

1) Radius of curve
2) Length of curve
3) Tangent length
4) Length of the Long chord
5) Chainage at the starting point and end point.

OR

8. a) Draw a neat sketch of a compound curve and show its various elements. **4**

b) What is the necessity of transition curve ? What are their different forms ? **4**

c) Two straights AB and BC intersect at an inaccessible point B. To connect them through a simple curve two points D and E are selected on line AB and BC respectively. The distance DE = 180 m and the angle ADE = 145° and CED = 165° respectively. Calculate the suitable radius, given that the distance AD = 120 m and the points A and C are the tangent points. **8**

9. a) State the various formulae to calculate the length of a transition curve and also state the meanings of the terms involved. **6**

   b) Describe the procedure of setting out a simple circular curve by offset from Chord produced. **8**

   c) What is meant by transition curves ? What are their advantages and disadvantages ? **4**

OR

10. a) Two straights intersects at an angle of 130°. The maximum allowable speed on the curve is 60 kmph. If the allowable rate of change of radial acceleration is 30 cm/sec$^3$ and the centrifugal ratio is 0.25, calculate the radius of the circular curve and length of the transition curve. **8**

    b) Write a short note on vertical curves. **6**

    c) Write a short note on location and uses of Reverse curves. **4**

11. a) Describe with the help of a neat sketch, 'strength of Fix'. **8**

    b) Explain in detail the direct method of contouring. **4**

    c) Explain in detail the profile levelling. **4**

OR

12. a) State the three point problem. Explain how it is solved by tracing paper method. **8**

    b) What is meant by orientation in plane table survey ? State the methods of it. Explain any one in brief. **4**

    c) Write a short note on Grade contour. **4**

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**S.E. (Mechanical) (Semester – I) Examination, 2010**
**FLUID MECHANICS**
**(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) A U tube is made up of two capillaries of bores 1.5 mm and 2 mm respectively. The tube is dipped in the liquid whose $\sigma$ = 0.075 N/m. Find out the mass density of the liquid if the difference in two menisci is 2 mm. Assume angle of contact is zero. **6**

b) State and explain Newton's Law of viscosity. **4**

c) Describe various types of flow with examples. **6**

OR

2. a) Through a narrow gap of height $\delta$, a thin plate of large surface is pulled with a velocity U on one side of the plate, oil is of viscosity $\mu_1$ and on the other side of $\mu_2$.

Determine i) The position of the plate so that shear force on the sides is equal and ii) Pull required to drag the plate is minimum. **8**

b) Derive three dimensional continuity equation in Cartesian coordinate. **8**

**P.T.O.**

## Unit – II

3. a) A well-type manometer has the measurement leg inclined at 30° from the horizontal. The diameter of the well is 50 mm while that of measurement leg is 5 mm. An oil of specific gravity of 0.85 is used as the fluid. A differential pressure produces a reading of 15 cm from zero level. What is the differential pressure in Pa ? Assume that inclined tube is open to atmosphere. **8**

   b) Derive an expression for total pressure and center of pressure for inclined plane submersed in liquid and hence derive the expression for center of pressure for vertical plane. **8**

OR

4. a) Define following terms :

   i) Buoyancy ii) Centre of buoyancy iii) Principle of floatation iv) Archimedes' Principle. **4**

   b) A square plate of diagonal 1.5 m is immersed in water with its diagonal vertical and upper corner 0.5 m below the free surface of water. Calculate the depth of the centre of pressure on the plate from the free surface of water and the hydrostatic force resulting on the plate in kN. **8**

   c) Explain with neat sketch the method of determining metacentric height of floating body. **4**

## Unit – III

5. a) Determine the discharge through an orifice 1 m wide and 0.6 m deep in the vertical wall of a large tank having water level 1.5 m above the upper edge of the orifice. Water on downstream side is 0.25 m above the bottom edge of the orifice. Take $C_d = 0.6$. **10**

   b) Sketch with equations various measurement arrangements of Pitot tube. **8**

OR

6. a) Obtain an expression for pressure drop from inlet to throat in a horizontally mounted venturimeter in terms of rate of volume flow (Q) and inlet diameter (D) for inlet/throat diameter ratio is equal to 2. **8**

   b) A sub-marine fitted with a pitot tube moves horizontally in sea with its axis is 12 m below the surface of water. The Pitot tube fixed infront 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 seawater = 1.025 times fresh water. **6**

   c) List the various forces acting on fluid mass. Explain the significance of each term. **4**

SECTION – II

**Unit – IV**

7. a) Derive expression for Hagen Poiseulli's equation. **10**

   b) What are repeating variables ? What points are important while selecting repeating variables ? **6**

OR

8. a) An oil is flowing between two parallel plates kept at 10 cm apart with maximum velocity of 1.5 m/s. Find out the discharge per meter (perpendicular to paper), shear at the plates; the pressure difference between two points 20 m apart along the flow direction. Also find out the velocity gradient at the plates and velocity at 2 cm from the plate surface. Take $\mu$ for oil = 25 Poise. **8**

   b) Using Buckingham-$\pi$ theorem, show that the velocity through a circular orifice in a pipe is given by $V = \sqrt{2gH}\; f\left(\dfrac{d}{H}, \dfrac{\mu}{\rho V H}\right)$. **8**

**Unit – V**

9. a) Derive expression for Darcy Weisbatch equation for head loss due to friction. **6**

   b) Two tanks 2.5 km long are connected by a pipe of 30 cm diameter. The water level difference between two tanks is 10 m. Find the diameter of another pipe which would provide twice the discharge of the first. Consider f is same in both cases and consider only frictional losses in both cases. **10**

OR

10. a) What is siphon ? Where it is used ? Explain its action. Derive formula for the length of its leg. **8**

    b) Determine the diameter of the pipe required to supply water to a turbine developing 180 KW under the following condition.

    Head = 100 m, Pipe length = 1000 m, $\eta$ = 80% Take f = 0.005. What would be the diameter of the pipe if it is to be designed for maximum power condition ? **8**

## Unit – VI

11. a) Explain the characteristics of laminar and turbulent boundary layers. **6**

    b) Discuss the phenomenon of separation for flow over curved surface. What are the methods used to prevent the separation ? **6**

    c) Air with a velocity of 0.5 m/s is flowing over a cylinder of 10 cm diameter. Find the total drag, shear drag and pressure drag if the length is 1 m. **6**

OR

12. a) Define drag and lift and differentiate between friction drag and pressure drag. Under what circumstances friction drag becomes zero and pressure drag becomes zero. **6**

    b) Explain development of fully developed turbulent flow in circular pipes with sketches. **6**

    c) Which factors affect the thickness of boundary layer ? **6**

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**S.E. (Production And Industrial Engg.) (Semester – I) Examination, 2010**
**THERMAL AND FLUID ENERGY CONVERSION (2003 Course)**
**(Common to Production S/W)**

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) Define surface tension. Prove relationship between surface tension and pressure inside droplet of liquid in excess of outside pressure is given by $\rho = 4\delta/d$. **8**

b) Explain phenomenon of capillary. Derive expression for the capillary rise of a liquid. **8**

OR

2. a) State and prove Pascal's law. Give its applications. **8**

b) Explain :

i) Dynamic viscosity

ii) Kinematic viscosity

iii) Compressibility

iv) Centre of pressure. **8**

3. a) Derive Euler's equation of motion and hence Bernoull's equation. **8**

b) Explain different type of fluid flow. **8**

OR

4. a) Explain the following : **8**

   i) Reynolds number

   ii) Feuler number

   iii) Froude number

   iv) Weber number

   b) Explain Buckingham's $\pi$ theorem. What do you mean by repeating variables ? **8**

5. a) Explain with neat sketch centrifugal pump. **6**

   b) Explain the terms static head and manometric head. **6**

   c) Describe air vessel for reciprocating pump. **6**

OR

6. a) Give classification of hydraulic turbines. **6**

   b) Describe with neat sketch Pelton turbine. **6**

   c) Explain what is governing of turbine. **6**

SECTION – II

7. a) Explain Bomb calorimeter with neat sketch. **8**

   b) A hydrocarbon fuel has following orsat analysis $CO_2$ = 11.5%, CO = 0.3%, $O_2$ = 3.1%, $N_2$ = 85.1%.

   Determine :

   i) Air fuel ratio

   ii) Fuel composition on mass basis

   iii) Percentage excess air. **8**

OR

8. a) Explain Boy's gas calorimeter with neat sketch. **8**

   b) The gravemetric analysis of coal gives 80% carbon, 8% hydrogen, 4% moisture, 8% ash. Actual air supplied is 18 kj/kg of coal. Determine minimum air required if 80% carbon is burnt to $CO_2$ and remaining to CO. Also determine volumetric composition of dry flue gas. **8**

9. a) What is boiler mounting ? Explain with neat sketch spring loaded safety valve. **8**

b) Boiler produces 15 T/hr of steam at 2 MN/$m^2$. Feed water temperature is 40°C. Equivalent of evaporation = 10.4 kj/kg of fuel. Fuel consumption is 1650 kg/hr. Find Boiler efficiency and condition of steam produced. Take calorific value of fuel = 29800 kJ/kg. **8**

OR

10. a) Explain with neat sketch Benson boiler. **8**

b) Explain with neat sketch central air conditioning system. **8**

11. a) Prove that for single stage reciprocating compressor $\eta = 1 + C - C\left(\frac{P_2}{P_1}\right)^{1/n}$

where C = clearance ratio. **6**

b) Explain various methods for improvement of isothermal efficiency. **6**

c) Calculate volumetric efficiency of compressor having a cylinder diameter 410 mm and stroke 610 mm. Compressor matches 420 rpm and delivers 30 kg/min of air at 1.01325 bar and 25°C. **6**

OR

12. a) Derive expression for air standard efficiency of otto cycle. **6**

b) Give classification of I.C. engine. **6**

c) Explain wet sump lubrication system. **6**

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**S.E. (Production and Industrial Engg.)/Production S/W (Semester – II) Examination, 2010**
**DESIGN OF MACHINE ELEMENTS**
**(2003 Course)**

Duration : 3 Hours Max. Marks : 100

SECTION – I

1. a) What explain the following terms : **4**
   i) Toughness
   ii) Brittleness
   iii) Resilience
   iv) Ductility.

   b) Explain various design stages for any machine element. **6**

   c) Explain the following material designation : **6**
   i) 40C8 ii) 35Ni 1Cr60
   iii) FG250 iv) 40 Cr 1

OR

2. a) Explain the effect of the following alloying elements on properties of iron : **6**
   i) Carbon ii) Tungsten
   iii) Silicon iv) Molybdenum
   v) Sulphur vi) Chromium

   b) Explain standards and codes in design. **4**

   c) Describe and compare : **6**
   i) Factor of safety
   ii) Safety margin and
   iii) Service factor or application factor.

**P.T.O.**

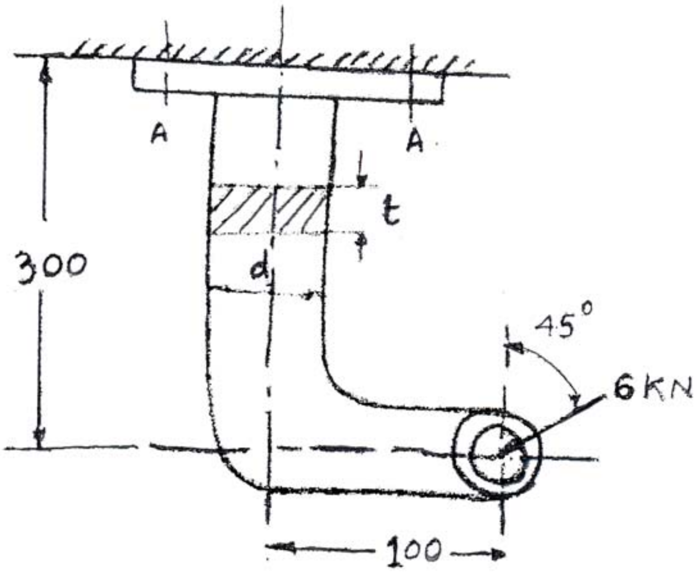
3. a) A knuckle joint is completely made of plain carbon steel 40 C8 ($S_{yt}$ = 375 N/mm$^2$) and subjected to an axial pull of 82 KN. Design the joint with factor of safety = 4.2. Assume the compressive strength of the material to 22% be more that the tensile strength. **12**

   b) What are the different theories of failure ? Compare them by drawing safe boundaries stated by each theory. **6**

OR

4. a) State the application of hand and foot levers. Discuss the design procedure for designing hand or foot lever. **6**

   b) A bracket shown in the figure is subjected to a pull of 6 KN acting at an angle of 45° to the vertical. The bracket has a rectangular section with its depth = 2 x thickness. If the permissible tensile stress is 60 N/mm$^2$, determine the cross-section of the bracket. **12**




5. a) A belt pulley is keyed to the shaft midway between the supporting bearings kept at 1100 mm apart. The shaft transmits 22 kW power at 420 rpm. The pulley has 420 mm diameter. The angle of wrap of belt on pulley is 180° and the belt tension acts vertically downwards. The ratio of belt tensions is 2.5. The shaft is made of steel having an ultimate tensile strength and yield strength of 420 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 meter length and the permissible lateral deflection is 1 mm per meter length. Design the shaft on the basis of strength and rigidity. Take G = 80 × 10$^3$ N/mm$^2$ and E = 200 × 10$^3$ N/mm$^2$. **16**

OR

6. a) A helical compression spring is made of 1.6 mm diameter with spring index 6. The permissible shear stress for the spring wire is 350 N/mm$^2$, while the modulus of rigidity is 82GPa. If the stiffness of the spring is 1820 N/m determine i) required number of coils ii) allowable deflection. **8**

   b) Explain in detail design procedure for protected type rigid flange coupling. **8**

SECTION – II

7. a) Derive the expression for : **8**

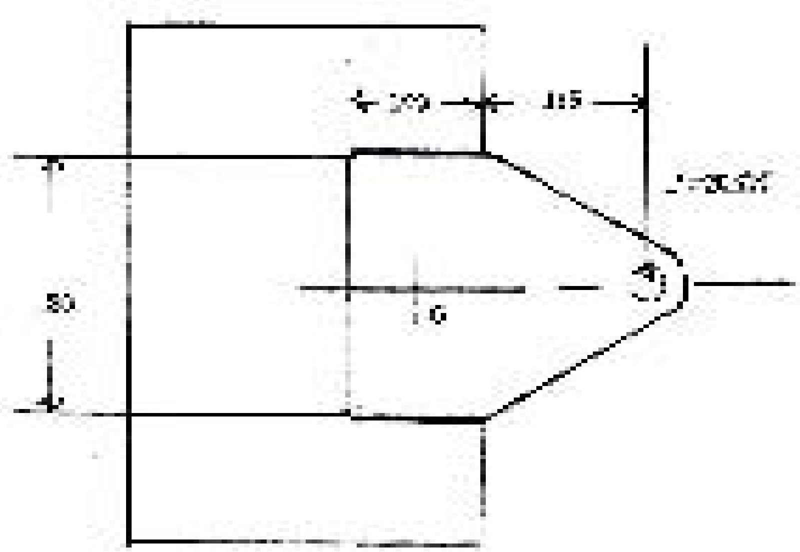
   i) Torque required to raise the load against thread friction.

   ii) Torque required for lowering the load against thread friction.

   b) Explain the terms with derivations : i) Screw efficiency ii) Overall efficiency. **8**

OR

8. A bracket is welded to column as shown in figure. Determine the size of the weld if the permissible shear stress in the weld is 80 N/mm$^2$. **16**



9. a) A single plate clutch, effective on both sides, is required to transmit 24 kW at 3000 rpm. Determine the outer and inner diameters of frictional surface if the coefficient of friction is 0.25, ratio of diameter is 1.22 and the maximum pressure is not to exceed 0.1 $N/mm^2$. Also determine the axial thrust provided by the springs. Assume uniform wear theory. **12**

b) Explain the two theories of friction used in design of friction clutched. **4**

OR

10. A multi plate clutch is to be designed to transmit 5 kW power at 1440 rpm with inner diameter as 50 mm and outer diameter as 80 mm. Coefficient of friction is 0.12 and the average allowable pressure intensity for lining is 355 kPa. Determine : i) Number of friction plates and pressure plates ii) Axial force required to transmit power iii) Actual average pressure and iv) Actual maximum pressure intensity after wear. **16**

11. a) What are the various pretensioning devices in belt drives ? **6**

b) Design considerations in shoe brake. **6**

c) Polygon effect in chains. **6**

OR

12. a) A V belt drive is driven on a flat pulley and a V pulley to transmit 20 kW power. The V-pulley has diameter of 240 mm and rpm as 1800, while the diameter of flat pulley is 900 mm. the center distance between the two pulleys id 1.10 m, and the angle of groove as 40°, the coefficient of friction is 0.22 and density of belting is 1115 $kg/m^3$. If the allowable stress for the belt material is 2.2 Mpa determine the number of belts requires if C-size belts having 225 $m^3$cross-sectional area are used. **12**

b) Explain : Designation of wire ropes. **6**

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**S.E. (Electrical) (Semester – I) Examination, 2010**
**ELECTRICAL MACHINES – I**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***N.B. :*** *i) Answers to the **two** Sections should be written in **separate** answer books.*
*ii) From Section **I** solve Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**. Similarly from Section **II** solve Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12**.*
*iii) Figures to the **right** indicate **full** marks.*
*iv) **Use** of electronic calculator is **allowed**.*
*v) Assume **suitable** data, if **necessary**.*

SECTION – I

1. a) Prove the condition for maximum efficiency of a transformer. **4**

b) Draw the phasor diagram of a transformer on : **6**

i) load with unity power factor

ii) load with leading power factor.

c) A 600 KVA, single phase transformer has an efficiency of 92% both at full load and half-load at unity power factor. Determine its efficiency at 60% of full load at 0.8 power factor lag. **6**

OR

2. a) Explain the various features of an ideal transformer. **4**

b) Compare the core type and shell type transformers. **4**

c) A 4-KVA, 200/400 V, 1-phase transformer has equivalent resistance and reactance referred to low voltage side equal to $0.5\Omega$ and $1.5\Omega$ respectively. Find the terminal voltage on the high voltage side when it supplies $3/4^{th}$ full load at power factor of 0.8, the supply voltage being 200 V. Hence, find the output of the transformer and its efficiency if the core losses are 100 W. **8**

3\. a) How equivalent circuit parameters are obtained from open and short circuit tests on transformer. **8**

b) A 5 KVA, 500/250V, 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**

OR

4\. a) Explain load sharing of transformers connected in parallel with equal voltage ratios and unequal voltage ratios. **8**

b) Two 2,200/110 V transformers are operated in parallel to share a load of 125 KVA at 0.8 p.f. lagging. Transformers are rated as below :

A : 100 KVA; 0.9% resistance and 10% reactance

B : 50 KVA; 1.0% resistance and 5% reactance.

Find the load carried by each transformer. **8**

5\. a) Explain the conditions which must be fulfilled for successful parallel operation of 3 phase transformer. **6**

b) With proper connection and phasor diagrams describe the different ways of connecting three phase transformers. **8**

c) Explain scott connection. **4**

OR

6\. a) What are the advantages of a single three phase transformer unit over a bank of single phase transformers. **6**

b) Explain the Sumpner's test on single phase transformer with the help of neat connection diagram. **6**

c) Explain the 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 compound generator delivers a load current of 50 A at 500 V and has armature, series field and shunt field resistances of 0.05$\Omega$, 0.03$\Omega$ and 250$\Omega$ respectively. Calculate the generated voltage and the armature current. Allow IV per brush for contact drop. **8**

OR

8. a) Distinguish between lap and wave type of windings in D.C. machines. **4**

b) Explain the significance of the Back e.m.f. **4**

c) A shunt generator has F.L. current of 196 A at 220 V. The stray losses are 720 W and shunt field coil resistance is 55$\Omega$. If it has a F.L. efficiency of 88%, find the armature resistance. Also, find the load current corresponding to maximum efficiency. **8**

9. a) Explain speed control methods for a d.c. series motor in details. **8**

b) A series motor, with an unsaturated field and negligible resistance when running at a certain speed on a given load takes 50 A at 400 V. If the load torque varies at the cube of speed, calculate the resistance required to reduce the speed by 25%. **8**

OR

10. a) Draw the performance characteristics of different types of d.c. generators and explain them. **8**

b) Explain the various losses in d.c. machine. **4**

c) A 250-V shunt motor with armature resistance of 0.5$\Omega$ runs at 600 r.p.m. on full load and takes an armature current of 20 A. If resistance of 1.0$\Omega$ is placed in armature circuit find the speed at full-load torque. **4**

11. a) Describe Hopkinson's test in details with its advantages and disadvantages. **8**

    b) What is commutator ? What is meant by good commutation ? How is it achieved ? **10**

OR

12. a) A 4 pole, 50 KW, 250 V wave-wound shunt generator has 400 armature conductors. Brushes are given a bead of 4 commutator segments. Calculate the demagnetisation amp-turns/pole if shunt field resistance is $50\Omega$. Also, calculate extra shunt field turns/pole to neutralize the demagnetisation. **10**

    b) Explain Swinburne's test for finding the efficiency of a d.c. machine. Can this method be applicable to d.c. series motors. **8**

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# [3862] – 357

**S.E. (Common to Comp./E.TC./I.T./Electrical S/W/Instru.) Examination, 2010**
**ENGINEERING MATHEMATICS – III (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 electronic pocket calculator is **allowed**.*
*5) Assume **suitable** data, if **necessary**.*

SECTION – I

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

i) $(D-1)^3 y = e^{3x} + 3^x + \frac{7}{2}$

ii) $\frac{d^2y}{dx^2} + y = x \sin x$ [By variation of parameter]

iii) $(D^2 - 4D + 4)\, y = e^{2x} \sin 3x$

iv) $(D^2 - 4D + 3)\, y = x^3 e^{2x}$

v) $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = \sin[\log x^2]$

b) A circuit consists of an inductance L and condenser of capacity C is in series. An alternating e.m.f. Esinnt is applied to it at time t = 0, initial current and the charge on the condenser being zero. Find the current flowing in the circuit at any time for w = n. **5**

OR

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

i) $\frac{d^3y}{dx^3} - 4\frac{dy}{dx} = \sinh 2x$

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

iii) $(D^2 - 6D + 9)\, y = \frac{e^{3x}}{x^2}$ [By variation of parameter]

iv) $(D^2 - 2D + 5)\, y = 25x^2$

v) $(2x+1)^2 \frac{d^2y}{dx^2} - 2(2x+1)\frac{dy}{dx} - 12y = 6x$

b) Solve the simultaneous equations, **5**

$$\frac{dx}{dt} - wy = a\cos pt$$

$$\frac{dy}{dt} + wx = a\sin pt$$

3. a) If $v = \dfrac{-y}{x^2 + y^2}$ find u such that $f(z) = u + iv$ is analytic. Determine $f(z)$ in terms of z. **6**

b) Evaluate $\oint_c \dfrac{z+2}{z^2+1}\,dz$ where $C : |z - i| = \dfrac{1}{2}$. **5**

c) Find the Bilinear transformation which sends the points 1, i, –1 from z-plane into the points i, o, –i of the w-plane. **5**

OR

4. a) Evaluate $\int_c \dfrac{\cos \pi z^2}{(z-1)(z-2)}\,dz$ where C is the circle $|z| = 3$. **6**

b) Show that, under the transformation $w = \dfrac{i - z}{i + z}$, x-axis in z-plane is mapped onto the circle $|w| = 1$. **5**

c) Show that the function $f(z)$ with constant magnitude is constant. **5**

5. a) Find Fourier sine and Fourier cosine transform of $f(x) = \begin{cases} \sin x & 0 \le x < a \\ 0 & x > a \end{cases}$. **6**

b) Find the inverse Fourier sine transform of $Fs(\lambda) = \dfrac{e^{-a\lambda}}{\lambda}$. **6**

c) Find inverse z-transform of $\dfrac{z+2}{z^2 - 2z + 1}$ $\quad |z| > 1$. **5**

OR

6. a) Find z-transform of the following **(any two)** :

i) $f(k) = \dfrac{2^k}{k!} \quad k \ge 0$

ii) $f(k) = (1 + k)a^k \quad k \ge 0$

iii) $f(k) = 2^k \sinh \alpha k \quad k \ge 0$ **6**

b) Using Fourier Integral representation show that

$$e^{-x} - e^{-2x} = \frac{6}{\pi}\int_0^\infty \frac{\lambda \sin \lambda x}{(\lambda^2+1)(\lambda^2+4)}\, d\lambda,\ x > 0.$$ **6**

c) Find the Fourier cosine transform of $f(x) = \begin{cases} x & 0 \le x \le 1/2 \\ 1-x & 1/2 < x < 1 \\ 0 & x > 1 \end{cases}$ **5**

SECTION – II

7. a) Find the Laplace transforms of **any two** of the following : **8**

i) $4t + e^{-2t}t^2 + t \sin t$

ii) $\int_0^t \left[\frac{e^t - \cos 2t}{t}\right] dt$

iii) $\frac{\cos mt - \cos nt}{t}$

b) Evaluate the integral by using Laplace transform $\int_0^\infty e^{-3t} t \cos t\, dt$. **4**

c) Solve the differential equation by using Laplace transform method $\frac{d^2y}{dt^2} + y = 0$ where $y(0) = 1,\ y'(0) = 2$. **4**

OR

8. a) Find Inverse Laplace transforms of any two of the following : **8**

i) $\frac{2s+3}{s^2+8s+2s}$

ii) $\frac{3s+1}{(s-4)(s+3)}$

iii) $\frac{4s+3}{2s+1}$

b) Use convolution theorem to find Inverse Laplace transform of $\frac{1}{s(s^2+4)}$. **4**

c) Obtain Laplace transform of $t^4 v(t-2) + t^3\, \delta(t-4)$. **4**

9. a) Prove the following **(any two)** : **8**

i) $\nabla \cdot \left( r \nabla \frac{1}{r^n} \right) = \frac{n(n-2)}{r^{n+1}}$

ii) $\nabla \left( \nabla \cdot \frac{\bar{r}}{r} \right) = -\frac{2\bar{r}}{r^3}$

iii) $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$

b) Find the directional derivative of $\phi = 4xz^3 - 3x^2y^2z$ at $(2, -1, 2)$ in the direction of $2i - 3j + 6k$. **5**

c) Show that the vector field $[f(r)\bar{r}]$ is irrotational vector field. **4**

OR

10. a) Show that the vector field $\overline{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$ is conservative and hence find a scalar potential $\phi$ such that $\overline{F} = \nabla\phi$. **7**

b) Show that curl[grad $\phi$] = 0 where $\phi$ is some scalar point function. **5**

c) If $\phi$, $\psi$ satisfies the Laplaces equation then prove that $(\phi\nabla\psi - \psi\nabla\phi)$ is solenoidal function. **5**

11. a) Evaluate $\int_C yzdx + (xz+1)dy + (xy)dz$ where C is the curve from (0, 0, 0) to (2, 1, 4). **5**

b) Verify the Green's Lemma for the vector field $\overline{F} = x^2 i + xy j$ over the region bounded between $y = x^2$ and y = x. **5**

c) Verify Gauss divergence theorem for $\overline{F} = 4xzi - y^2 j + yzk$ over the surface s of the cube bounded between x = 0, x = 2, y = 0, y = 2, z = 0, z = 2. **7**

OR

12. a) Verify Stokes theorem for $\overline{F} = (y - z + 2)i + (yz + 4)j - xzk$ over the surface of a cube x = 0, x = 2, y = 0, y = 2 and z = 2 above the XOY plane (open at the bottom). **7**

b) Maxwell's equations are given by $\nabla \cdot \overline{H} = 0,\ \nabla \times \overline{E} = -\frac{\partial \overline{H}}{\partial t},\ \nabla \times \overline{H} = \frac{\partial \overline{E}}{\partial t}$. Show that $\overline{H}$ satisfies the equation $\nabla^2 u = \frac{\partial^2 u}{\partial t^2}$. **5**

c) Evaluate $\int_C \overline{F} \cdot d\overline{r}$ where $\overline{F} = 3xi + (2xz - y)j + zk$ from (0, 0, 0) to (2, 1, 3) along a line joining these points. **5**

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*B/II/10/3,310*

# [3862] – 362

**S.E. (Instrumentation and Control) (Semester – I) Examination, 2010**
**MATERIALS AND PROCESSES FOR SENSORS**
**(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 electrical and mechanical properties of conductor. **8**
   b) Enlist the guidelines for material selection of mercury filled thermometer. **8**

OR

2. a) Explain the properties and applications of Tungsten. **8**
   b) Enlist the guidelines for material selection of mercury filled thermometer. **8**

3. a) Explain the effect of temperature 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. **8**

**P.T.O.**

SECTION – II

7. a) Explain the properties of magnetic materials. **8**

   b) Give properties and applications of soft and hard magnetic materials. **8**

OR

8. a) Discuss ferromagnetic material and hysteresis in ferromagnetic materials. **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 photosensitive materials. **10**

OR

10. a) What are various requirements of fiber optic materials ? **8**

    b) Write a note on radioactive materials. **10**

11. a) Explain anodizing. **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 Thermal Spraying. **8**

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**[3862] – 382**

**S.E. (Chemical/Printing/Polymer/Petroleum/Petrochemical/Bio. Tech.)**
**(Semester – I) Examination, 2010**
**ENGINEERING MATHEMATICS – III**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *i) Answers to the **two** Sections should be written in **separate** answer books.*
*ii) In Section **I**, attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**.*
*In Section **II**, attempt Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12**.*
*iii) **Neat** diagrams must be drawn **wherever** necessary.*
*iv) Figures to the **right** indicate **full** marks.*
*v) **Use** of non-programmable electronic pocket calculator is **allowed**.*
*vi) Assume **suitable** data, if **necessary**.*

SECTION – I

1. A) Attempt **any three** : **12**

i) $\frac{d^3y}{dx^3} + y = e^{-x} + 5x^3 + 3$

ii) $(D^4 + 26D^2 + 25)\,y = 4\sin 2x\cos 3x$

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

iv) $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} + y = (\log x + 1)^2$

v) $(D^2 + 36)\,y = \operatorname{cosec} 6x$ (Using variation of parameters).

B) Solve **5**

$$\frac{dx}{x^2 - y^2 - z^2} = \frac{dy}{2xy} = \frac{dz}{2xz}$$

OR

**P.T.O.**

2. A) Attempt **any three** : **12**

i) $\dfrac{d^2y}{dx^2} - 3\dfrac{dy}{dx} + 2y = \dfrac{1}{e^{e^{-x}}} + \cos\left(\dfrac{1}{e^x}\right)$

ii) $(D^2 - 4D + 4)\,y = e^{2x}\sec^2 x$ (Using variation of parameters)

iii) $\dfrac{d^2y}{dx^2} - 2\dfrac{dy}{dx} + 2y = \sinh x \cos x$

iv) $(2x+1)^2\,\dfrac{d^2y}{dx^2} - 2(2x+1)\,\dfrac{dy}{dx} + 4y = (2x+1)^3$

v) $(D^2 - 2D + 1)\,y = e^x \log x$

B) Solve : **5**

$$2\,\frac{dx}{dt} - x + 3y = 0,$$

$$2\,\frac{dy}{dt} + 3x - y = \cos t$$

3. A) Solve the equation $\dfrac{\partial^2 u}{\partial x^2} + \dfrac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions

i) $u = 0$ when $y \to \infty$

ii) $u = 0$ when $x = 0$ and $x = 20\ \forall\ y$

iii) $u(x, 0) = 50\sin\left(\dfrac{\pi x}{20}\right),\ 0 < x < 20$ **8**

B) A light horizontal strut AB of length $l$ is freely pinned at A and B is under the action of equal and opposite compressive forces P at each of its ends and carries a load W at its centre. Show that the deflection at its centre is

$$\frac{W}{2P}\left[\frac{1}{n}\tan\frac{nl}{2} - \frac{l}{2}\right] \text{ where } n^2 = \frac{P}{EI}$$ **8**

OR

4. A) If $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ represents the vibrations of a string of length $l$ units fixed at both ends, find the solution with boundary conditions,

i) $u(0, t) = 0$ and $u(l, t) = 0$

ii) $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$

iii) $u(x, 0) = a \sin \frac{\pi x}{l}, \ 0 \le x \le l$ **8**

B) In a certain chemical reaction following equations appear

$$\frac{dx}{dt} + 3x - 2y = 2$$

$$\frac{dy}{dt} - 2x + 3y = 0$$

Find x and y if x = y = 0 at t = 0. **8**

5. A) The initial temperature along the length of an infinite bar is given by

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

If the temperature $u(x, t)$ satisfies the equation

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \quad -\infty < x < \infty, \ t > 0$$

Use Fourier transform to find the temperature at any point of the bar at any time t. **9**

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

then prove that for every $-\infty < x < \infty$,

$$f(x) = \frac{1}{\pi}\int_0^\infty \frac{\sin\lambda(1+x)+\sin\lambda(1-x)}{\lambda}\,d\lambda$$

$$= \frac{2}{\pi}\int_0^\infty \frac{\sin\lambda\cos\lambda x}{\lambda}\,d\lambda$$ **8**

OR

6. A) Find the Fourier Cosine transform of

$$f(x) = \begin{cases} x^2, & 0 \le x \le 1 \\ 0 & x > 1 \end{cases}$$ **5**

B) Find the inverse Sine transform of

$$F_s(\lambda) = \frac{1}{\lambda}e^{-a\lambda}$$ **7**

C) Solve the following integral equation

$$\int_0^\infty f(x)\sin\lambda x\,dx = \begin{cases} 1, & 0 \le \lambda \le 1 \\ 2, & 1 < \lambda \le 2 \\ 0, & \lambda > 2 \end{cases}$$ **5**

SECTION – II

7. a) Find the Laplace transforms of the following **(any two)** : **8**

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

ii) $\dfrac{e^t - \cos 2t}{t}$

iii) $f(t) = \cos t, \quad 0 < t < \pi$

$\quad = \sin t, \quad t > \pi$

b) Find the inverse Laplace transforms of the following **(any two)** : **8**

i) $\dfrac{s^2+2s-3}{(s-3)\,(s+2)^2}$

ii) $\cot^{-1}\left(\dfrac{s+1}{2}\right)$

iii) $\dfrac{1}{s^4(s+1)}$

OR

8. a) Find the Laplace transforms of the following **(any two)** : **8**

i) $t\sin^3 t$

ii) $e^{-2t}\int_0^t \dfrac{1-\cos 3t}{t}\,dt$

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

b) Find inverse Laplace transforms of the following **(any two)** : **8**

i) $\dfrac{1}{s}\log\left(\dfrac{s+3}{s+2}\right)$

ii) $\dfrac{(s+1)\;e^{-\pi s}}{s^2+s+1}$

iii) $\dfrac{s+1}{(s^2+2s+2)^2}$

9. a) Establish the following vector identities **(any two)** : **6**

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

ii) $\nabla^4 \left[r^2 \log r\right] = \frac{6}{r^2}$

iii) $\nabla \cdot \left[\left(\frac{\bar{a}\cdot\bar{r}}{r}\right)\bar{r}\right] = \frac{3(\bar{a}\cdot\bar{r})}{r}$

b) If the directional derivative of $\phi = axy + byz + czx$ at (1, 1, 1) has maximum magnitude 6 in a direction parallel to the line $2(x-2) = y-1 = z-1$, Find the values of a, b, c. **6**

c) Evaluate $\int_C (y^2 - z + 3)\,dx + (yz + 4x)\,dy - xz\,dz$ where C is the boundary of the rectangle $0 \le x \le 2,\ \ 0 \le y \le 1$ and z = 2. **5**

OR

10. a) Show that the tangent at any point on the curve $x = e^{\theta}\cos\theta,\ y = e^{\theta}\sin\theta,$ $z = e^{\theta}$ makes constant angle with the z-axis. **5**

b) If $\bar{F}_1 = yz\vec{i} + zx\vec{j} + xy\vec{k}$ and $\bar{F}_2 = (\bar{a}\cdot\bar{r})\bar{a}$, then show that $\bar{F}_1 \times \bar{F}_2$ is solenoidal. **6**

c) Using Divergence theorem, evaluate $\iint_S \bar{F}\cdot d\bar{s}$, where $\bar{F} = x\vec{i} + y\vec{j} + (z+2)\vec{k}$ and S is the curved surface of the paraboloid $z = 4 - x^2 - y^2$, above the xy-plane. **6**

11. a) Show that the motion of an incompressible perfect fluid is a possible motion, when the velocity $\overline{q}$ is given by

$$\overline{q} = x(y^2 - z^2)\vec{i} + y(z^2 - x^2)\vec{j} + z(x^2 - y^2)\vec{k}.$$

Determine whether the motion is irrotational. Find the equations of the stream lines of the motion. **6**

b) The transfer function of a second order system is given as

$$G(s) = \frac{10}{2s^2 + 0.3s + 0.5}.$$ **5**

Determine : i) overshoot, ii) y(t)max

c) Solve the differential equation by Laplace transform method : **6**

$$\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 4e^{2t}, \quad y(0) = -3, \quad y'(0) = 5$$

OR

12. a) A liquid is in equilibrium under the action of field $\overline{F}$ per unit mass given by $\overline{F} = \lambda\left[(y+z)\vec{i} + (z+x)\vec{j} + (x+y)\vec{k}\right]$. Find the pressure at any point of the field. **5**

b) The transfer function for a second order system is given by $\frac{2}{s^2 + 2s + 2}$. If the forcing function is a unit step function, find the response function. **6**

c) Using Laplace transform method, solve the differential equation : **6**

$$y'' + 9y = \cos 2t, \quad y(0) = 1, \quad y\left(\frac{\pi}{2}\right) = -1$$

**S.E. (Chemical) (Semester – I) Examination, 2010**
**PROCESS CALCULATIONS**
**(2003 Course) (Common to Bio-Tech.)**

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)* ***Use*** *of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
*4) Assume* ***suitable*** *data, if* ***necessary****.*

SECTION – A

1. a) By electrolyzing mixed brine, a mixture of gases is obtained at the cathode having the following composition by mole **6**

$Cl_2$ = 67%, $Br_2$ = 21%, $O_2$ = 12%

Using ideal gas law, calculate

i) The average molar mass of the gas

ii) Composition of gas by weight

iii) The density of the gas in kg/m$^3$ at 30°C and 750 mm Hg pressure.

b) The strength of a phosphoric acid sample is found to be 35% $P_2O_5$ (by mass). Find out the actual concentration of $H_3PO_4$ in the acid. **4**

c) A sample of wine contains 20% alcohol (ethanol) on volume basis. Find the mass% of alcohol in the wine. Assume the densities of alcohol and alcohol free liquid to be 0.79 kg/lit and 1.0 kg/lit respectively. **6**

OR

**P.T.O.**

2. a) The analysis of a sample of glass yields 7.8% $Na_2O$, 7.0% MgO, 9.7% $Z_nO$, 2.0% $Al_2O_3$, 8.5% $B_2O_3$ and 65% $SiO_2$ (by mass). Convert this composition into mole %. **6**

b) 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. **4**

c) Make the following conversions : **6**

i) 294 gm/lit $H_2SO_4$ to normality

ii) 5N $H_3PO_4$ to gm/lit

iii) 54.75 gm/lit HCl to molarity.

3. a) Crystals of $MgCl_2.6H_2O$ have a solubility of 190 gm per 100 gm ethanol at 298 K. It is desired to make 1000 kg of saturated solution. Calculate the quantities of crystals and ethanol required to make the above solution. Also find the composition of the saturated solution by mass. **8**

b) A spent lye sample obtained from a soap making unit contains 9.6% glycerol and 10.3% salt (NaCl). It is concentrated at the rate of 5000 kg/hr in a double effect evaporator until the final solution contains 80% glycerol and 6% salt. Assume that about 4.5% glycerol is lost by entrainment. **8**

Find :

i) The evaporation taken place in the system.

ii) The amount of salt crystallized out in the salt box of the evaporator.

OR

4. a) A spent solution of chloroacetic acid in ether contains 20 mole % chloroacetic acid. It is desired to make 500 kg of a saturated solution at 298 K. Find the quantities of spent solution and chloroacetic acid required to make the above solution.

The solubility of chloroacetic acid in ether is 190 gm per 100 gm ether at 298 K. **8**

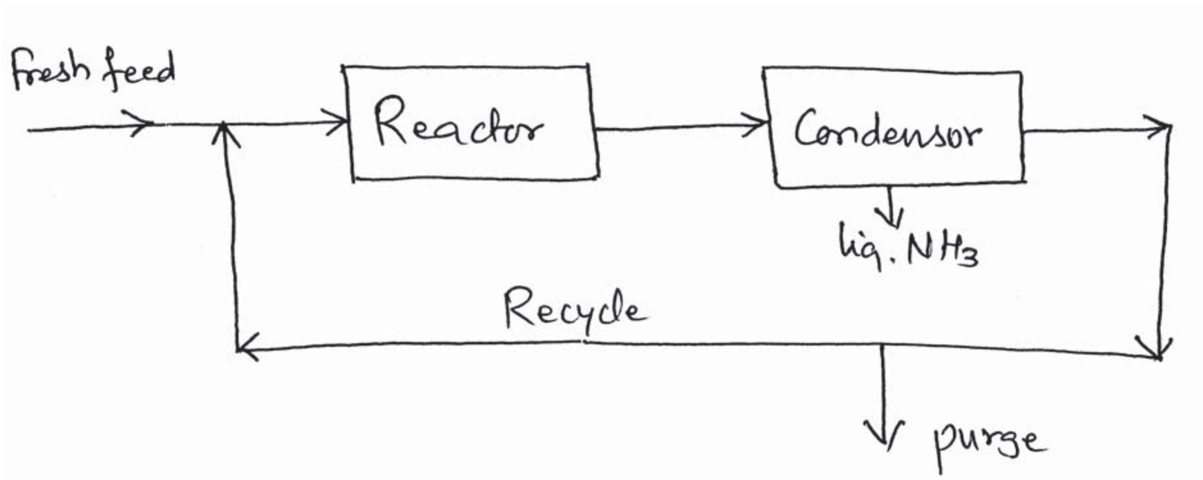
b) For carrying out nitration reaction, it is desired to have a mixed acid containing 39% $HNO_3$, 42% $H_2SO_4$ by mass. Nitric acid of 68.3% is readily available. **8**

Calculate :

i) The required strength of Sulphuric acid to obtain the above mixed acid.

ii) The weight ratio of $H_2SO_4$ to $HNO_3$ to be mixed.

5. In the operation of a synthetic ammonia plant,




1 : 3 nitrogen – hydrogen mixture is fed to the converter resulting in a 25% conversion to ammonia. The ammonia formed is separated by condensation and the unconverted gases are recycled to the reactor. The initial nitrogen – hydrogen mixture contains 0.20 parts of Argon to 100 parts of $N_2$-$H_2$ mixture. The toleration limit of Argon entering the reactor is assumed to be 5 parts to 100 parts of $N_2$-$H_2$ mixture by volume. Estimate the fraction of recycle that must be continually purged. **18**

OR

6. Pure $CO_2$ is prepared by treating limestone with aq. $H_2SO_4$. The limestone used contained $CaCO_3$, $MgCO_3$ and remainder being inert insoluble material. The acid used contained 12% $H_2SO_4$ by weight. The residue from the process had the following composition. **18**

$CaSO_4$-8.56%, $MgSO_4$-5.23%, $H_2SO_4$-1.05%

Inerts-0.53%, $CO_2$ 0.12%, $H_2O$-84.51%.

During the process the mass is warmed and $CO_2$ and $H_2O$ vapors were removed.

a) Calculate the analysis of limestone used.

b) Calculate the percentage of excess acid used.

c) Calculate the weight and analysis of the material distilled from the reaction mass per 5000 kg of limestone treated.

SECTION – B

7. a) Pyrites fines are roasted in a chamber plant for making sulphuric acid. The gases leaving the roaster are at 775 K and have the molar composition $SO_2$ – 7.1%, $O_2$ – 10.6%, $SO_3$ – 0.5% and $N_2$ – 81.8%. Calculate the heat content of 1.0 Kmol of gas mixture over 298 K, using heat capacity data. **6**

$$Cp = 24.77 + (62.98 \times 10^{-3})T + (-44.26 \times 10^{-6})T^2 \text{ – for } SO_2$$

$$= 22.04 + (121.60 \times 10^{-3})T + (-91.87 \times 10^{-6})T^2 \text{ – for } SO_3$$

$$= 26.03 + (11.76 \times 10^{-3})T + (-2.34 \times 10^{-6})T^2 \text{ – for } O_2$$

$$= 29.60 + (-5.14 \times 10^{-3})T + (13.18 \times 10^{-6})T^2 \text{ – for } N_2$$

Cp expressed in KJ/Kmol K.

b) Calculate the enthalpy of 1.0 Kmol of water vapor at 150°C and 1.0 atm relative to ice at 0°C. **10**

Given data : Latent heat of fusion = 333.7 KJ/kg.

– Latent heat of vaporization of water at 100°C = 2257 KJ/kg

– Heat capacity of liq. water (KJ/kmol K) $= 50.85 + (213.1 \times 10^{-3})T - (631.4 \times 10^{-6})T^2$

– Heat capacity of water vapor (KJ/kmol K) $= 32.49 + (0.076 \times 10^{-3})T + (13.21 \times 10^{-6})T^2$

OR

8. Chlorine is manufactured by burning hydrogen chloride gas using air. **16**

$$4\,HCl + O_2 \longrightarrow 2\,H_2O + 2\,Cl_2$$

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 K.

Calculate :

a) The composition of gases leaving the burner and

b) The adiabatic reaction temperature of the product gas steam.

Given : Cp = a + bT KJ/kmol K.

– Heat capacity constants

| **Component** | **a** | **b × 10$^3$** |
|---|---|---|
| HCl | 30.31 | –7.61 |
| $O_2$ | 26.02 | 11.76 |
| $H_2O$ | 32.49 | 0.08 |
| $Cl_2$ | 28.54 | 23.88 |
| $N_2$ | 29.59 | –5.14 |

9. Chlorobenzene is nitrated using a mixture of nitric acid and sulphuric acid. During the pilot plant studies a charge consisted of 100 kg of chlorobenzene, 106 kg of 65% $HNO_3$ and 108 kg of 94% $H_2SO_4$. After two hrs of operation the final mixture was analyzed. The final product contained 2% unreacted chlorobenzene, also the product distribution was found to be 68% p-nitrochlorobenzene and 32% O-nitrochlorobenzene. Calculate % conversion of chlorobenzene and composition of product mixture. **16**

OR

10. a) The dry bulb temperature and dew point of ambient air were found to be 29°C and 18°C respectively. The barometer reads 100 kN/$m^2$. **8**

Compute :

i) the absolute molar humidity

ii) the absolute humidity

iii) the % RH

iv) the % saturation

Given data

Vapor pressure of water

= 2.062 KN/$m^2$ at 18°C

= 4.004 KN/$m^2$ at 29°C.

b) A double effect evaporator concentrating weak juice from 7% to 67% solids handles 100 kg solids per hour. If the same system is to concentrate a weak juice from 5% to 47%, find the capacity of the system in terms of solids that can be handled per hour assuming water evaporation capacity to be same in both the cases. **8**

11. Describe briefly :

a) Proximate and Ultimate analysis of coal. **8**

b) Calorific values of fuel. **6**

c) Classification of fuels. **4**

OR

12. a) The orsat analysis of the flue gases from a boiler house chimney gives $CO_2$ – 11.4%, $O_2$ – 4.2% and $N_2$ – 84.4% (mole %).

Assuming that complete combustion has taken place

i) Calculate the % excess air and

ii) Find the C : H ratio in the fuel. **10**

b) A sample of fuel oil has C/H ratio 9.33 (by mass) and contains sulphur to the extent of 1.3% (mass). The GCV of the fuel is measured to be 41785 KJ/kg at 298 K. Calculate its NCV. Latent heat of water vapor = 2442.5 KJ/kg. **8**

Given data Atomic weight

| | | | |
|---|---|---|---|
| Ca = 40, | S = 32 | Zn = 65.4 | Si = 28 |
| Mg = 24, | P = 31 | Al = 27 | |
| Na = 23, | Br = 80 | B = 10.8. | |

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**[3862] – 393**

**S.E. (Petro. Petrochem./Poly.) (Semester – I) Examination, 2010**
**FLUID MECHANICS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Define fluid and explain any 3 applications involving mechanics of fluids. **(1+6)**

b) 10 litres of fluid weighs 10 kg. Determine

i) Specific mass ii) Specific weight

iii) Specific volume iv) Specific gravity.

If the Kinematic viscosity of fluid is 400 CS, determine its viscosity in P, CP, Pa-sec. **6**

c) Draw rheological diagram and show various fluid types on it with examples. **5**

OR

2. a) Define viscosity and explain its causes. Explain how and why viscosity variation with temperature is different for liquids and gases. **(1+2+4)**

b) For a surface tension of 0.08 N/m, determine the pressure difference between inside and outside of i) jet ii) droplet iii) soap bubble, if radius is 3 mm. **6**

c) Explain continuum hypothesis with an example. **5**

**P.T.O.**

3. a) Derive hydrostatics equation. **8**

b) Explain working, principle, construction and use of micromanometer with a neat sketch. **8**

OR

4. a) State and prove Pascal's law. **8**

b) Explain metacentre and its importance in the stability of floating bodies. **4**

c) Explain ideal requirements of a manometric fluid. **4**

5. a) Derive continuity equation for 3D fluid flow in Cartesian co-ordinates. **8**

b) For $\phi = 8xy$, determine $\psi$ and hence the velocity at the point P(2, 1). **8**

OR

6. a) Derive continuity equation along a streamline. **8**

b) For $\psi = \frac{3}{2}(x^2 - y^2)$, determine $\phi$ and hence the velocity at the point P(1, 2). **8**

SECTION – II

7. a) Derive Euler's equation of motion along a streamline. **8**

b) A diffuser has diameters 200 mm and 300 mm respectively. Length is 2 metres. The velocity at the smaller end is 30 cm/sec., and the pressure is 100 Pa. Assuming losses in the diffuser at 10% of the velocity head at outlet, determine i) Q ii) $\frac{V_2^2}{2g}$ iii) $\frac{p_2}{r}$, if fluid is water. **8**

OR

8. a) From Euler's equation of motion, derive Bernoulli's equation and explain meaning of each term in it. **8**

b) Define H.G.L. and E.G.L. Draw these lines for a suddenly expanding section and a gradually converging section. **(2+3+3)**

9. a) For steady laminar flow through pipes, prove that $u_{avg} = \frac{1}{2} U_{max}$. **8**

b) Explain methodology of determining $\pi$ terms using Buckingham's Pi method. **8**

OR

10. a) For steady laminar flow through pipes show that $f = \frac{64}{Re}$. **12**

b) Draw orificemeter and explain its use. **4**

11. a) Explain boundary layer growth on a flat plate with minimum 4 velocity profiles. **8**

b) Explain working of centrifugal pump with a neat sketch. **6**

c) Explain minor losses in pipe flow. **4**

OR

12. 3 pipes, 300 mm$\phi$, 3000 m length, f = 0.03, 200 mm$\phi$, 2000 m length, f = 0.02, and 250 mm$\phi$, 2500 m length, f = 0.025, are connected in series between 2 reservoirs whose w.s.e differ by 100 m. All connections are sudden. Determine : **18**

i) % difference in flow rate considering and neglecting minor losses

ii) Magnitude of each loss in the pipe system

iii) Velocities in each pipe

iv) Equivalent diameter of a pipe with f = 0.015.

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# [3862] – 407

**S.E. (Computer Engg.) (Semester – II) Examination, 2010**
**DATA STRUCTURES (2003 Course)**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Differentiate singly linked list and doubly linked list. Write a function to insert a node after any node in doubly linked list. **8**

   b) What is generalized linked list ? Write a node structure in C for generalized linked list. Give the diagrammatic representation of the following polynomial using generalized linked list **8**

   $8x^3y^3z^3 + 3x^3y^2z^3 + y^2z^2 + xy^2z^2 + 8x + 9y.$

OR

2. a) Write pseudo 'C' algorithm to reverse a singly linked list **8**

   i) By using new list

   ii) Without using new list.

   b) Show how to implement stack operations by using linked list. **8**

3. a) Define BST. Write a function in C to insert a Node into BST. **8**

   b) Write a non-recursive postorder traversal algorithm for Binary tree. **8**

OR

4. a) Explain how to convert general tree to Binary tree. **6**

   b) What is the use of threaded Binary tree ? Give the node structure required for a threaded binary tree. Write pseudo algorithm for in order threading of Binary tree. **10**

**P.T.O.**

5. a) What is minimum spanning tree ? Write a Kruskal's algorithm for minimum spanning tree. **8**

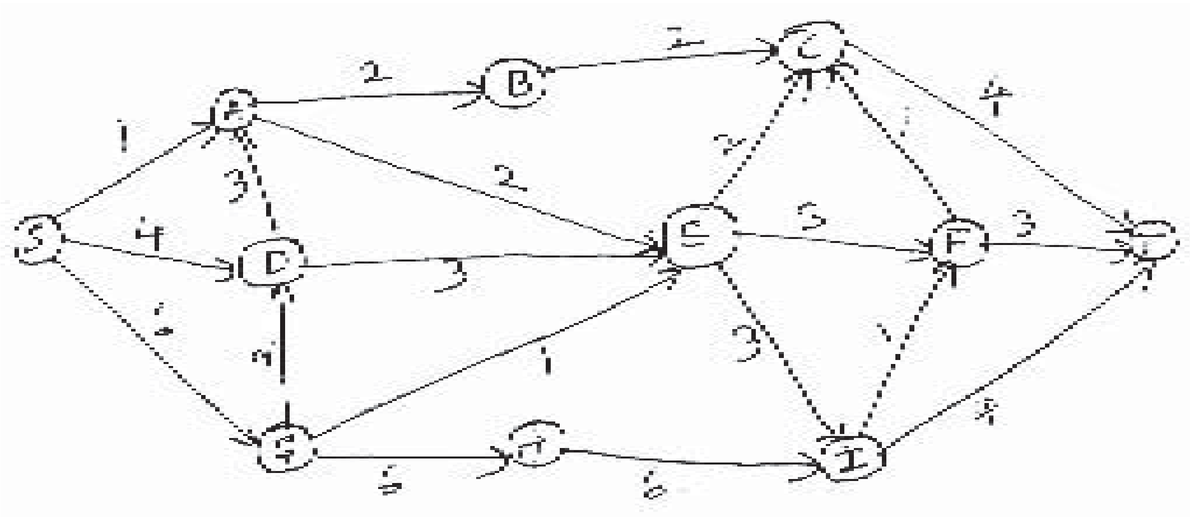
b) Write pseudo 'C' algorithm for : **10**

i) BFS traversal of graph

ii) DFS traversal of graph

OR

6. a) Find a topological ordering for the following graph. **8**



b) Define the following terms with respect to graph : **10**

i) Graph traversal

ii) Adjacency matrix

iii) Adjacency list

iv) Indegree and outdegree of vertex

v) Diagraph.

SECTION – II

7. a) What is Hashing ? What is the hashing function ? Give at least two examples of hashing function. Discuss about the characteristics of a good hashing function. How is collision handled during hashing ? **10**

b) Explain Rehashing with example. **8**

OR

8. a) Obtain AVL tree starting with an empty tree on the following sequence : **12**

STA, ADD, LDA, MOV, JMP, TRIM, XCHG, MVI, DIV, NOP, IN, JNZ.

Draw the tree at each stage of insertion. At each stage, mention the rotation applied if any.

b) Compare the AVL tree with Binary search tree. **6**

9. a) Define Min-Heap and Max-Heap. Write a algorithm to design a priority queue using heap. **8**

b) Explain Heapsort algorithm and give its time complexity. **8**

OR

10. a) Explain how to construct a 'B' tree of order 5 with steps for the following data 78, 21, 14, 11, 97, 85, 74, 63, 45, 42, 57, 20, 16, 19, 52, 30, 21. **8**

b) Define Red-Black tree and give its properties. **8**

11. a) Compare sequential file organization with indexed sequential file organization. Write 'C' implementation of primitives for sequential file organization. **8**

b) State the advantages and disadvantages of the following file organization :

1) Sequential

2) Indexed-sequential

3) Direct. **8**

OR

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

a) Sequential file

b) Inverted files

c) Linear probing

d) Application of hash table.

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**[3862] – 317**

**S.E. (Mechanical) (Sem. – II) (2003 Course) Examination, 2010**
**I.C. ENGINES AND AUTOMOBILE ENGINEERING**

Time : 3 Hours Max. Marks : 100

***N.B. :*** *i) Answer **any three** questions from **each** Section.*
*ii) Answers to the **two** Sections should be written in separate books.*
*iii) Neat diagram must be drawn **wherever** necessary.*
*iv) Figures 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)**

I. a) Enlist the main components of I.C. engines along with its function and material of manufacture. **8**

b) In diesel engine working on dual combustion cycle, the temperature of the beginning of compression is 90º C and pressure 1 bar. The compression ratio is 13. The heat supplied per kg of is 1674 KJ, half of which is supplied at constant pressure and half at constant volume. Calculate

i) maximum pressure in the cycle

ii) percentage of stroke at which cut off occurs.

Take specific heat ratio K = 1.4, R = 0.293 kJ/kg and Cv = $0.71 + 18.85 \times 10^{-5}$ T kJ/kg K. **10**

OR

2. a) How are I.C. engines classified ? **4**

b) Explain the concept of fuel air cycle. State the assumptions made. **6**

c) Explain the effect of variable specific heat and dissociation in S.I. engine with P.V. diagram. **8**

**(Unit – II)**

3. a) Describe with suitable sketch the following systems of modern carburettor

i) Main metering system ii) Idling system

iii) Economiser system iv) Acceleration pump system. **8**

b) What are the main functions of the nozzle ? Bring out the differences in construction and working of pintle and pintaux nozzles with the help of neat sketches and discuss their relative merits. **8**

OR

4. a) What is the necessity too gasoline injection ? Enlist the various types of gasoline injection systems. Explain any one type of gasoline injection. **8**

b) What are the requirements of fuel injection system for C.I. engines ? How they are classified ? Explain with the help of neat sketch the most common injection system used in multi cylinder diesel engines. **8**

**Unit – III**

5. a) Why is cooling necessary for I.C. engines ? What are the effect of overheating and over cooling of engines ? **4**

b) Explain wet sump lubrication system with the help of neat sketch. **6**

c) Differentiate between quantity governing and quality governing. What is the purpose of using governor in C.I. engine ? **6**

OR

6. a) Explain with the help of neat sketch pressurised water cooling system. **6**

   b) What is ignition advance ? What are the factors that affects the ignition advance ? **4**

   c) Explain the working of dry sump lubrication system. What are its advantages ? **6**

SECTION – II

**(Unit – 4)**

7. a) What are the effects of supercharging on following operating parameters of C.I. Engine ?

   i) Power Output

   ii) Fuel Consumption

   iii) Mechanical efficiency. **6**

   b) A trial carried out on a 4-stroke cycle, single cylinder oil engine working on a otto cycle gave the following results :

   – Indicated power = 14.53 KW

   – Mechanical efficiency = 72.62%

   – Fuel used per hour = 4.25 liter

   – Effective Radius of brake drum = 0.5 m

   – Specific gravity of fuel = 0.8

   – C.V. of fuel = 43000 kJ/kg

   – Mass of jacket cooling water = 7 kg/min

   – Rise in temperature of cooling water = $27^{o}$ C

   – Air used per kg of fuel = 34 kg

   – Exhaust gas temperature = $410^{o}$ C

   – Room temperature = $30^{o}$ C

   – Sp. heat of exhaust gas = 1.005 kJ/kg.K

   – Speed = 500 r.p.m.

Calculate :

i) Effective brake load

ii) Brake thermal efficiency

iii) Draw heat Balance sheet on minute basis. **10**

OR

8. a) What is constant pressure Turbo-charging ? State its advantages and disadvantages over other methods of turbocharging in C.I. Engine. **6**

b) The following particulars were obtained during a trial on a four stroke gas engine.

– Duration of trail = 1 Hour

– Revolutions = 16000

– Number of missed cycles = 600

– Net brake load = 1600 N

– Effective brake circumference = 400 cm

– Mean effective pressure = 8 bar

– Gas Consumption = 22000 liters

– C.V. of gas supply = 20 kJ/liter

– Cylinder bore diameter = 25 cm

– Cylinder stroke length = 40 cm

– Compression ratio = 6.5

Estimate :

i) Indicated Power ii) Brake Power

iii) bsfc iv) Brake thermal efficiency

v) Relative efficiency. **10**

**(Unit – 5)**

9. a) Explain with a diagram the stages of combustion in C.I. Engine. **6**

   b) What is ignition lag in S.I. Engine ? Discuss the effects of various engine variables on ignition lag of S.I. Engine. **6**

   c) What is surface ignition ? How does it leads to detonation in S.I. Engine ? **6**

OR

10. a) How the knock can be detected in S.I. Engine ? What are the methods to control knocking in S.I. Engine ? **6**

    b) Explain the phenomenon of diesel knock. **6**

    c) What is swirl in C.I. Engine ? State advantages and disadvantages of compression swirl. **6**

**(Unit – 6)**

11. a) What are the major pollutants found in S.I. and C.I. Engines emissions ? **6**

    b) Write a short note on "Emission Norms in India". **6**

    c) Write a note on 'Hybrid Electric Vehicles'. **4**

OR

12. a) Explain with the help of diagram exhaust gas recirculation system. **6**

    b) Write a note on effects of different automobile pollutants on human life. **6**

    c) What are the engine requirements for automotive applications ? **4**

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# S.E. (Production & Industrial Engineering) (Sem. – I) Examination, 2010
## STRENGTH OF MATERIALS
## (Common to Production S/W)
## (2003 Course)

Time : 3 Hours                                                                 Max. Marks : 100

*N.B.* : *i) 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**.*

*ii) Answer to the **two** Sections should be written in **separate** answer books.*

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

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

*v) Assume suitable data **if necessary**.*

*vi) Due credit will be given to the correct solution procedure and not to the final answer alone.*

*vii) Draw neat diagram **whenever** necessary.*

*viii) Use of cell phone is **prohibited** in examination hall.*

SECTION – I

1. a) A bar of certain material is 60 mm×60 mm in cross section is subjected to an axial pull of 230 KN. The extension over the length of 120 mm is 0.07 mm and decrease in each side is 0.007 mm.

Calculate

i) Young's modulus

ii) Poisson's ratio

iii) Shear modulus

iv) Bulk modulus **8**

b) In fig. 1 (b) rod AB has diameter 12 mm, length 450 mm and modulus of elasticity $E_1$ Rod BC has 12 mm diameter, length 300 mm and modulus of elasticity $E_2$. $F_1$, $F_2$ and $F_3$ are axial Forces. When $F_1 = 0$, $F_2 = 6$ KN, $F_3 = 6$ KN and elongation of AC is 0.2 mm.

When $F_1 = 6$ KN, $F_2 = 0$ and $F_3 = 6$ KN, the elongation of AC is 0.4. Determine the values of $E_1$ and $E_2$. **8**

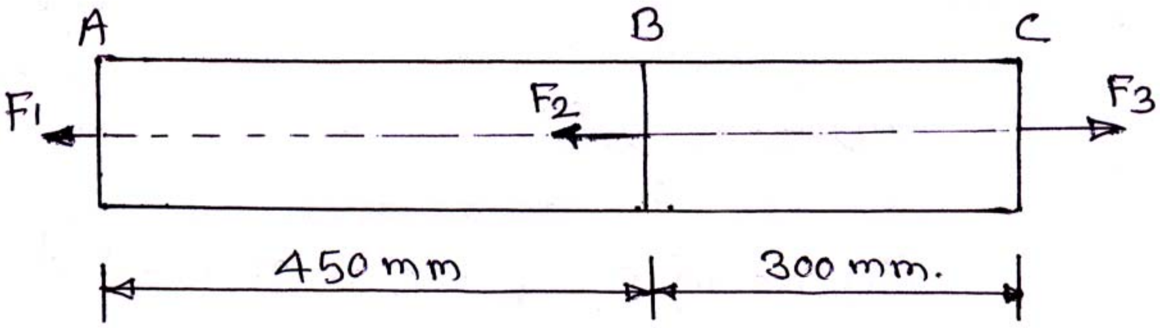



Fig. 1 (b)

OR

2. a) A light rigid bar ABCD pinned at B and connected to two vertical rods, is shown in Fig. 2(a). Assuming that the bar was initially horizontal and rods stress free, determine the stress in each rod after the load P = 1000 N is applied.

Take E for steel = $2 \times 10^5$ N/mm$^2$ , E for Aluminium = $1 \times 10^5$ N/mm$^2$ **8**

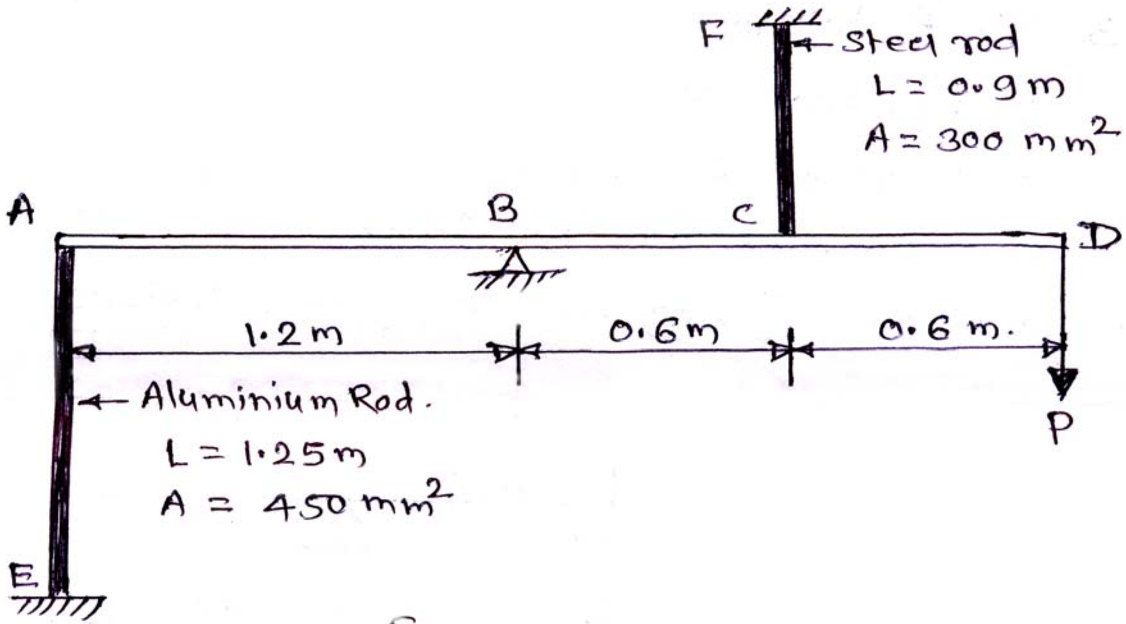



Fig. 2 (a)

b) As shown in Fig. 2(b), a composite member is made by connecting a steel bar and a copper bar rigidily fixed at their ends. Find the maximum value of stresses in steel and copper when combination is subjected to an axial pull of 14.4 KN.

Take $E_S$ = 200 GPa

$E_C$ = 100 GPa **8**

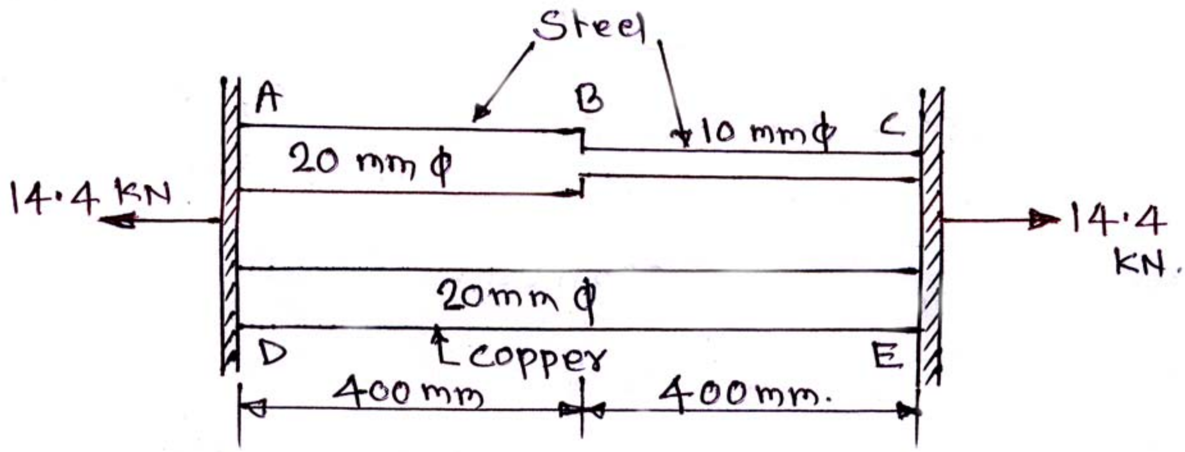
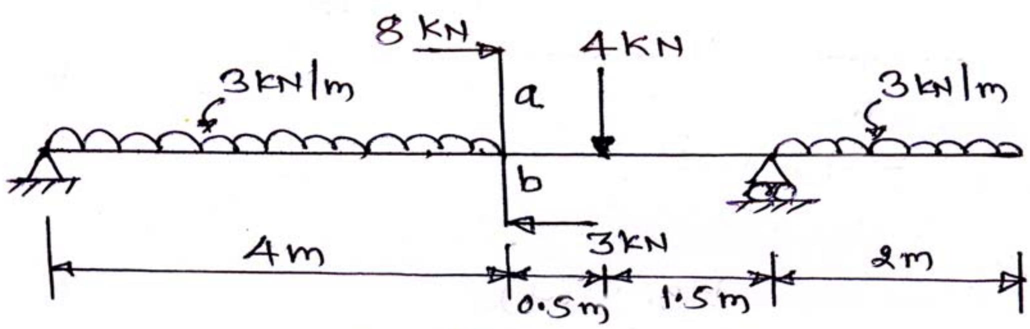



Fig. 2 (b)

3. a) A beam of total span 8 m is shown in fig. 3(a). H has a hinge support at 'A' and roller support at 'C'. Two brackets are welded at 'B'. Draw S.F. and B.M. diagrams giving all important values. **8**




a = 600 mm

b = 400 mm.

Fig. 3 (a)

b) What uniformaly distributed load can a simply supported beam of span 4 m of cross section shown in fig. 3(b), can carry, if the permissible stresses are 120 MPa in compression and 40 MPa in tension. **10**

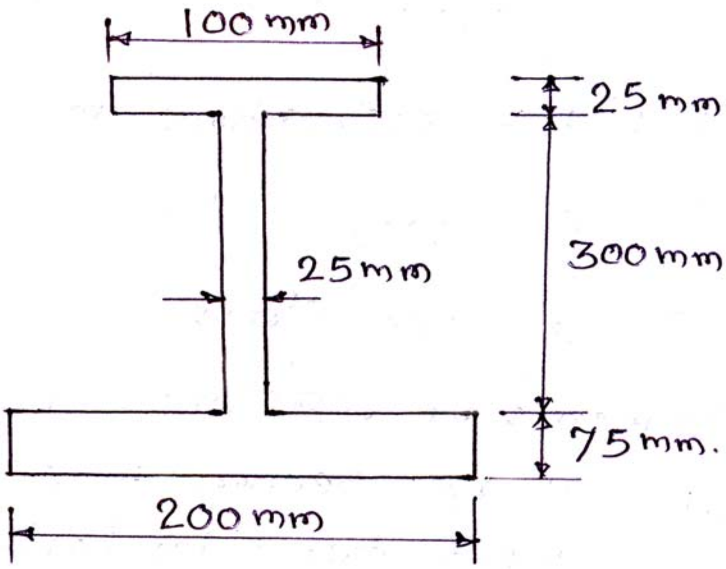
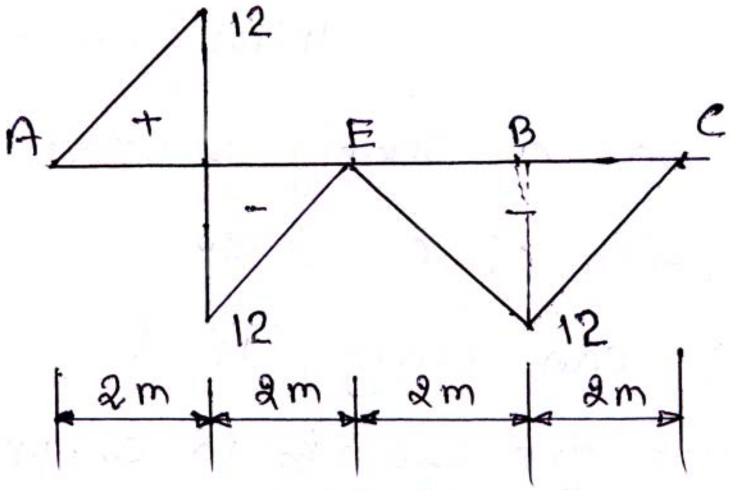



Fig. 3 (b)

OR

4. a) A beam is simply supported at A and B. Support A and B are 6 m apart and overhanging BC = 1m. The B.M.D. is as shown in fig. 4(a).
Construct S.F.D. and load diagram. **8**




B.M.D (KN.m)

fig. 4 (a)

b) i) List the assumptions made in simple theory of bending. **4**

ii) For a given stress, compare the moments of resistance of a beam of square section placed.

1) with two sides horizontal 2) with a diagonal horizontal **6**

5. a) A symmetrical I section with flanges 120 mm × 20 mm and a web 20 mm × 180 mm is used as a simply supported beam and carries u.d.*l*. of 60 kN/m over a span of 3m. Evaluate maximum bending and shear stresses and sketch shear stress distribution across the section. **8**

b) The circular link shown in fig. 5(b) has a rectangular section 100 mm wide by 50 mm thick. Compute the stresses at A & B and C & D. **8**

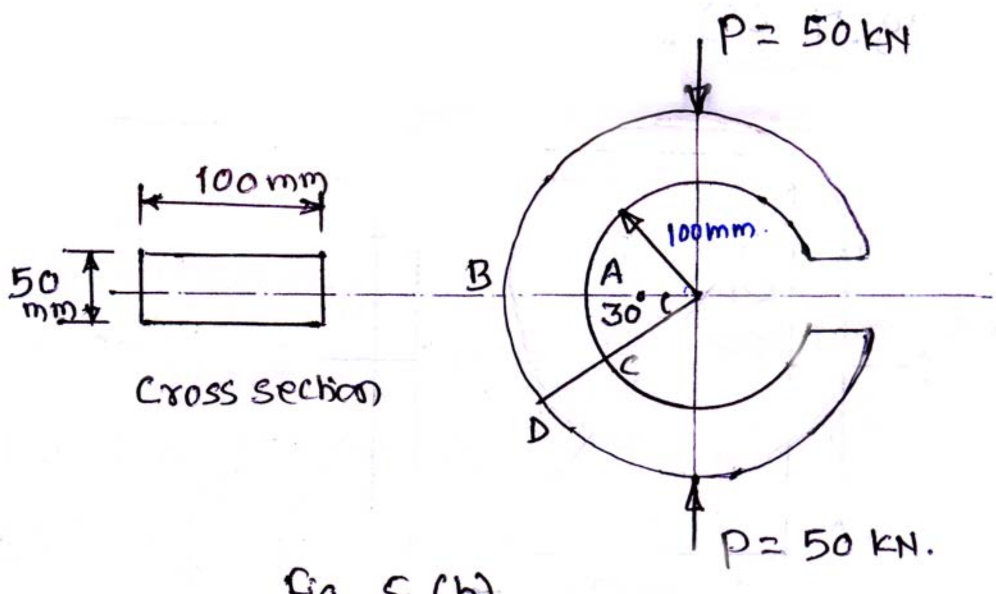



Fig. 5. (b)

OR

6. a) A beam of square section is placed horizontally with one diagonal placed horizontally. If the shear force at a section of the beam is ‘s’, derive the shear stress distribution expressions and sketch the shear distribution diagram for the section. **8**

b) Prove that in the curved beam the neutral axis is always laying below the centroidal axis. **8**

SECTION – II

7. a) Find normal and shearing stress on the oblique plane as shown in fig. 7(a). **8**

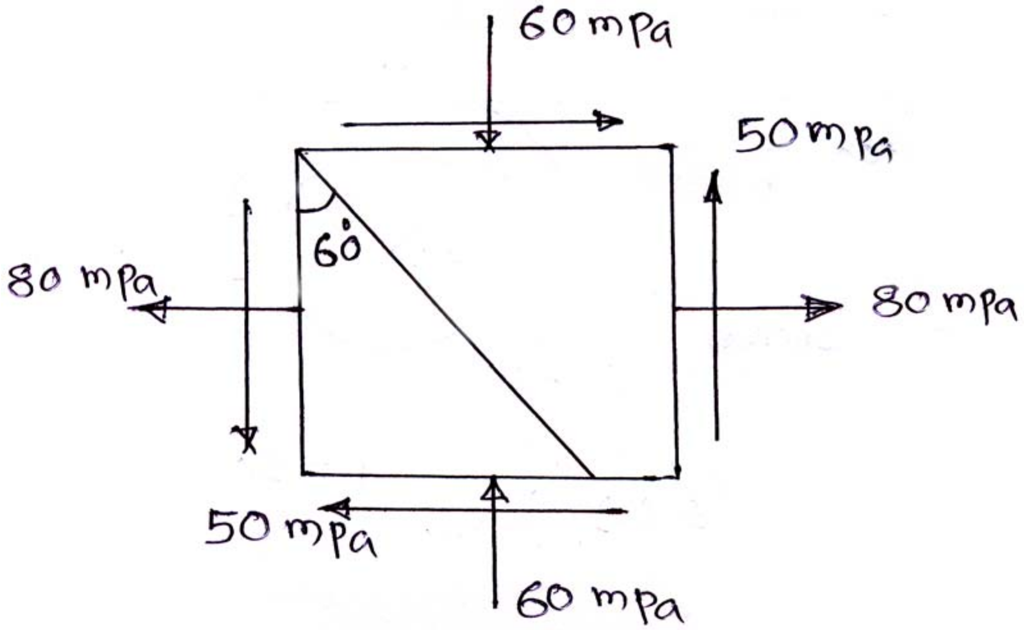



fig. 7 (a)

b) A cylindrical shell with closed ends, 3 m long, 1000 mm in diameter, thickness of metal 12 mm is subjected to an internal pressure of 1.5 MPa.

Calculate

i) the hoop stress ii) the longitudinal stress

iii) the change in diameter and length

Given E = 200 GPa, Poisson's ratio = 0.3 **8**

OR

8. a) At a point in a strained material, there are two planes at right angles to each other on which the normal stresses are 75 MPa tensile on one plane and 45 MPa compressive on the other plane accompanied by a shear stress. If the major principal stress is 105 MPa tensile, evaluate the shear stress on two planes. **8**

Calculate the minor principal stress and also the maximum shear stress at a point.

b) A thick cylindrical shell has 120 mm internal diameter. It is subjected to an internal pressure of 45 $N/mm^2$.

Determine the thickness of the shell, If the permissible tensile stress is 120 $N/mm^2$. **8**

9. a) Two solid shafts of different materials are rigidly fastened together and attached to rigid support as shown in fig. 9(a). The aluminium segment is 75 mm in dia. and steel segment has a diameter of 50 mm. The torque T = 1000 N.m. is applied at the junction of the two segments. Compute the maximum shearing stress developed in the assembly

Take $G_{AL}$ = 28 GPa, $G_{st}$ = 28 GPa **8**

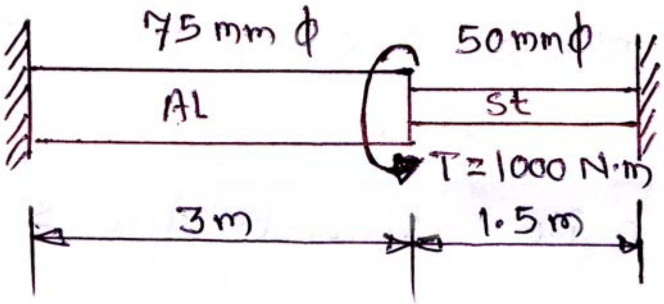



fig. 9(a)

b) Two bars shown are to absorb the same amount of energy due to axial force. Ignoring the effect of stress concentration compare the maximum stress induced in the two bars if they are made of same material. See fig. 9(b). **8**

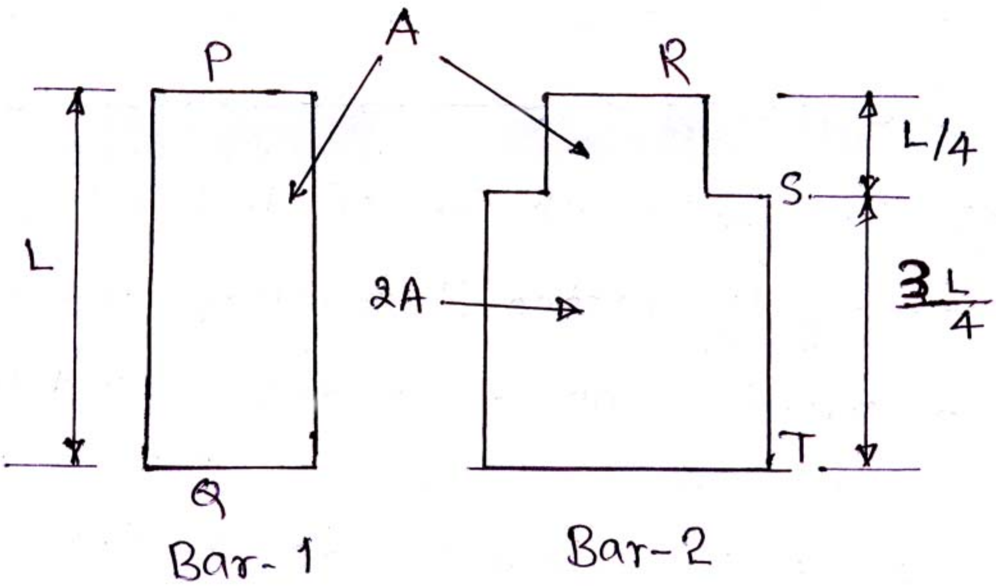



fig. 9 (b)

OR

10. a) A solid shaft subjected to bending moment of 4 KN.m and twisting moment of 6 KN.m. Find diameter of shaft if the permissible stresses in tension and compression not to exceed 600 MPa and 300 MPa. **8**

    b) A vertical tie bar, rigidly fixed at the top end, consists of a steel rod, 3 metres long and 20 m diameter encased in a bronze tube 20 mm internal and 28 mm external diameter. The rod and the tube are securely fixed at both ends. A weight of 5 KN is dropped on to a collar at the bottom end, falling freely through 5m, before hitting the collar.
    Calculate the maximum instantaneous stresses induced in bronze and steel.
    Take $E_s = 2\times10^5$ N/mm$^2$
    $E_b = 1\times10^5$ N/mm$^2$. **8**

11. a) Find the deflection of a cantilever beam at free end, if the beam is subjected to uniformly varying load having intensity zero at free end and 'w' per unit length at fixed end by double integration method. **9**

    b) Derive expression for critical load 'p' on the column having both ends hinged using Euler's method. **9**

OR

12. a) For a simply supported beam acted upon by weight 'W' at the centre, find slope at the ends and deflection under the load W. Use conjugate beam method. **8**

    b) A hollow cylindrical cast iron column is 4 metres long, both ends being fixed. Design the column to carry an axial load of 250 kN. Use Rankine's formula and adopt a factor of safety of 5. The internal diameter may be taken as 0.80 times the external diameter.
    Take fc = 550 MPa and

$$\alpha = \frac{1}{1600}$$ **10**

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**[3862] – 358**

**S.E. (Elex. & Electronics and Telecommunication) (Semester – II) Examination, 2010**
**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) Figure to the* ***right*** *indicate* ***full*** *marks.*
*v) Use of non-programmable pocket size scientific calculator is* ***permitted****.*
*vi) Assume suitable data* ***if necessary****.*

SECTION – I

1. a) Draw a neat connection diagram for carrying out OC and SC tests on a single phase transformer in the laboratory. What useful information can be obtained from these tests ? **8**

b) A transformer is rated at 100 KVA. At full load its copper loss is 1200 W and its iron loss is 960 W. Calculate
i) the efficiency at full load, unity power factor
ii) the efficiency at half load, 0.8 power factor
iii) the efficiency at 75% full load, 0.7 power factor
iv) the load KVA at which maximum efficiency will occur
v) the maximum efficiency at 0.85 power factor. **10**

OR

2. a) Explain different losses taking place in 3 phase transformer. **6**
b) Write short note on welding transformer. **6**
c) Write short note on auto transformer. **6**

**P.T.O.**

3. a) What are the different methods of speed control of dc shunt motor ? Explain in brief with diagram. **8**

b) A 200 V dc series motor runs at 1000 rpm and takes 20 A. Combined resistance of armature and field is 0.4 $\Omega$ . Calculate the resistance to be inserted in series so as to reduce the speed to 800 rpm, assuming the torque to vary as square of the speed and linear magnetisation curve. **8**

OR

4. a) What is the necessity of starter for dc shunt motor ? Explain with a neat sketch, working of 3 point starter bring out the protective features incorporated in it. **8**

b) A 4 pole, 250 V, wave connected shunt motor gives 10 KW when running at 1000 rpm and drawing armature and field currents of 60 A and 1 A respectively. It has 560 conductors. Its armature resistance is 0.2 $\Omega$. Assuming a drop of 1V per brush, determine

i) Total torque ii) Useful torque

iii) Useful flux per pole iv) Efficiency **8**

5. a) Explain with neat ckt. diagram and phasor diagram how total active power can be measured using two Wattmeter method in a three phase balanced star connected inductive load. **8**

b) A balanced load of 20 KVA is connected to a three phase three wire system. Two Wattmeters are connected in the usual manner to measure power. Determine the readings of two Wattmeters if the power factor of the load is

i) unity ii) 0.866 lagging

iii) 0.5 leading and iv) zero lagging

What is the maximum possible reading of either Wattmeter ? **8**

OR

6. a) Explain with neat connection and phasor diagram how total reactive power can be measured using single Wattmeter in a three phase load ckt. Write down the expression for Wattmeter reading. **8**

   b) A balanced, star connected load is connected across a 400 V, 3 phase supply, and takes 30 A from the supply. The phase sequence is R-Y-B. A Wattmeter is connected with its current coil in R line and pressure coil across Y and B lines and reading is 6000 W. Find the active power of the load (KW), reactive power (KVAR), apparent power (KVA) and the p.f. **8**

SECTION – II

7. a) Draw and explain Torque-slip char of 3 phase Induction motor showing clearly the starting torque, maximum torque and normal operating region. **8**

   b) A 3 phase slip ring inductor motor gives a reading of 60 V across slip rings when at rest with normal stator voltage applied. The rotor is star connected and has an impedence of (0.8 + j 0.6) $\Omega$ per phase. Find the rotor current when the machine is

      i) at standstill with the slip-rings joined to a star connected starter with a phase impedance of (4 + j3)$\Omega$ and

      ii) running normally with 5% slip. **8**

OR

8. a) What is necessity of starter for 3 phase induction motor ? Sketch rotor resistance starter diagram. **6**

   b) Compare squirrel cage and slip ring induction motor. **4**

   c) A 6 pole, 50 Hz, 3 phase induction motor running on full load develops a useful torque of 150 Nm, at a frequency of 1.5 Hz. Calculate the shaft power output. If the mechanical torque lost in friction be 10 Nm, determine

      i) Rotor Copper loss    ii) The input to the motor, and

      iii) The efficiency

   Total stator loss is 700 watts. **6**

9. a) Define voltage regulation of an alternator. Explain its significance. **4**

   b) Compare salient pole and nonsalient pole type of alternator. **4**

   c) A 3 phase Star connected alternator is rated at 1600 KVA, 13500 V. The armature effective resistance and synchronous reactance are $1.5\,\Omega$ and $30\,\Omega$ respectively per phase. Calculate the percentage regulation for a load of 1280 KW at power factors

      i) 0.8 leading

      ii) Unity

      iii) 0.8 lagging **8**

OR

10. a) What is hunting in synchronous motor and how it is minimized ? **4**

    b) Compare synchronous motor and induction motor with reference to operating characteristics, power factor, auxiliary equipment and application. **6**

    c) Why synchronous motor is not self starting ? What methods are generally used to start the synchronous motor ? **6**

11. a) Explain principle of working of a shaded pole motor. Draw its torque speed char and state its applications. **6**

    b) Discuss the constructional features and principles of operation of hysteresis motor. Comment on its torque speed char and give its applications. **6**

    c) What are the modifications to be incorporated to enable a dc series motor to work satisfactorily on as supply ? **6**

OR

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

    a) Stepper motor

    b) Servo motor

    c) Universal Motor

    d) Reluctance Motor.

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# S.E. (Chemical Engineering) (Sem. – II) Examination, 2010
# HEAT TRANSFER (Common to Bio-Tech.)
# (2003 Course)

Time : 3 Hours                                                                 Max. Marks : 100

*N.B. : 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) State and explain the following :

   i) Fourier's Law of conduction **3**

   ii) Newton's Law of cooling **3**

   iii) Stefan-Boltzman Law of cooling **3**

   b) Explain Rayleigh's method of dimensional analysis. **6**

   c) What are different applications of Dimensional Analysis ? **3**

OR

2. a) Explain significance of following dimensionless numbers

   i) Stanton number **2**

   ii) Nusselt number **2**

   b) Explain different modes of heat transfer. **6**

   c) By Buckingham's method of dimensional analysis show that for forced convection heat transfer Nusselt number is function of Reynolds number and Prandtl number. **8**

3. a) What are fins ? Explain different types. What is efficiency and effectiveness of fin ? **6**

b) Calculate temperature at an interior point of the wall distance 15 cm from inner surface of wall. The temperature of the inner and outer surface are 200ºC and 80ºC. The thickness of the wall is 0.5 m. **4**

c) Compute the heat loss from a 50 cm thick furnace wall having surface temperature of 200ºC and 100ºC. The thermal conductivity 'K' of the material is given by,

k = 50 (1 + T/1000)

Where, T is temperature in ºC. **6**

OR

4. a) What is Insulation ? Explain critical radius and optimum thickness of Insulation. **8**

b) An aluminium rod 25 mm in diameter and 100 mm long protrudes from a wall which is maintained at 250ºC into the environment maintained at 15ºC. Estimate the heat loss by rod assuming that the rod end is isulated.

Data :

'k' for aluminium = 200 W/mºK

'h' between rod surface and environment = 15 W/mºK. **8**

5. a) Air at 30ºC is flowing across a tube with a velocity of 25 m/s.. The tube could be either a square with 5 cm or a circular cylinder of diameter 5 cm. The tube surface temperature is 124ºC. Compare the rates of heat flow in each case.

Use, $Nu_D = 0.027\ Re_D^{0.805}\ Pr^{0.33}$ for circular tube

$Nu_D = 0.102\ Re_D^{0.675}\ Pr^{0.33}$ for square tube

At 77 ºC, the properties of air are :

$\nu = 20.92 \times 10^{-6}\ m^2/sec$, $K = 3 \times 10^{-2}$ W/m-K, Pr = 0.7. **10**

b) Draw a neat sketch and explain different in pool boiling. **6**

OR

6. a) A steam pipe 50 mm diameter and 2.5 m long has been placed horizontally and exposed to air at 25ºC. If the wall temperature is 295ºC, determine the rate of heat loss. At the mean temperature of 160ºC, the thermo-physical properties of the air are :

   $k = 3.13 \times 10^{-2}$ kcal/m-hr-K ; $\nu = 30.09 \times 10^{-6}\ m^2/s$

   Pr = 0.682 ; $\beta = 2.31 \times 10^{-3}\ K^{-1}$. **8**

   b) Derive Nusselt's equation of condensation over vertical plate. **8**

SECTION – II

7. a) State and explain the following terms in radiation heat transfer :

   i) Black body **2**

   ii) Gray body **2**

   iii) Emissive power **2**

   iv) Emissivity **2**

   v) Wavelength of electromagnetic waves **2**

   b) What is Wien's law of displacement ? Derive the expression. **6**

OR

8. a) Calculate the heat flux emitted due to thermal radiation from a black surface at 5700. At what wavelength is the monochromatic emissive power maximum ?

   $[\sigma = 5.67 \times 10^{-8}\ W/m^{20}\ K^4]$ **6**

   b) What are the different laws of thermal radiation ? Explain. **6**

   c) Discuss radiation shields. **4**

9. a) What is heat exchanger ? Explain the detailed classification of heat exchanger. **8**

   b) A heat exchanger is designed to cool 300 Kg/hr of liquid 150ºC having specific heat value 3350 J/Kg. ºK using parallel flow arrangement. Cooling water is available at 15ºC. If the overall heat transfer coefficient is 1100 W/m$^{20}$ K surface area available for heat transfer is 0.4 m$^2$, calculate outlet temperature of two fluid and effectiveness of heat exchanger.

   $Cp_{H_2O}$ = 4187 J/Kg. ºK.

   Take water flow rate 800 Kg/hr. **8**

   c) Explain the term 'LMTD'. **2**

OR

10. a) Derive the NTU-effectiveness correlation for parallel flow heat exchanger. **10**

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 a rate of 25 Kg/s. If the overall heat transfer coefficient is 1500 $W/m^2K$, calculate the heat transfer area required in :
Concurrent flow concentric pipe heat exchanger and
Counter-current flow concentric pipe heat exchanger. **8**

11. a) A solution containing 10% solid is to be concentrated to a level of 50% solid. Steam is available at a pressure of 0.2 MPa (saturated temperature of 393° K) Feed rate to the evaporator is 30,000 kg/h. The evaporator is working at reduced pressure, such that boiling point is 323°K. The overall heat transfer coefficient is 2.9 $KW/m^2K$. Estimate steam economy and heat transfer surface for :
Feed introduced at 293°K and
Feed introduced at 308°K
Data :
Specific heat of the feed = 3.98 KJ/Kg-K
Latent heat of condensation of steam at 0.2 MPa = 2202 KJ/Kg. **12**

b) Discuss the following :

i) Boiling point elevation **2**

ii) Capacity and economy of evaporator **2**

OR

12. a) What are the different types of evaporators ? Explain any one in detail. **8**

b) What are the different feed arrangements in multiple effect evaporators ? Give the comparison between forward feed and backward feed arrangement of the evaporator. **8**

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**[3862] – 398**

**S.E. (Petroleum / Petrochemical / Polymer) (Sem. – II) Examination, 2010**
**PROCESS CALCULATIONS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *i) Attempt Q.No.* ***1*** *or Q. No.* ***2****, Q. No.* ***3*** *or Q. No.* ***4*** *or Q. No.* ***5*** *or Q. No.* ***6*** *in Section I.*

*ii) Attempt Q.No.* ***7*** *or Q. No.* ***8****, Q. No.* ***9*** *or Q. No.* ***10****, Q. No.* ***11*** *or Q. No.* ***12*** *in Section* ***II****.*

*iii) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer books.*

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

*v) Refer to steam table if* ***necessary****.*

*vi) Figures to* ***right*** *hand side indicates* ***full*** *marks.*

SECTION – I

I. a) Your boss announced that the speed of the company Boeing 727 is to be cut from 525 mi/hr to 475 mi/hr to "conserve fuel", thus cutting consumption from 2200 gal/hr to 2000 gal/hr. How many gallons are saved in a 1000 mile trip ? **6**

b) Do the following conversions :

i) 67 g/l $H_3SO_4$ into normality.

ii) 13.04 M $H_2PO_4$ to g/l.

iii) 4.8 mg/ml of $(COOH)_2$ solution into molarity. **6**

c) What will be the $Na_2O$ content of lye containing 47.3 % caustic soda. **4**

OR

2. a) Find Density of air having approximate composition : $N_2$ : 71.8 %, $CO_2$ : 0.5 %, Moisture : 1.2 % and rest $O_2$ at a temperature of 25º C and external pressure of 1.2 atm., assuming air follows ideal gas laws. **8**

b) A sample of limestone is found to contain 52.8 % CaO (by wt.). If this CaO is present as $CaCO_3$ in the limestone, find the content of $CaCO_3$ in the limestone sample. How many tons of limestone is needed to make 1 ton of lime. **8**

3. a) It is required to make 1222 kg of mixed acid containing 56 % $H_2SO_4$, 32.5 % $HNO_3$ and rest water by blending

i) the spent acid containing 11.3 % $HNO_3$, 44% $H_2SO_4$ and rest water,

ii) aqueous 92% $HNO_3$ and

iii) aqueous 98.2 % $H_2SO_4$. All percentages are by mass, calculate the quantities of each of the three acids required for blending. **10**

b) Differentiate between Batch, Semibatch and Continuous operations. **6**

OR

4. a) Define : Fractional Conversion, Extent of Reaction, Yield and Selectivity. **8**

b) Antimony is obtained by heating pulverized stibnite ($Sb_2S_3$) with scrap iron and drawing off the molten antimony from the bottom of the reaction vessel.

$$Sb_2S_3 + 3\ Fe \rightarrow 2\ Sb + 3\ FeS$$

Suppose that 0.6 kg of stibnite and 0.25 kg of iron turnings are heated together to give 0.2 kg of Sb metal. Calculate :

i) The limiting reactant

ii) The degree of completion of reaction

iii) The percent conversion

iv) The yield **8**

5. a) Define single phase and multi phase systems, differentiate between them with help of suitable example. **4**

b) What is an Ideal Solution ? **2**

c) Define vapor pressure and highlight its significance. **2**

d) For a vapor mixture of ammonia ($NH_3$) and sulfur dioxide ($SO_2$) with a molar proportion of 13 : 12, find the bubble point at a pressure of 405 kPa. Antoine coefficients are given below, where vapor pressure is expressed in mm Hg and temperature is in K. **10**

| **Component** | **A** | **B** | **C** |
|---|---|---|---|
| $NH_3$ | 16.95 | 2132.5 | – 32.98 |
| $SO_2$ | 16.77 | 2302.35 | – 35.97 |

OR

6. a) Define : Absolute Humidity, % Humidity and Enthalpy of Humid Air. **6**

b) Nitrogen and hydrogen combines to produces ammonia by following equation

$N_2 + 3\ H_2 \leftrightarrow 2\ NH_3$

If 280 kg of nitrogen and 64.5 kg of hydrogen are brought together and allowed to react at 515° C and 300 atm. pressure, and it is found that there are 38 kg moles of gases present at equilibrium. Calculate :

i) How many kg moles of $N_2$, $H_2$ an $NH_3$ are present at equilibrium ?

ii) Which is the limiting reactant and why ?

iii) What is the amount of theoretically required $H_2$ and what is the % excess of hydrogen ?

iv) What is the degree of completion of the reaction ? **12**

SECTION – II

7. a) Heat capacity of certain gaseous substance can be given by :

$C_p = -7.2733 + 0.77054 \times T + 0.00165 \times T^2$ kJ (kmol. K)

where T in K. Calculate heat required to raise temperature from 165° C to 212° C. **6**

b) What is the need and necessity of energy balance in Process Calculations ? Explain with help of suitable examples. **4**

c) Define : Latent Heat, Standard Heat of Reaction, Psychrometry. **6**

OR

8. a) Tin is melted in an open pan using a jacket. The jacket is fed with the vapors of an eutectic mixture of diphenyl – diphenyl oxide at 171 kPa abs. Tin is fed to the pan at 30º C. Calculate the quantity of eutectic mixture of the diphenyl – diphenyl oxide condensed per 100 kg of tin melted at its melting temperature. Assume no subcooling of vapors.

   Data for Tin : Molar mass = 118.7, Melting point = 505 K, latent heat of fusion = 7201 kJ/kmol, $C_p$ = 21.14 + 0.02 T kJ/ (kmol. K), where T is in K. Latent heat of diphenyl – diphenyl oxide = 278 kJ/kg. **10**

   b) Two gram moles of nitrogen are heated from 25º C to 375º C in a cylinder. What is $\Delta H$ of the process ? The heat capacity equation is

   $C_p = 27.32 + 6.23 \times 10^{-3}\,T - 9.5\times10^{-7}\,T^2$

   where T is in K and $C_p$ is in J/(g mol.K). **6**

9. a) A sample of fuel oil has C/H ratio 9.5 (by wt.), it contains 2% sulfur by wt. The net calorific value of the fuel oil is 39685 kJ/kg at 298 K. Calculate its gross calorific value using latent heat of water at 298 K. **8**

   b) Write short notes on Proximate and Ultimate Analysis of Coal sample. **8**

OR

10. a) The exhaust gas from a hydrocarbon fuel fired furnace have analysis : $CO_2$ = 10.2 %, $O_2$ = 7.9 %, $N_2$ = 81.9 % by ORSAT analysis. Calculate percentage excess air used in the furnace. **6**

b) Define Calorific Value and its highlight its significance. **4**

c) Calculate heat of reaction for the following reaction of 4 mol of ammonia :

$4\ NH_3\ (g) + 5\ O_2\ (g) \rightarrow 4\ NO\ (g) + 6\ H_2O\ (g)$

Data : Standard heat of formation for $NH_3$ = – 46.191 kJ/mol

Standard heat of formation for NO = + 90.374 kJ/mol

Standard heat of formation for $H_2O$ = – 241.826 kJ/mol. **6**

11. a) To produce aqueous hydrochloric acid, purified HCl (g) is absorbed in water in a talcum absorber in a continuous process. How much heat must be removed from the absorber per 100 kg of product if hot HCl (g) at 120º C is fed into water in the absorber. The feed water can be assumed to be at 25ºC and the exit product aq. HCl is 25% (by wt.) at 35º C.

Data : $C_p$ of product mixture can be approximated to 2.7 J/(g. K) and heat of formation of diluted HCl solution = – 157753 J/mol HCl. **8**

b) Write short note on determination of heat of solution and heat of mixing. **6**

c) In the reaction $4\ FeS_2\ (s) + 11\ O_2\ (g) \rightarrow 2\ Fe_2O_3\ (s) + 8\ SO_2\ (g)$.

The conversion is only 80% complete. If standard heat of reaction is calculated to be – 197.7 kcal/g mol $FeS_2$ (s), what value of $\Delta H^0_{rxn}$ will you use in the energy balance per kg of $FeS_2$ fed ? **4**

OR

12. a) A tank holds 100 gal of water salt solution in which 4 lb of salt is dissolved. Water runs into the tank at the rate of 5 gal/min and salt solution overflows at same rate. If the mixing in the tank is adequate to keep the concentration of salt in the tank uniform at all times, how much salt will be in the tank at the end of 50 min. ? Assume density of salt solution be almost equal to that of water. **9**

b) A coal with given composition is burnt with 100% excess air. Calculate

i) Theoretical oxygen requirement per unit mass of coal,

ii) Theoretical dry air requirement per unit mass of fuel and

iii) Orsat analysis of flue gas obtained with 100 % excess air. The composition of coal is : Carbon = 50.22 %, Hydrogen = 2.79 %, Sulfur = 0.37 %, Oxygen = 18.04 %, Nitrogen = 2.05 %, Ash = 19.53 % and Moisture = 7 %. **9**

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**[3862] – 417**

**S.E. (Information Technology) (Semester – II) Examination, 2010**
**PRINCIPLES OF COMMUNICATION ENGINEERING**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***N.B :*** *1) Answer* ***any three*** *questions from* ***each*** *Section.*
*2) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer-books.*
*3) Neat diagrams must be drawn* ***whenever*** *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) Compare half duplex and full duplex communication systems. Give examples of each system. **8**

   b) Calculate the Fourier Transform of the signal $y(t) = x(t)\cos\omega_c t$. **8**

OR

2. a) Draw block diagram of the basic communication system and explain the functions of all blocks. **8**

   b) If Fourier Transform F { x (t) } = X (f) and F { y (t) } = Y (f).
   Prove that F { x (t) y (t) } = X (f) * Y (f) **8**

3. a) Define modulation index for AM signal. State formula for calculating modulation index of an AM signal displayed on an oscilloscope.
   An AM wave displayed on an oscilloscope has values of $V_{max}$ = 3.8 and $V_{min}$ = 1.5. Calculate the modulation index and percentage of modulation. **8**

   b) Compare DSBFC (Double Side Band Full Carrier) and DSBSC (Double Side Band Suppressed Carrier). Draw these signals in time domain and frequency domain. **8**

OR

**P.T.O.**

4. a) Compare and contrast AM and FM. **8**

   b) Enlist benefits of Single Slide Band transmission. **8**

5. a) Compare single conversion and double conversion super heterodyne receiver. Support your answer with suitable block diagram. **8**

   b) Draw and explain block diagram of SSB transmitter. **8**

OR

6. a) Draw and explain block diagram of FM transmitter. **8**

   b) Define modulation index for FM signal. Explain why FM is called constant bandwidth system. **8**

SECTION – II

7. a) Explain the concept of FDM with suitable diagram of transmitting end and receiving end system. Also sketch the spectrum of an FDM signal. **8**

   b) Explain the operation of a pulse code modulation system. **8**

OR

8. a) Explain DTMF telephone system. **8**

   b) Explain concept of cellular system. **8**

9. a) Describe the following terms with reference to an antenna

   i) Polarization ii) Radiation Pattern

   iii) Beam width iv) Characteristic Impedance

   v) Directivity **10**

   b) Compare half wave dipole and folded dipole. **8**

OR

10. a) Draw spectrum of a broadcast TV signal. Explain Interlaced scanning. What are its advantages ? **6**

    b) Discuss DTV standards. **6**

    c) Explain satellite TV transmission and reception. **6**

11. a) Compare asynchronous and synchronous communication. **8**

    b) Explain the need of communication protocols. Discuss any one technique of error detection and correction. Support your answer with a suitable example. **8**

OR

12. a) Draw and explain block diagram of a fiber optical communication system. Enlist benefits of it over wireless communication. **8**

    b) Compare and contrast the following types of optical fibers : **8**

    i) Single Mode

    ii) Multimode

    iii) Step Index

    iv) Graded Index

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# S.E. (Mechanical) (Semester – II) Examination, 2010
# MANUFACTURING PROCESSES – II
# (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) The following equation for tool life is given for a turning operation

$VT^{0.13} f^{0.77} d^{0.37} = C$

A 60 minute tool life was obtained while cutting at

V = 30 m/min, f = 0.3 mm/rev. and d = 2.5 mm. Determine the change in tool life if the cutting speed, feed and depth of cut are increased by 20% individually and also taken together. **8**

b) What are the functions of cutting fluid ? And how will you select it for given operation ? **8**

OR

2. a) During machining of C-25 steel with 0 – 10 – 6 – 6 – 8 – 90 – 1mm (ORS) shaped tripple carbide cutting tool, the following observations have been made :

| | | |
|---|---|---|
| Depth of cut | = | 2 mm |
| Feed | = | 0.2 mm/rev. |
| Speed | = | 200 m/min |
| Tangential cutting force | = | 1600 N |
| Feed thrust force | = | 850 N |
| Chip thickness | = | 0.39 mm |

**P.T.O.**

Calculate :

i) Shear force

ii) Normal force at shear plane

iii) Friction force

iv) Kinetic co-efficient of friction. **8**

b) Draw Marchant's circle of force. **3**

c) What are the types of chips ? Explain its characteristics and effect on machining. **5**

3. a) Explain geometry of broach with neat sketch. **6**

b) What is indexing ? How and why it is performed for gear manufacturing ? **6**

c) Explain with neat sketch, the principle of thread cutting on lathe. **4**

OR

4. a) Write short note on 'Thread Rolling'. **5**

b) List the types of broaching machines and explain any one type. **6**

c) Explain the gear sheaping process with neat sketch. **5**

5. a) Explain linear and circular interpolation with neat sketch. **6**

b) Define NC. State the advantage of NC machine over conventional machine. **6**

c) Write the function of following : **6**

i) G03

ii) G90

iii) M04

iv) T01

v) G00

vi) M30.

OR

6. Write short note on : **18**
   i) Automatic tool changers
   ii) NC part programming
   iii) FMS.

SECTION – II

7. a) Explain the principle of 'Electrochemical Machining' with neat sketch. **6**

   b) Explain 'Laser Beam Machining' with neat sketch. State its applications. **6**

   c) Name the abrasive and carrier gases used in AJM. **4**

OR

8. Explain with neat sketch, the following processes. State its advantages, limitations and applications
   i) EDM
   ii) IBM. **16**

9. a) The square blank of size 25 mm is to be cut, from aluminium sheet of 1.4 mm thickness, ultimate shear strength 50 $N/mm^2$.

   Determine the dimension of die and Punch. **3**

   Draw neat sketch of die and punch assembly. **4**

   Calculate cutting force required. **3**

   b) Draw neat sketch of : **6**
      i) Progressive die
      ii) Compound die.

OR

10. a) Why stripper are required ? What are the different types of stripper, draw neat sketch of it. **6**

    b) What are the methods of reducing cutting force in press tool ? **5**

c) Define the following (**any five**) : **5**

i) Penetration

ii) Blanking

iii) Punching

iv) Strip layout

v) Staggering

vi) Pilot.

11. a) 'Full Proffing' as a locating principle, explain. **6**

b) Explain box type jig with sketch. **6**

c) Write note on quick acting clamping devices. **6**

OR

12. a) Explain the difference between jig and fixture. **6**

b) Explain selection criteria for clamping devices. **6**

c) Explain different types of locating elements. **6**

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*B/II/10/710*

# [3862] – 325

**S.E. (Mechanical S/W) (Semester – II) Examination, 2010**
**FLUID MECHANICS AND MACHINERY**
**(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) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

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

SECTION – I

1. a) Explain the following terms : **6**
   i) viscosity
   ii) specific gravity
   iii) surface tension.

   b) A shaft of 100 mm diameter rotates at 60 rpm in a 200 mm long bearing. Taking that a two surfaces are uniformly separated by a distance of 0.50 mm and taking linear velocity distribution in the lubricating oil having dynamic viscosity of 0.004 $NS/m^2$, find the power absorbed in the bearing. **10**

OR

2. a) A tank with vertical sides is 1.5 m × 1.5 m × 1.5 m deep. It consists water for the lower 0.6 m depth. The upper remaining part is filled with oil of specific gravity 0.9. Calculate :
   1) The total pressure on one side on the tank
   2) The position of the centre of pressure for one side of the tank. **6**

   b) What is manometer ? Describe a differential manometer. **6**

   c) Draw a sketch of the Bourdon gauge and explain shortly how it is used for measurement of pressure. **4**

**P.T.O.**

3. a) A cube of side 2 m floats in water with half its volume immersed and its bottom face horizontal. The centre of gravity of the cube is 600 mm below the geometric centre in a vertical line passing through it. A weight equal to $\frac{1}{20}$ of the weight of the cube is placed at the middle point of one of the top edges of the cube. Find the angle through which the cube will tilt due to this additional weight. **12**

b) State the conditions of equilibrium of a floating body. **4**

OR

4. a) Distinguish between rotational and irrotational flow. **4**

b) A stream function follows the law

$\psi = 4x^2 - y4^2$.

Obtain the velocity potential function. **6**

c) A stream function is given by $\varphi = 2xy$. Show that the flow is irrotational and continuous. **6**

5. a) State and prove Euler's equation of motion. Obtain Bernoullis equation from Euler's equation. **6**

b) Differentiate between energy and energy head. **6**

c) A venturimeter with a 75 mm diameter throat is installed in a 150 mm diameter pipe line. The pressure at the entrance to the meter is 70 kPa gauge and it is undesirable that the pressure should, at any point shall fall below 56 kPa absolute.

Assuming cd for the meter is 0.96, find the maximum flow for which it may be used. Take the specific weight of the liquid as 9420 N/$m^2$ and atmospheric pressure as 103 kPa. **6**

OR

6. a) Define coefficient of contraction. Coefficient of velocity and coefficient of discharge. What is relation between them ? **6**

b) A 400 mm diameter pipe 350 meters long connects two reservoirs. If the discharge through the pipe is 0.4 $m^3$/sec, find difference in elevations between the water surfaces in the two reservoirs. Consider all losses. Take f = 0.006. **6**

c) Show that for maximum power transmission the head lost due to friction is equal to one-third of the head at inlet. **6**

7. a) Explain impulse momentum principle, what is impulse ? **5**

b) Derive equation for force exerted by the jet of water on the curved plate in the direction of the jet when plate is moving in the direction of jet also. Derive equation for work done by the jet on the plate per second. **8**

c) Define impact of jets. **3**

OR

8. a) Show that the force exerted by a jet of water on an inclined fixed plate in the direction of the jet is given by

$$F_x = \rho a V^2 \sin^2 \theta$$

a = area of jet, V = velocity of jet, $\theta$ = inclination of the plate with the jet. **8**

b) Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of jet when the jet strikes at the centre of the semi-circular plate is two times the force exerted by the jet on an fixed vertical plate. **8**

9. a) A pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres/s under head of 30 meters. The buckets deflect the jet through an angle of 160 degree. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity 0.98. **10**

b) Explain :

1) NPSH

2) Performance characteristics of centrifugal pump. **8**

OR

10. a) Following data is given for a Francis turbine. Net head = H = 60 m, speed – 700 rpm, shaft power = 294.3 kW, $\eta_{overall}$ = 84%, $\eta_{hydraulic}$ = 93%, flow ratio – 0.20 , Breadth $\pm$ 0 diameter at inlet = 0.1 outlet dia of runner = 2 × inner dia. of runner. Discharge is radial velocity of flow is constant. Thickness of vanes occupy 5% of circumferential area of runner. Determine :

1) Guide blade angle
2) Runner vane angles
3) Width of wheel at inlet
4) Dia. of runner at inlet and outlet. **12**

b) Explain :

1) Centrifugal pump classification
2) Specific speed of pump. **6**

11. a) What is dimensional homogeneity ? What do you understand by dimensionally homogeneous equation ? Give two examples. **4**

b) Write short note :

1) hydraulic ram
2) jet pumps
3) accumulators. **12**

OR

12. a) Resistance ‘R’ to the motion of supersonic air craft of length ‘L’ moving with velocity ‘V’ in air of mass density ‘$\rho$’ depends upon viscosity ‘$\mu$’ and bulk modulus of elasticity ‘K’ of the air. Obtain using Buckingham $\pi$ theorem, the expression for R

$R = \rho L^2 V^2 \phi\,(Re, M)$ **12**

b) Derive expressions for following dimensionless parameters :

1) Reynold’s Number
2) Mach Number. **4**

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**S.E. (Electrical) (Semester – I) Examination, 2010**
**POWER PLANT ENGINEERING**
**(2003 Course)**

Time : 3 Hours Marks : 100

UNIT – 1

1. a) Explain Reheat cycle with T-S diagram. State the advantages of Reheat cycle. **8**

   b) How will you carry out flue gas analysis ? **8**

OR

2. a) Explain Bomb calorimeter with a neat sketch. **6**

   b) Explain :

      i) Pulverised coal firing system

      ii) F.B.C. **10**

UNIT – 2

3. a) Explain working of centrifugal pump. **5**

   b) Compare impulse and reaction turbine. **5**

   c) With a neat sketch, explain construction and working of Pelton wheel. **6**

OR

4. a) Explain two pass surface condenser. **4**

   b) Compare surface and jet condensers. **4**

   c) Classify boilers in detail. **4**

   d) Write a short note on : cooling towers. **4**

UNIT – 3

5. a) Draw the layout of a modern steam power plant and explain it briefly. **8**

b) What factors should be taken into consideration while selecting the site for steam power plant ? **6**

c) State at least four advantages and four disadvantages of hydro-electric plants. **4**

OR

6. a) Classify hydro power plants and explain pumped storage plant. **6**

b) With the help of a neat sketch, explain the working of hydro electric power plant stating the function of different components. **8**

c) Explain :

i) Hydrograph

ii) Flow duration curve. **4**

UNIT – 4

7. a) State the advantages and disadvantages of Diesel Power Plants. **8**

b) Describe with a neat sketch the working of a closed cycle gas turbine. Also state its merits and demerits. **8**

OR

8. a) Comment on : Developments of a gas turbine plants in India. **6**

b) Make a layout of a modern diesel power plant showing the following systems :

i) Air intake system

ii) Cooling system

iii) Fuel supply system

iv) Lubrication system

v) Exhaust system. **10**

UNIT – 5

9. a) Explain with the help of a neat diagram the construction and working of a nuclear power plant. **8**

b) Explain boiling water reactor. How does it differ from pressurised water reactor ? **8**

OR

10. a) What factors should be considered while selecting materials for the various reactor components ? **4**

b) List down some safety measures for nuclear power plants. **4**

c) Write a short note on :

i) Nuclear materials

ii) Nuclear waste disposal. **8**

UNIT – 6

11. a) Explain open cycle MHD generator with a neat sketch. **6**

b) Write a short note on : solar collectors. **6**

c) What are the advantages and limitations of tidal power generation ? **6**

OR

12. a) With a neat sketch, explain working of Tidal Power Plant. **5**

b) State the advantages and drawbacks of MHD system. **8**

c) Write a short note on : Renewable energy development program of India. **5**

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**S.E. (Electrical) (Semester – I) Examination, 2010**
**ELECTRICAL MEASUREMENTS**
**(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) With a suitable diagram, explain absolute measurement of resistance. How the accuracy can be improved using this set up ? **10**

   b) Derive dimensions of following electrical quantities using SI system of units-Flux density, reluctance. **4**

   c) Explain-gross error, random error. **4**

OR

2. a) With a suitable diagram, explain absolute measurement of current. How errors can be minimized in this method ? **10**

   b) Explain the terms-Accuracy, linearity. **4**

   c) Explain parallex error, limiting error. **4**

3. a) Draw circuit diagram of Kelvin's double bridge and derive the expression for unknown resistance. **8**

   b) Describe wattmeter method of measurement of iron loss. **8**

OR

4. a) State the difficulties involved in measurement of high resistance. Also write the remedies to reduce errors. **8**

   b) Give classification of resistance. State two methods each for measurement of resistance of each category. **4**

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

5. a) With circuit diagram, derive the expression for unknown capacitance in case of schering bridge. **8**

   b) What are the different types of detectors used in a.c. bridges ? **4**

   c) State the advantages of Anderson's bridge. **4**

OR

6. Write short notes on **any two** : **16**

   a) Synchroscope

   b) Mechanical resonance type frequency meter

   c) Power factor meter.

SECTION – II

7. a) Draw and explain construction and working of moving coil instrument. State its advantages and disadvantages. **8**

   b) A D'Arsonal galvanometer operates with a flux density of 6.25 mWb. The spring constant is $5\times10^{-9}$ Nm/rad. no. of turns are 200. Damping constant is $5\times10^{-9}$ Nm/rad. sec$^{-1}$. The coil dimensions are 20 mm × 40 mm, with moment of inertia of $5\times10^{-9}$ kgm$^2$ and resistance of $50\,\Omega$. Find the deflection for current of $5\,\mu\text{Amp}$ and value of Critical Damping Resistance (CDRx). **6**

   c) What is meant by integrating and indicating instruments ? **4**

OR

8. a) What is necessity of damping torque in an indicating instruments ? With neat sketch, explain fluid friction and eddy current damping. **8**

   b) Out of following two meters, which one meter will have high sensitivity ?

   Meter A has range 0 – 150V and multiple resistance of 30 $k\Omega$.

   Meter B has range 0 – 300V and multiple resistance of 60 $K\Omega$.

   Both meters have basic coil resistance of 3 $k\Omega$. **4**

   c) Draw and explain construction and operation of repulsion type moving iron instrument. Comment on shape of scale. **6**

9. a) Explain with neat circuit and phasor diagram two wattmeter method to measure active, reactive power and power factor of load. **8**

b) A three phase 415V, load has power factor of 0.5 lagg. The two wattmeters read a total power of 10 KW. Find reading of each wattmeter. **4**

c) What are different types of errors in dynamometer type wattmeter ? **4**

OR

10. a) Explain with neat diagram, construction and working of low power factor type wattmeter. Also state applications. **6**

b) With neat connection diagram and phasor diagram, explain which power will be read by wattmeter if current coil is connected in yellow phase and pressure coil is connected in red and blue phase. Phase sequence is RYB. **6**

c) A wattmeter reads 5 KW when current coil is connected in yellow phase and pressure coil is connected between Red and Neutral for a balanced symmetrical 3 phase system supplying 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 how connected between Red and Blue phases ? Find total reactive power for this case. **4**

11. a) Explain various errors and their adjustments of single phase induction type energy meter. **8**

b) An energy meter is designed to make 3200 impulses of LED for one unit of energy. Calculate the no. of impulses made by it when connected to a load carrying 20 A, 230 V, 0.8 p.f. for an hour. If it actually makes 12000 impulses, find the % error. **4**

c) Define the following terms associated with instrument transformer.

i) Nominal ratio ii) Burden. **4**

OR

12. a) Explain "If the primary of CT is energised, why secondary of CT should not be kept open". **4**

b) A 230V, 1$\phi$ energy meter is connected to a constant load of 6A, unity power factor for 8 hours. i) If the impulses made during this are 35328, what is meter constant in imp./kwh. ii) Calculate the power factor of load if no. of impulses made by LED are 31795, when operating at 230V, 9Amp for 6 hours. **6**

c) Explain construction and operation of single phase induction type energy meter with neat diagram. **6**

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**S.E. (Electrical) (Semester – II) Examination, 2010**
**ANALOG AND DIGITAL ELECTRONICS**
**(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) Draw and explain working of R-C coupled transistorized amplifier. **10**

b) Compare BJT and FET as an amplifier. **6**

OR

2. a) Explain working of transistor as a amplifier in CE configuration. **8**

b) Explain the operation of any one type of multistage amplifier. **8**

3. a) Draw and explain the pin diagram of Op-Amp IC 741. **8**

b) Define the following terms related to IC 741 : **10**

1) CMRR
2) Voltage Gain
3) Slew Rate
4) Band Width
5) PSRR.

OR

4. a) Explain operation of IC 555 as a Monostable Multivibrator. **8**

b) Draw a neat circuit diagram of Zero Crossing Detector using Op-Amp. Also explain its operation with waveforms. **10**

5. a) With the help of neat diagram explain the working of LM 317 voltage regulator. **8**

   b) Explain the working of Digital to Analog converter. **8**

OR

6. a) Explain the working of SAR type of Analog to Digital converter. **8**

   b) Explain the working of protection circuit used for voltage regulator. **8**

SECTION – II

7. a) Explain the operation of PRESET and CLEAR in flip flop. **8**

   b) Explain the working of T flip flop. **8**

OR

8. a) What is Race Around condition in J-K flip flop ? Also explain techniques to avoid it. **8**

   b) Give comparison between sequential and combinational logic circuit. **8**

9. a) Explain the working of 3 bit (MOD 8) Asynchronous DOWN Counter. **8**

   b) Explain the working of 3 bit SISO with clocked output. **8**

OR

10. a) Explain the difference between Synchronous and Asynchronous Counter. **6**

    b) Draw and explain working of 3 bit Johnson's ring counter. **10**

11. a) Explain the operation of 7 segment LED display with common anode system in detail. **10**

    b) Explain the operation of 1 : 4 De-Multiplexer (DEMUX) with truth table. **8**

OR

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

    i) Opto-Isolator

    ii) LCD display system

    iii) Semiconductor memories

    iv) Opto-encoder

    v) Encoder.

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**S.E. (Elex.E & TC) (Semester – I) Examination, 2010**
**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) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Differentiate between :
   i) Dependent and independent sources
   ii) Unilateral and bilateral networks **4**

   b) Determine the value of '$R_L$' so as to have maximum power transfer to '$R_L$' in the circuit shown in 1b. **8**

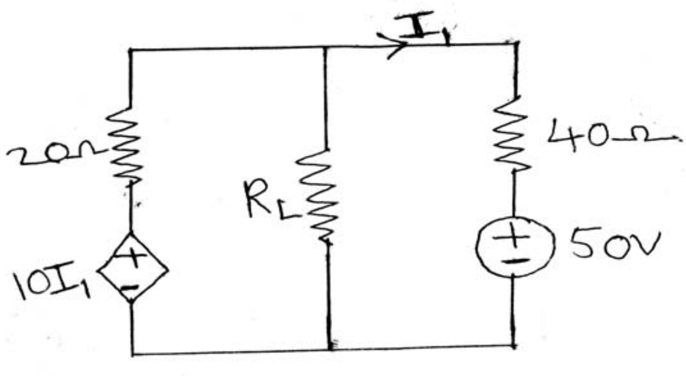


Fig. 1 b

c) Use mesh analysis to find $V_3$ in the circuit of fig. 1c if element 'A' is

i) a Short circuit

ii) a 20 V independent voltage source positive reference on right. **6**

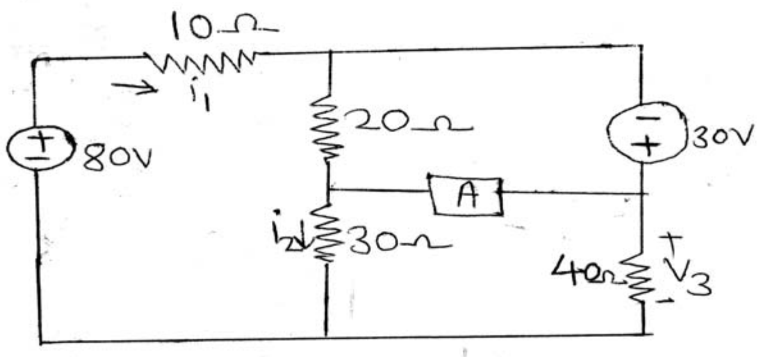


Fig. 1 c

OR

2. a) Find the current through branch a – b using mesh analysis of fig 2a. **6**

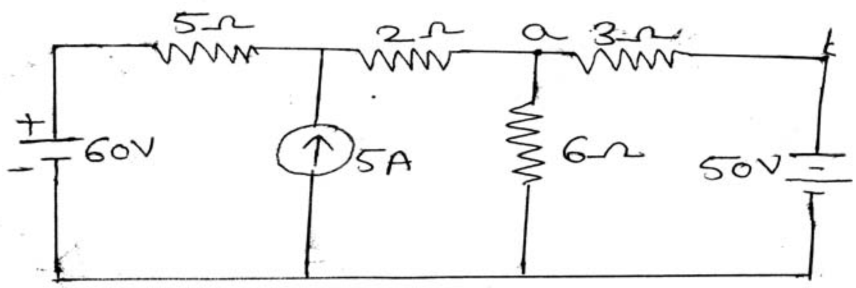


Fig. 2 a

b) Using current shifting to find current $I_{AB}$ in the circuit shown in fig 2b. All resistors are in ohms. **6**

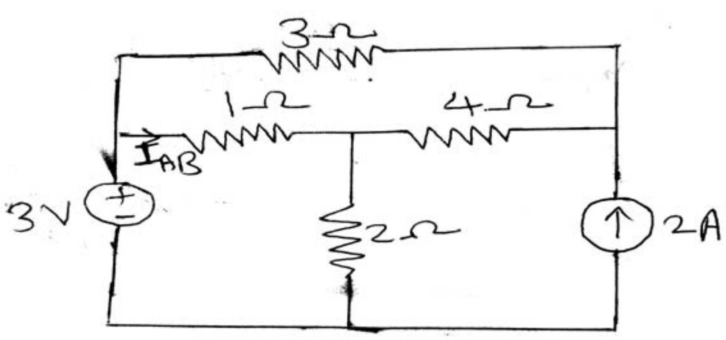


Fig. 2 b

c) State and prove maximum theorem applied to AC circuit. **6**

3. a) What do you mean by resonance ? What is antiresonance ? **4**

b) A 20 $\Omega$ resistor is connected in series with an inductor and a capacitor across a 25V variable frequency supply. When frequency is 400 Hz the current is maximum and equal to 0.5 A and potential difference across capacitor is 150V. Calculate

i) Capacitance of capacitor and

ii) Resistance and inductance of inductor. **6**

c) Derive expression for impedance of parallel resonance circuit. **6**

OR

4. a) What is Q factor ? Find value of Q factor for an inductor and capacitor. **4**

b) Derive an expression for bandwidth of an antiresonant circuit. **6**

c) A parallel resonant circuit has a coil of 150 $\mu$H with a Q of 60 are resonated at 1 MHz. This circuit is loaded by a resistance of 20 k$\Omega$ in parallel. Calculate

i) Value of required capacitor

ii) Resistance of coil

iii) Circuit impedance at resonance with load. **6**

5. a) What is time constant ? Explain time constant in case of series R-L and series R-C circuit. **4**

b) Find V(t), $i_1(t)$ for t > 0 if switch is closed at t = 0 after being open for a long time. Refer fig. 5b. **6**

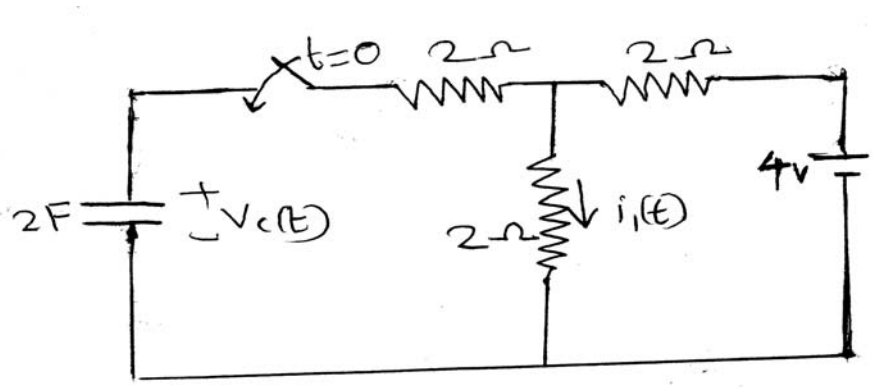


Fig. 5 b

c) The circuit given in fig. 5c is in steady state when switch is opened at t = 0. Find expression for $i_L(t)$, $v_L(t)$ as indentified in fig. 5c. **6**

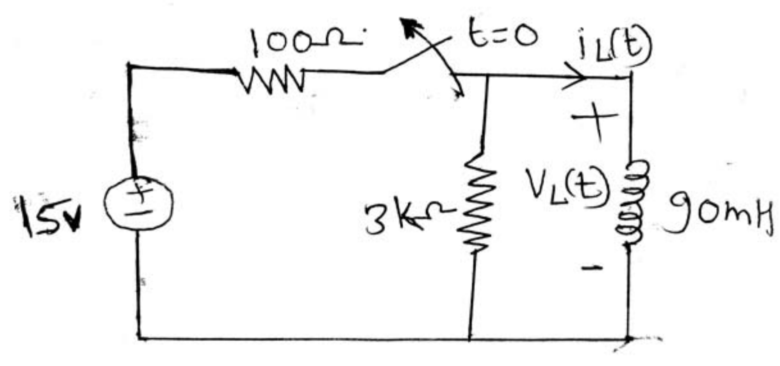


Fig. 5 c

OR

6. a) Define and explain the characteristics of
   i) Unit step function
   ii) Unit ramp function **4**

   b) Determine i(t) for all values of time in the circuit of fig. 6b. Sketch i(t). **6**

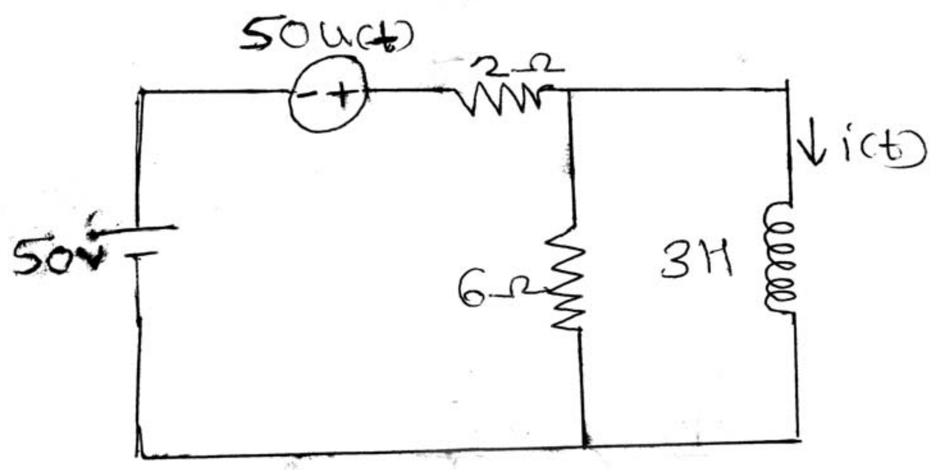


Fig. 6 b

c) In how many seconds after t = 0 has the current i(t) become one half of its initial value in the given circuit shown in fig. 6c. **6**

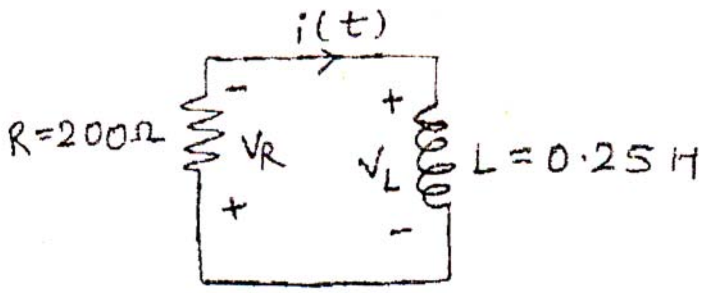


Fig. 6 c

SECTION – II

7. a) Define and derive Image Impedance as applied to L-section. **6**

b) A symmetrical T-section consist of pure resistances has open and short circuit impedances of 800 $\angle$ 0° and 600 $\angle$ 0° respectively. Determine the components of the network. **6**

c) Determine insertion loss of the network shown in fig. 7c. **6**

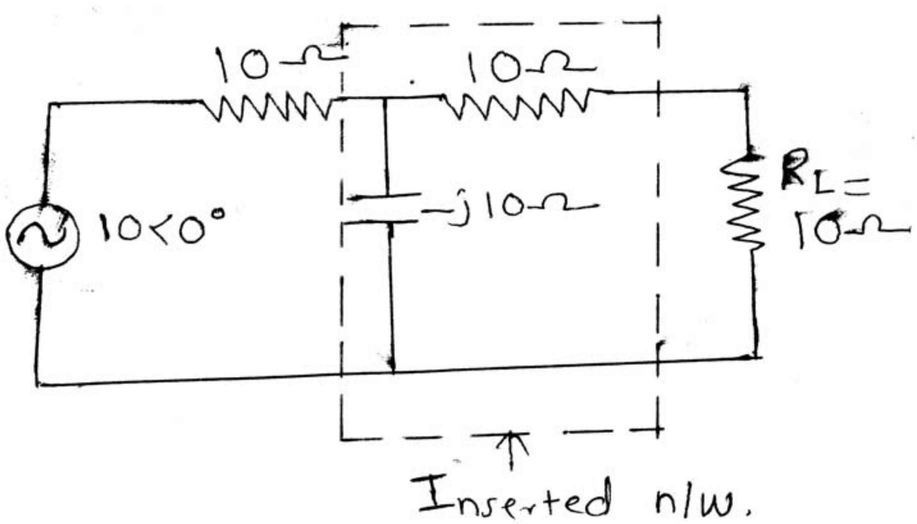


Fig. 7 c

OR

8. a) What is the need of composite filter and draw the block diagram of it ? **6**

b) Design a T type attenuator with following specifications. Attenuation = 10 dB, characteristic impedance = 600 $\Omega$. **6**

c) A constant prototype HPF has cut off frequency of 10 KHz and design impedance of 600 $\Omega$. Find the element values of L and C. Also find attenuation in dB and phase shift in degrees at frequency of 8KHz. **6**

9. a) Explain the significance of poles and zeros. **4**

b) Find the input impedance $Z_{in}$ (S) and plot its poles and zeros for the circuit shown in fig. 9.b. **6**

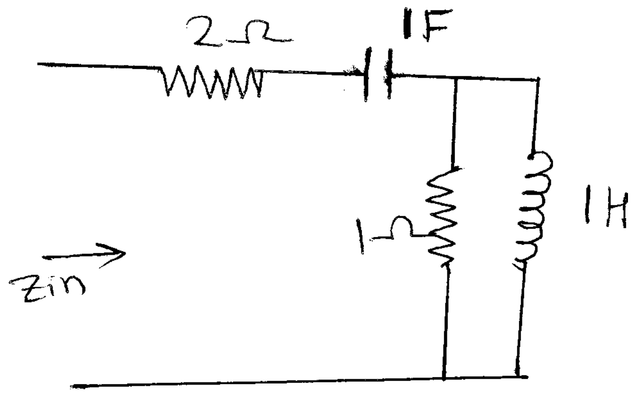


Fig. 9 b

c) Find the driving point admittance function for the given network as shown in fig. 9c having only one port. **6**

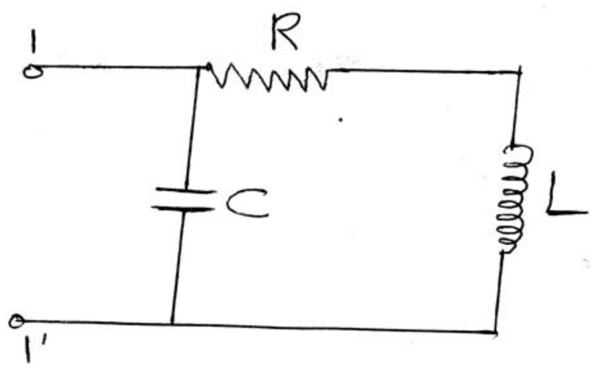


Fig. 9 c

OR

10. a) State different network function for two port network. **4**

b) State the essential properties of driving point function and transfer function. **6**

c) For the network shown in fig.10c, plot poles and zeros of function $\frac{I_0}{I_i}$. **6**

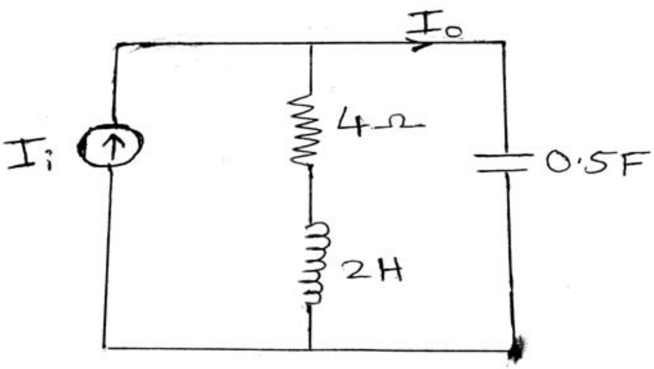


Fig. 10 c

11. a) Explain different types of inter connections of two ports. **4**

b) Find the z parameters for the network shown in fig. 11b. **6**

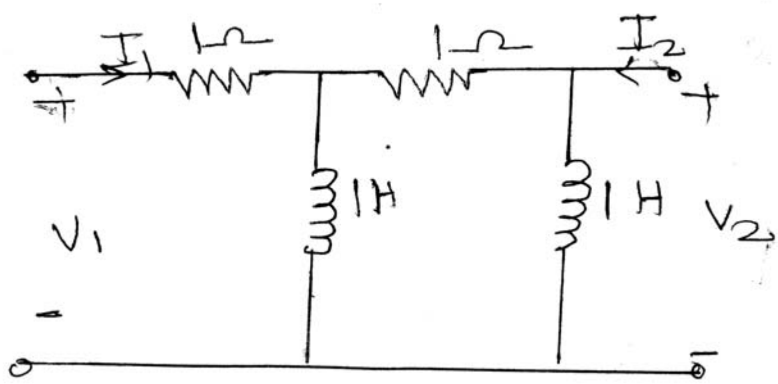


Fig. 11 b

c) Derive condition of reciprocity and symmetry for y parameters. **6**

OR

12. a) Obtain Z parameters in terms of hybrid parameters. **4**

b) Obtain the Y parameters of the network shown in fig. 12b. **6**

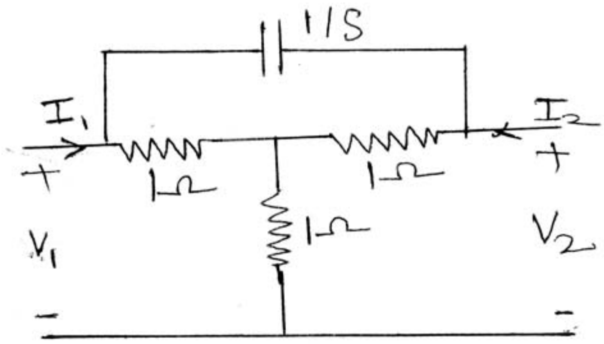


Fig. 12 b

c) Find the transmission parameters for the network shown in fig. 12c. **6**

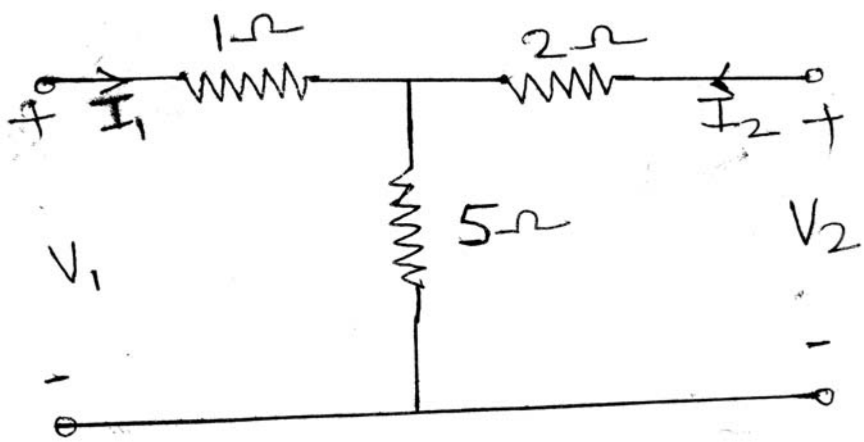


Fig. 12 c

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**S.E. (Printing Engg. & Commun. Tech.) (Semester – I) Examination, 2010**
**ELECTRICAL MACHINES AND UTILIZATION**
**(2003 Course)**

Time : 3 Hours

Max. Marks : 100

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

SECTION – I

1. a) Explain commutation process in dc motor. **8**

b) A dc generator has an armature emf of 100V when the useful flux per pole is 20 mWb and the speed is 800 rpm.

Calculate the generated e.m.f.

i) With the same flux per pole and speed 1000 rpm

ii) With a flux per pole of 24 mWb and speed 900 rpm. **8**

OR

2. a) With the help of a neat diagram explain three point starter used for d.c. shunt motor. **8**

b) A 50 kW, 250 V, 1200 rpm dc motor when tested on no load at 250 V draws a armature current of 13.24A, while its speed is 1215 rpm. Upon conducting other tests it is found that $R_a = 0.06\ \Omega$ and $R_f = 50\ \Omega$. While brush drop is 2 V. Calculate the motor efficiency at a shaft load of 50 kW at rated voltage with a speed of 1195 rpm. Assume that stray loss is 1% of output. **8**

**P.T.O.**

3. a) Explain starting methods of single phase induction motors. **8**

b) The rotor resistance and standstill reactance of a 3-ph induction motor are respectively $0.015\,\Omega$ and $0.09\,\Omega$ per phase.

i) What is p.f. of motor at start ?

ii) What is p.f. at a slip of 4% ?

iii) If the number of poles is 4, the supply frequency is 50 Hz and the standstill emf per rotor phase is 110 V find out the full load torque. Take full load slip as 4%. **8**

OR

4. a) Derive the expression for rotating magnetic field in the rotor of a 3-ph induction motor. **8**

b) Explain in detail a single phase shaded pole induction motor. **8**

5. a) Explain advantages of electric drive. Explain group drive and individual drive. **8**

b) A 3-phase synchronous motor of 8000 W at 1100 V has synchronous reactance of $8\,\Omega$ per phase. Find the minimum current and the corresponding induced emf for full load condition. The efficiency of the machine is 0.8 neglect armature resistance. **10**

OR

6. a) Explain synchronous-condenser application of synchronous motor with relative phasor diagram. **8**

b) Explain stepper motor with neat diagram and states its applications. **10**

## SECTION – II

7. a) Explain following components used in printing industry

i) Electric Encoders

ii) Micro switches

iii) Contactors

iv) Photo cells **8**

b) Power input to a 3-ph, 415 V, 50 Hz induction motor is measured using two wattmeters. It was observed that one wattmeter reads 7.5 kW while other reads 2.5 kW after reversing the connections of pressure coil calculate
i) Total power ii) Power factor iii) Line current. **8**

OR

8. a) Explain the method to measure active power using single wattmeter. **8**

   b) A balanced load of (4+j3) Ω per phase is connected in star across 400 V, 3-phase, ac supply calculate i) Readings of wattmeters ii) Total active power iii) Total reactive power if two wattmeter method is used. **8**

9. a) Explain construction and working of dielectric heating with suitable applications. **8**

   b) State electrochemical equivalent. Describe various applications of electrolytic process. **8**

OR

10. a) Explain various methods used for temperature control of electric furnaces. **8**

    b) Explain Faradays law of electrolysis in detail. **8**

11. a) Write a short note on safety procedure and maintenance procedure adopted in printing industry. **8**

    b) Explain step by step procedures used while designing industrial workshop and flood lighting scheme. **10**

OR

12. a) State and explain following factors i) space to height ratio ii) absorption factor iii) coefficient of utilization iv) Beam factor. **8**

    b) Write short notes on : **10**

       i) Neon lamp

       ii) Sodium Vapour Lamp.

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**[3862] – 375**

**S.E. (Printing & Communi. Tech.) (Semester – II) Examination, 2010**
**PRINTING MACHINE MANUFACTURING PROCESSES**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

*N.B. :* *i)* ***All*** *questions are* ***compulsory****.*
*ii) Assume suitable data, if* ***necessary****.*

SECTION – I

1. 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**

OR

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 non ferrous metals and alloys. **8**

2. a) Explain in short the various moulding methods. **8**
b) Explain the pattern layouts. **8**

OR

a) State the principle of centrifugal casting and state its advantages and limitations. **8**
b) Explain the various allowances provided on pattern. **8**

3. a) Write a note on set-over method of taper turning. **2**
b) What is a lathe carriage ? Explain its various parts with the help of a sketch. **8**
c) Explain the working principle of CNC M/c. **8**

OR

a) Draw a neat sketch and explain the various elements of single point cutting tool. **8**
b) Explain the centre lathe principle by drawing a block diagram of lathe. **8**
c) Explain adaptive control. **2**

SECTION – II

4. a) Describe with sketches the different operations performed on drilling M/c. **8**

   b) Explain twist drill terminology. **8**

OR

   a) Describe with sketches different operations performed on milling machine. **8**

   b) Differentiate between up-milling and down-milling. **8**

5. a) Differentiate between shaper and planer. **8**

   b) Explain in short slotting machine. **8**

OR

   a) Explain in detail the grinding wheels specification. **8**

   b) Write a note on centreless grinding machine. **8**

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

   a) Vernier height gauge

   b) Errors in measurement

   c) Angles gauges

   d) Line and end standard.

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**S.E. (Chem.) (Semester – II) Examination, 2010**
**CHEMISTRY – II**
**(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) Explain the following :

i) Mutarotation

ii) Inversion of cane sugar. **6**

b) Discuss the primary, secondary and tertiary structure of proteins. **6**

c) Give the IUB classification of enzymes. **4**

OR

2. a) What happens when glucose is treated with the following reagents :

i) Fehling's solution

ii) Oxidation with $HIO_4$

iii) Oxidation with nitric acid

iv) Catalytic hydrogenation. **4**

b) Write a short note on :

i) Isoelectric point

ii) Essential and non-essential amino acids. **6**

c) Explain the factors affecting enzyme activity. **6**

3. a) Write a short note on the following reactions :

i) Koch reaction

ii) Oxymercuration – Demercuration

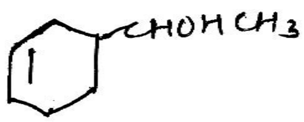
iii) Hoffmann's degradation of amides. **6**

b) Identify A and B in the following reactions :

i) $CH_3 - CH = CH - CH_3 \xrightarrow{\Delta,\ KMnO_4} A$

ii) $CH_3CH_2OH \xrightarrow[H_2SO_4]{Na_2Cr_2O_7} A \xrightarrow[H_2SO_4]{Na_2Cr_2O_7} B$

iii) $CH_3MgBr + CO_2 \rightarrow A \xrightarrow{H^+/H_2O} B$

iv)  $\xrightarrow[\text{acetone}]{H_2CrO_4} A$

v) $CH_3\,CH_2\,CH_2\,Cl \xrightarrow{\text{KOH (alc)}} A$

vi) $CH_3COCl + CH_3NH_2 \longrightarrow A + B.$ **6**

c) Describe the Gabriel synthesis for preparation of primary amines. **4**

OR

4. a) Give mechanism of Swern oxidation. **4**

b) How will you synthesize esters from ?

i) Acids

ii) Acid chloride

iii) From diazomethane. **6**

c) Give balanced equations for the following reactions :

i) Reduction of nitriles

ii) Hydrolysis of dithiones

iii) Clemmensen reduction. **6**

5. a) Explain the following terms :

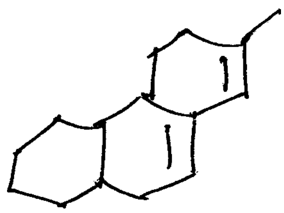
i) Chromophore

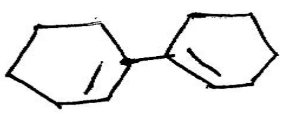
ii) Auxochrome

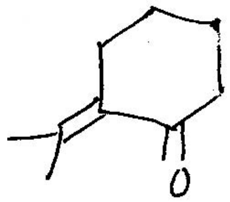
iii) Hyperchromic shift

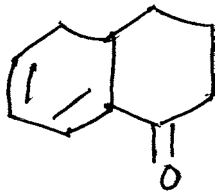
iv) Bathochromic shift. **4**

b) Calculate $\lambda_{max}$ using Woodward Feiser rules.

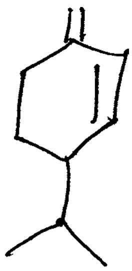
i) 

ii) 

iii) 

iv) 

v) 


vi)  **6**

c) Give mechanism of $K_2Cr_2O_7$ oxidation. **8**

OR

6. a) Write short notes on the following reactions :

i) Sabatier and Senderen's reaction

ii) Hydroboration – oxidation

iii) Birch reduction. **6**

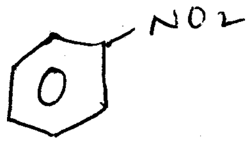
b) Describe the factors affecting IR spectroscopy with the help of examples. **8**

c) Predict the product :

i) $CH_3\ COCH_3 + SeO_2 \longrightarrow$

ii) $R_3C\ NH_2 \xrightarrow{[O]}$

iii)  $\xrightarrow[\text{ethanol}]{\text{Na}}$

iv)  $\xrightarrow{H_2,Pt}$. **4**

SECTION – II

7. a) Define and explain Hund's rule and Aufbau principle. **4**

b) Distinguish between B.M.O and A.B.M.O. **4**

c) Find the quantum numbers of :

i) $21^{st}$ electron in Cr

ii) $24^{th}$ electron in Ni. **4**

d) Explain the formation of $NH_3$ molecule using hybridisation theory. **4**

OR

8. a) Explain the bonding in diborane molecule. **4**

b) State the limitation of VSEPR theory. **4**

c) Explain the LCAO concept. **4**

d) Draw MO diagram of CO molecule and calculate the bond order. **4**

9. a) Explain $[Ni\,Cl_4]^{-2}$ is tetrahedral while $[Ni(CN)_4]^{-2}$ is square planar. **4**

b) Draw crystal field splitting diagram for the octahedral ligand field. **4**

c) Explain oxidation states of members of $I^{st}$ transition series. **4**

d) Find out the E.A.N. in the following complexes :

i) $[Cu\,(CN)_4]^{-3}$

ii) $[Fe\,(CN)_6]^{+3}$. **4**

OR

10. a) State the applications of transition metal complexes. **4**

b) Explain $[Fe(CN)_6]^{-4}$ is diamagnetic while $[Fe\,(CN)_6]^{-3}$ is paramagnetic on the basis of V.B.T. **4**

c) Explain the assumptions of V.B.T. **4**

d) Calculate CFSE for $d^3$ and $d^4$ octahedral complex. **4**

11. a) Define the following terms :

i) Molality

ii) Normality

iii) Standard solution

iv) End point. **4**

b) Explain the analysis of mixture of NaOH and $Na_2CO_3$ by volumetric method. **5**

c) Write note on indicators used in complexometric titration. **5**

d) How many grams of $Na_2S_2O_3$ is required to prepare one liter of 0.5 M solution (mole. weight of $Na_2S_2O_3$ = 142). **4**

OR

12. a) Explain Mohr's method for the determination of chloride ions. **4**

b) Write note on primary standard chemicals. **5**

c) Explain the pH metric titration curves for the strong base-weak acid. **5**

d) Calculate the volumes of titrant to be added into titration flask to obtain equivalence point in the following titration :

i) 35 ml 0.1 N NaOH against 0.05 N HCl

ii) 25 ml 0.2 N KCl against 0.04 N $AgNO_3$. **4**

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**[3862] – 388**

**S.E. (Chemical) (Semester – II) Examination, 2010**
**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) A solid short compression member of circular cross section has 60 mm dia. In order to give greater lateral stiffness, it is to be replaced by a tube having 100 mm od. Determine wall thickness of the tube if the compressive stress is to remain unchanged. **6**

b) Determine the smallest size of a hole that can be punched in a 15 mm thick m.s. plate, having an ultimate shear strength of 330 MPa. The allowable crushing stress in the punch is 1200 MPa. **6**

c) A copper cylinder has 150 mm od and 25 mm wall thickness. End plates are stayed by 24 mm dia. bar of steel which passes through the cylinder and is just tight at 5°C. Estimate the stress in copper cylinder and stay when steam at atmospheric pressure is admitted.

Given : $\alpha_b = 18\times10^{-6}\,k^{-1}$, $E_b = 63\,GPa$

$\alpha_s = 11\times10^{-6}\,k^{-1}$, $E_s = 210\,GPa$ **6**

OR

**P.T.O.**

2. a) A punch can withstand a safe compressive stress of 330 MPa. It is used for punching holes of 17.5 mm dia. in material which has ultimate shear stress of 140 MPa. Calculate maximum thickness of material through which a hole can be punched. **6**

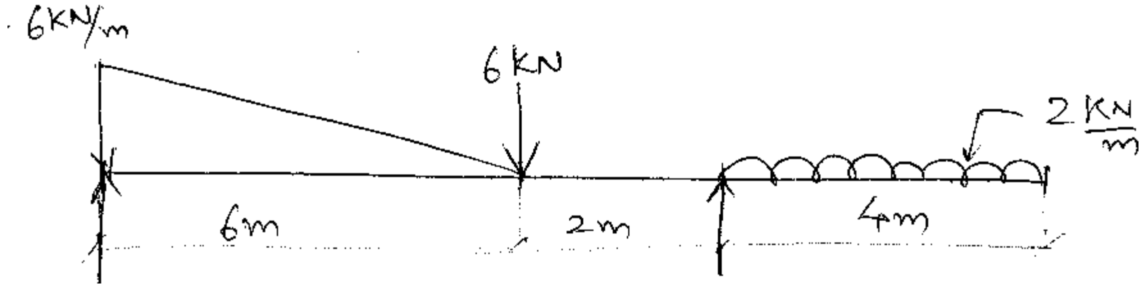
b) The body of a small condenser is made from 200 mm od brass tube. The end plates are also of brass and are held in place by four long 8 mm diameter steel bolts. If these are tightened equally at 283 K so that each carries a load of 4.5 kN, what load will they carry at the operating temperature of 373 k. The condenser tube is 12 mm thick.

Given : $\alpha_b = 17 \times 10^{-6} k^{-1}$, $E_b = 63$ GPa

$\alpha_s = 11 \times 10^{-6} k^{-1}$, $E_s = 210$ GPa **6**

c) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of the press. If the safe stress is 85 MPa and E = 210 GPa, find diameter of the rods and extension in each rod of length 2.5 m. **6**

3. a) For the beam shown in the figure, draw SFD and BMD. Find maximum values of SF and BM along the beam along with the positions where they occur. Find the point of contraflexure if any. **8**



b) A steel shaft 35 mm in diameter and 1.2 m long held rigidly at one end has a handwheel 50 cm in diameter keyed to the other end.

i) What load applied tangential to the rim of a wheel produce a torsional shear of 60 MPa ?

ii) Through how many degrees wheel will turn when this load is applied.

Given $G = 0.8 \times 10^5$ MPa **8**

OR

4. a) At a point in a strained material, the stresses on two mutually perpendicular planes are 600 MPa (t) and 400 MPa (C) along with complimentary shear stress of 100 MPa. Find the principal planes and stresses, maximum shear stress. Also find the normal, tangential and resultant stress on the plane at angle 30° with major principal plane along with angle of obliquity. Use Mohr’s circle method. **8**

b) A stainless steel beam has a concentrated load at the center which fluctuates from a value of P to 4P. The span of the beam is 500 mm and its cross-section is circular with 60 mm diameter. The beam material has fu = 700 MPa, fy = 500 MPa, fe = 330 MPa for completely reversed bending. Calculate maximum value of ‘P’ with size factor 0.85, surface factor 0.9 and fatigue stress concentration factor 1. Use Goodman’s formula and Soderberg equation. **8**

5. a) A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm dia meter rivets at 100 mm pitch. The permissible stresses are $f_t$ = 120 MPa, $f_s$ = 100 MPa, $f_c$ = 150 MPa. Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that in single shear. **8**

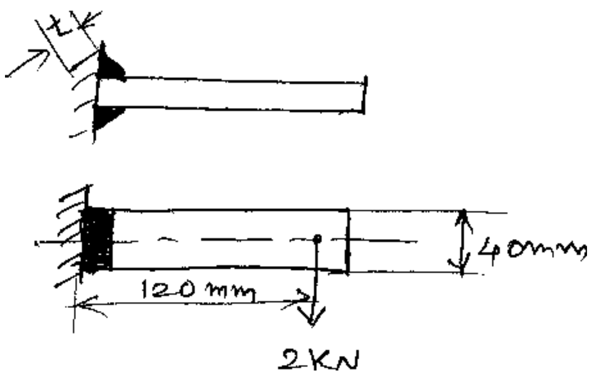
b) Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of the joint are made of same material with the following allowable stresses $f_t$ = 60 MPa, $f_s$ = 70 MPa, $f_e$ = 125 MPa. **8**

OR

6. a) Design a knuckle joint for a tie rod of a circular section to sustain a maximum pull of 70 kN. The ultimate strength of material of the rod against tearing is 420 MPa, while ultimate tensile and shearing strengths of pin material are 510 MPa and 396 MPa respectively. Design tie rod section and pin section.

Given F.O.S. = 6. **8**

b) A welded joint as shown in figure is subjected to an eccentric load of 2 kN. Find the size of the weld, if maximum shear stress in the weld is 25 MPa. **8**



SECTION – II

7. a) Design protective type cast iron flange coupling for steel shaft transmitting 15 kw at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolt should not exceed 30 MPa.

   Assume that same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than full load torque. The shear stress for cast iron is 14 MPa. Design shaft, hub, key, flange and bolts of the coupling. **12**

   b) Draw neat sketch of protective type of flange coupling showing all the parts along with their design dimensions. **4**

OR

8. a) Draw neat labelled sketch of universal coupling state its applications. **4**

   b) Design a bushed-pin type flexible coupling for connecting a motor shaft to a pump shaft for transmitting 40 kw power at 1000 rpm. The diameters of motor and pump shafts are 50 mm and 45 mm respectively. The bearing pressure in the rubber bush and allowable stress in the pins are to be limited to 0.45 MPa and 25 MPa respectively. Design the pin, bush and check the safety for normal and shearing stress. **12**

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 are on the smaller pulley is 120° and stress in tight side is 2 MPa, find the power capacity of the belt. The density of leather may be taken as 980 kg/m$^3$ and the coefficient of friction of leather on cast iron is 0.35. **8**

b) A journal bearing 150 mm in diameter and 225 mm long is supporting a load of 9 kN at 1000 rpm. If the radial clearance is 0.075 mm and the bearing dissipates 1.5 kW in friction, what is the viscosity of oil at the operating temperature ? **8**

OR

10. a) A 15 cm diameter shaft supporting a load of 100 N has speed of 1500 rpm. The shaft runs in a bearing whose length is 1.5 times the shaft diameter. If the diametral clearance of the bearing is 0.015 cm and the absolute viscosity of the oil at the operating temperature is 11cp, find the hp wasted in friction. **6**

b) 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 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 power if each belt has a cross-sectional area of 375 $mm^2$, density 1000 $kg/m^3$, and an allowable tensile stress of 2.5 MPa. The groove angle of pulley is 35° and the coefficient of friction between the belt and pulley is 0.25. Calculate the length required for each belt. **10**

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

a) Cavitation and MPSH

b) Types of fans and blowers

c) Types of valves.

OR

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

a) Centrifugal pumps

b) Types of impellers

c) Classification of pumps.

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*B/II/10/165*

**[3862] – 402**

**S.E. (Comp.) (Semester – I) Examination, 2010**
**ELECTRONIC DEVICES & CIRCUITS**
**(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 electronic pocket calculator is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. A) The circuit in fig. 1 uses a silicon transistor with current gain ($\beta$) 200 & $V_{CEQ}$ = 3V. For the output voltage ($V_o$) to be zero

i) Determine the value of collector resistance and emitter resistance. **8**

ii) With reference to the values in part (1) above, find the new value of $V_o$ if $\beta$ is 100. **4**

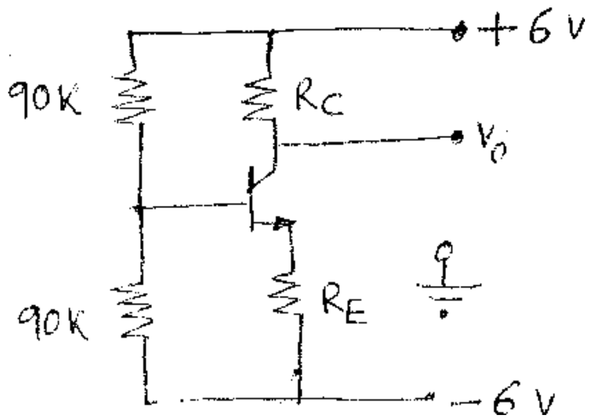


Fig. 1

B) Explain Thermal Runaway. **4**

OR

P.T.O,

2. A) Calculate stability factor for a transistor circuit to be thermally stable if the specifications are as under
   - Transistor used is NPN and is operated in self bias arrangement
   - The component values are $R_C$ = 1k and $R_E$ = 0.1 K
   - The parameter values are $I_{CO}$ = 1.2 nA, $\theta$ =10×$10^8$ °C/W, $V_{CEQ}$ = 5.5V
   - The power supply used is +10 volts. **8**

   B) Explain with necessary illustrations, what happens when
   - i) Operating point is located closer to saturation region **4**
   - ii) Operating point is located closer to cutoff region. **4**

3. A) For the circuit in fig. 2
   - i) Draw the small signal hybrid model. **2**
   - ii) Derive in terms of h parameter and circuit component the equations for a) current gain $A_I$ and $A_{IS}$ b) Voltage gain $A_v$ and $A_{VS}$ c) Input impedance $R_i$' and $R_i$ d) output impedance $R_O$ and $R'_o$. **10**

   B) Justify "CE is the only transistor configuration to produce phase shift between input and output signal". **4**

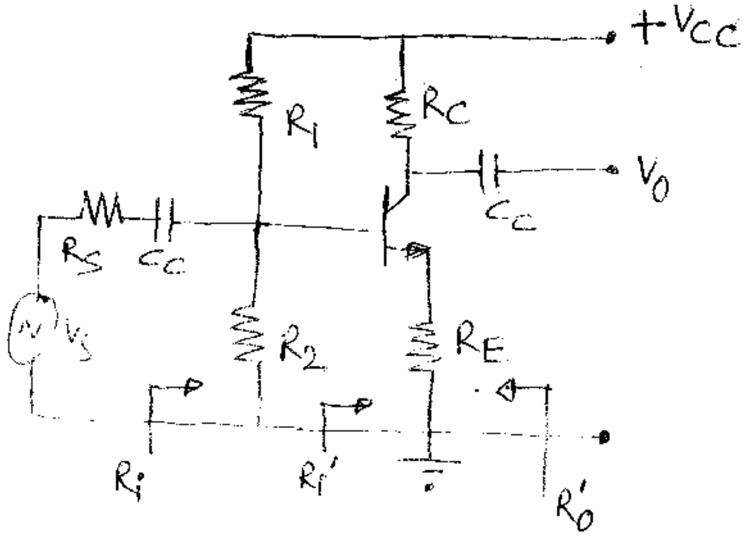


Fig. 2

OR

4. A) For the circuit in fig. (3), the transistor h parameters are hie = 1k, hfe = 50 and negligible hre and hoe, determine the following

i) $A_v = \dfrac{v_0}{v_s}$ ii) $A_I = \dfrac{i_o}{i_s}$ iii) $R_i$ iv) $R_0'$ **10**

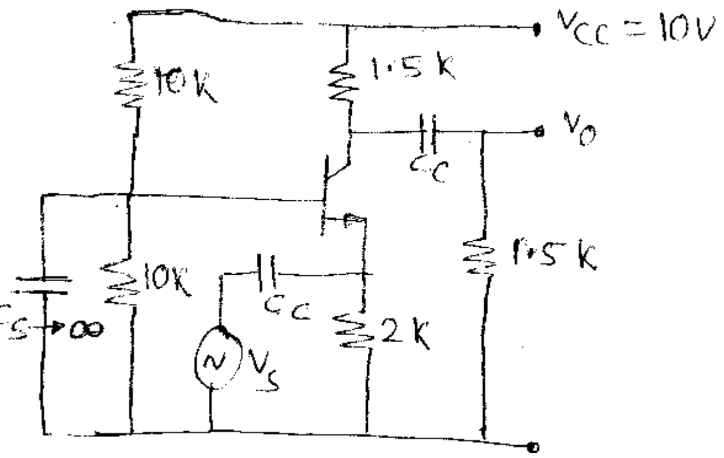


Fig. 3

B) Draw the circuit diagram and explain importance of **6**

i) Bootstrap emitter follower circuit

ii) Bootstrap darlington pair

5. A) For the circuit in fig. 4, transistors used are identical with hie = 2k, hfe = 100, hre = hoe = 0,

i) Draw neat labelled hybrid model of the circuit. **2**

ii) Determine $\dfrac{V_o}{V_s}$ & $\dfrac{i_o}{i_s}$. **8**

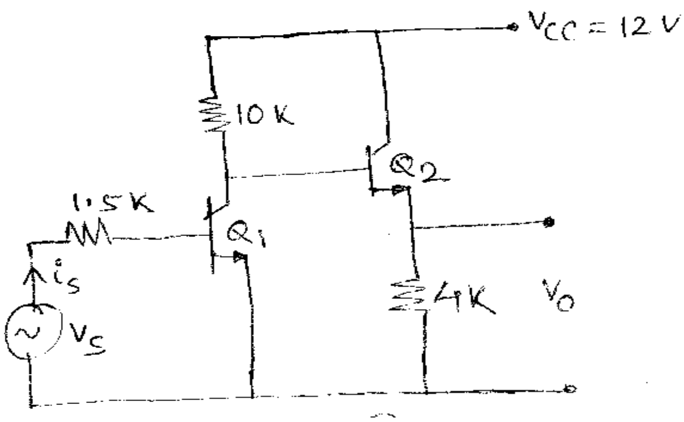


Fig. 4

B) Explain harmonic and cross over distortion of a power amplifier with necessary illustrations. **6**

C) Explain what you mean by large signal and small signal. **2**

OR

6. A) A power transistor in class A transformer coupled mode delivers 5W Power to $5\Omega$ load. The operating point is adjusted for symmetrical current swing with $V_{cc}$ = 18 V. Assuming ideal characteristic and $V_{min}$ = 0, calculate

   i) turns ratio of output transformer

   ii) peak collector current

   iii) Q point coordinates

   iv) collector circuit efficiency **8**

B) Draw the circuit diagram of two stage

   i) Direct coupled amplifier

   ii) R-C coupled amplifier

   iii) Single stage transformer coupled amplifier. **6**

C) Explain necessity of multistage amplifier. State the configuration of stages used in cascade amplifier. **2**

D) Explain can h parameter be used to analyse large signal amplifier. **2**

SECTION – II

7. A) i) Draw the circuit diagram of a source follower n channel JFET, consisting of $R_D$, $R_S$, $R_G$, input source $V_i$ and coupling capacitors $C_C$. **2**

ii) Draw the small signal model of the circuit in part (1) above. **2**

iii) Derive equation for drain current $i_d$ **2**

iv) Obtain equation for voltage gain $A_V$ of the circuit. **2**

v) Can this circuit be used to amplify voltage signal. Justify your answer. **2**

vi) Derive equation for output resistance $R_o$ **2**

B) Draw the structure and symbol of n channel EMOSFET. Sketch its transfer characteristics. **4**

OR

8. A) For the circuit in fig. 5, calculate the following

i) $g_m$ ii) $r_d$

iii) $A_v$ iv) $R_i$ v) $R_o$ **10**

Assume $I_{D(ON)}$ = 5.5 mA, $V_{GS}$(ON) = 7.5V, $V_T$ = 3V, $Y_{OS}$ = 50 $\mu$s, k = 0.25 mA/$v^2$, $V_{GS}$= 6.5 V & $I_D$ = 3 mA. Use Miller theorem. Calculate values of $R_{eff}$(i/p) and $R_{eff}$(o/p). **2**

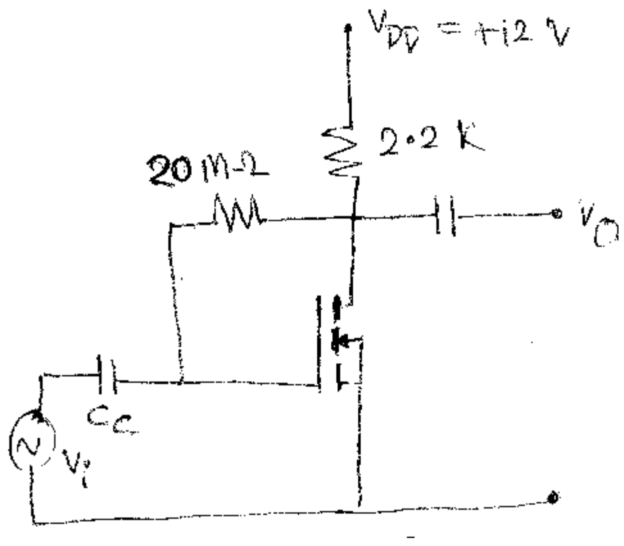


Fig. 5

B) State and define JFET parameters. **4**

9. A) i) Draw block diagram of OPAMP. **2**

ii) Sketch the circuit of level shifter an derive equation for output voltage $V_o$. **4**

iii) State disadvantage of level shifter and explain how it can be overcome with the help of necessary circuit. **4**

B) Draw and explain operation of I to V converter circuit using OPAMP. Derive equation for output voltage $V_o$. State its application. **6**

OR

10. A) i) Draw using OPAMP a circuit to generate a square wave without any input signal applied to it. **2**

ii) Explain its operation with the help of waveforms $V_C$ & $V_O$. **4**

iii) Derive equation for time period T of the square wave. **4**

B) Explain OPAMP parameters

i) CMRR ii) PSRR

iii) Slew rate iv) $V_{io}$. **6**

11. A) i) Draw a full wave rectifier circuit using 2 SCRS and a centre tap transformer. **2**

ii) Obtain firing angle $(\alpha)$, conduction angle $(\beta)$, average output voltage $(V_o)$ and load current $(i_L)$ for a load resistance of $200\,\Omega$ if the forward voltage of SCR is 400 V at a gate current of 5mA and input applied is 600 sin wt. **6**

B) i) Explain with neat diagram the working of Buck converter. **3**

ii) Obtain equation for output voltage $V_O$ **3**

iii) Sketch the nature of output voltage waveform **2**

C) Sketch V-I characteristic of diac **2**

OR

12. A) i) State difference between on line and off line UPS. **2**

ii) Explain operation of on line UPS with neat diagram. **4**

B) i) Explain operation of SCR using two transistor analogy. **3**

ii) Derive equation for anode current $I_A$. **3**

C) Define i) Latching current ii) Holding current iii) $V_{BO}$ iv) $V_{BR}$. **6**

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*B/II/10/965*

**[3862] – 406**

**S.E. (Computer Engg.) (Semester – II) Examination, 2010**
**MICROPROCESSORS AND INTERFACING TECHNIQUES**
**(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) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Draw and explain the minimum mode configuration of 8086 microprocessor. **8**

b) Draw and explain write cycle timing diagram in maximum mode of 8086 microprocessor. **8**

OR

2. a) Explain briefly with the help of diagram how 8086 addresses memory as even and odd bank for
1) even addressed byte
2) odd addressed byte
3) even addressed word
4) odd addressed word. **8**

b) Explain the difference between memory mapped I/O and I/O mapped I.O. **4**

c) Explain how 20-bit physical address is obtained in 8086 microprocessor. **4**

3. a) Write a program in 8086 assembly language to find the number of positive, zero and negative numbers from a user fed array of ten numbers. **8**

b) What is an addressing mode ? Identify the addressing modes for the following instructions and explain each :

i) ADD AX [SI]

ii) MOV BL, NUM 1

iii) ROL BX, 1

iv) MOV, AX, [BX] [SI]. **8**

OR

4. a) What do you mean by Assembler Directives ? Explain the following assembler directives with example :

i) Assume

ii) Extrn

iii) Far

iv) Segment. **8**

b) What is XLAT ? How will you use it to convert a BCD number to its ASCII
equivalent ? **4**

c) Explain the difference between a macro and procedure. **4**

5. a) Draw a neat block diagram of 8259 PIC. Explain in brief the use of 8259. Also draw the flow chart for the initialization sequence of 8259. **10**

b) Explain type 0, 1, 2 interrupts found in interrupt vector table of 8086/8088 microprocessor. **8**

OR

6. a) Draw a block diagram of 8254 timer. Explain operation of 8254 in modes 1, 3 and 5 with the help of timing diagram. **12**

b) State and explain the functions of the following pins of 8254 :

i) CLK

ii) GATE

iii) AO, A1. **6**

SECTION – II

7. a) Explain mode O and BSR mode of 8255 with appropriate control word formats. **8**

b) With respect to IC 8279 explain :

i) Display modes

ii) Scanned keyboard with two key lockout. **8**

OR

8 . a) Draw a neat block diagram of 8251 USART and explain. **8**

b) What is DMA ? Explain different data transfer modes supported by 8237. **8**

9. a) Show a typical 8-bit ADC interface with 8086. Explain functionality of each signal used. **10**

b) Define following terms for D/A converters :

i) Resolution ii) Accuracy

iii) Conversion time. **6**

OR

10. a) Interface a stepper motor to 8086 microprocessor system and write an 8086 assembly language program to control the stepper motor. **8**

b) Write a note on Data Acquisition System. **8**

11. a) Explain TSR. Also explain the structure of TSR in detail. **8**

b) What are the components of MS-DOS ? Explain how MS-DOS gets loaded after power on with a neat diagram. **10**

OR

12. a) What is PSP ? Explain structure and usage of PSP. **10**

b) Differentiate between :

i) Internal Commands and External Commands

ii) DOS Calls and BIOS Calls. **8**

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**S.E. Biotechnology (B.Tech.) (Semester – II) Examination, 2010**
**THERMODYNAMICS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Notes :*** *1) Figures to the **right** indicate **full** marks.*
*2) Use of Programmable calculator is **not** allowed.*
*3) Draw a **neat** sketch **wherever** necessary.*
*4) Make necessary assumptions **wherever** required.*
*5) Answer **any three** questions from Section – **I** and **any three** questions from Section – **II**.*

SECTION – I

1. a) What do you mean by the number of degrees of freedom ? What is the number of degrees of freedom when a binary liquid mixture is in equilibrium with its vapor ? **4**

b) Calculate $\Delta U$ and $\Delta H$ in KJ for 1 kmol water, as it is vaporized at the constant temperature of 373 K and constant pressure of 101.3 KPa. The specific volumes of liquid and vapor at these conditions are $1.04 \times 10^{-3}$ and 1.675 $m^3$/Kmol respectively. 1030 KJ of heat is added to water for this change. **4**

c) Distinguish between the extensive and intensive properties. State whether the following properties are intensive or extensive

i) Specific volume

ii) Density

iii) Heat capacity

iv) Specific heat. **8**

OR

2. a) Explain Carnot cycle and prove Carnot theorem. **8**

b) During summer months there is an increased demand for ice to cool soft drink bottles in various shops. It is desired to produce ice at 0°C at the rate of 5000 Kg per hour from water at 0°C. The ambient temperature is 40°C. To operate the refrigerating machine it is planned to supply power from a heat engine. The heat engine operates between the ambient atmosphere and a source at 100°C which is supported by solar heating panels. Calculate minimum power required to operate the refrigerating unit, the maximum possible efficiency of heat engine and the ratio of energy rejected to ambient atmosphere to energy absorbed from water at 0°C. The latent heat of fusion of water at 0°C is 6.002 KJ/mol and molar mass of water is $18 \times 10^{-3}$ Kg/mol. **8**

3. a) Using Hess's law, calculate the heat of formation of chloroform ($CHCl_3$) with the following given data :

i) $CHCl_{3(g)} + \frac{1}{2}O_{2(g)} + H_2O_{(1)} \rightarrow CO_{2(g)} + 3HCl_{(g)}$ $\Delta H^\circ_{298} = -509.93\,KJ$

ii) $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H^\circ_{298} = -296.03\,KJ$

iii) $C_{(s)} + O_{2(g)} \rightarrow CO_{2(g)}$ $\Delta H^\circ_{298} = -393.78\,KJ$

iv) $\frac{1}{2}H_{2(g)} + \frac{1}{2}Cl_{2(g)} \rightarrow HCl_{(g)}$ $\Delta H^\circ_{298} = -167.57\,KJ$ **8**

b) Write short note on latent heat of pure substances. **4**

c) Suppose a piston – cylinder assembly contains one mole of $CO_2$ at 0.101325 MPa and 300 K. The cylinder is placed on a hot plate allowing the gas to expand at constant pressure till the temperature rises at 400 K. Calculate the change in entropy of $CO_2$. **4**

For $CO_2$ $C_P^\circ = 45.369 + 8.688 \times 10^{-3}\,T - 9.619 \times 10^5\,T^{-2}$.

OR

4. a) Derive expression of temperature dependence of standard heat of reaction ($\Delta H^\circ$). **8**

b) What are sensible heat effects ? Find relation between heat capacity and temperature. **8**

5. a) What are partial properties ? What is its physical significance ? Derive expression for partial volumes of binary solution. **10**

b) What is chemical potential ? Express the definition with mathematical statement. **8**

OR

6. a) Find relation between excess properties and residual properties. **6**

b) Prove the following :

i) $(\partial T / \partial V)s = -(\partial P / \partial S)v$

ii) $(\delta T / \partial P)s = (\partial V / \partial S)p$

iii) $(\partial P / \partial T)v = (\partial S / \partial V)T$

iv) $(\partial V / \partial T)p = -(\partial S / \partial P)T$ . **12**

SECTION – II

7. a) Explain the Duhem's theorem. What is its significance in establishing the state of the system ? **4**

b) Derive the expression of phase rule for non reacting systems. **4**

c) 100 g each of ethanol and methanol are mixed at 20 °C to prepare an ideal mixture. The vapor pressure of the pure methanol is 88.7 mm and that of ethanol is 44.5 mm at 20 °C. Calculate :

i) The vapor pressure of solution

ii) Partial vapor pressures of ethanol and methanol in solution

iii) The vapor phase composition. **8**

OR

8. a) Explain in a detail Roult's law and its application to thermodynamic systems. Why modified Roults law is required explain in detail. **8**

b) An equimolar solution of benzene and toluene is totally evaporated at a constant temperature of 363 K. At this temperature the vapor pressures of benzene and toluene are 135.4 and 54 KPa respectively. What are the pressures at the beginning and at the end of the vaporization process ? **8**

9. a) Explain the criteria for chemical reaction equilibrium. **4**

b) Calculate the equilibrium constant at 298 K of the reaction

$$N_2O_{4(g)} \rightarrow 2NO_{2(g)}$$

Given that the standard free energies of formation at 298 K are 97,540 J/mol for $N_2O_4$ and 51,310 J/mol for $NO_2$. **4**

c) A gas mixture containing 3 mol $CO_2$, 5 mol $H_2$ and 1 mol water is undergoing the following reactions :

$$CO_2 + 3H_2 \rightarrow CH_3OH + H_2O$$

$$CO_2 + H_2 \rightarrow CO + H_2O$$

Develop expressions for the mole fraction of the species in terms of the extent of the reaction. **8**

OR

10. a) Explain the effect of temperature on Equilibrium Constant. **8**

b) Explain in detail Phase rule and Duhem's theorem for reacting system. **8**

11. Define first and second law of thermodynamics. Explain its application to biological systems in detail. **18**

OR

12. What is Gibb's free energy ? Explain in detail applications of Gibb's free energy to biological systems. **18**

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# [3862] – 1

**S.E. (Civil) (Semester – II) Examination, 2010**
**GEOTECHNICAL ENGINEERING (Old)**
**(1997 Course)**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Refer the three phase soil system figure and write the basic equations for :
   1) Water content
   2) Porosity
   3) Voids ratio
   4) Degree of saturation
   5) Air content. **5**

   b) Explain Casagrandes Plasticity chart. **5**

   c) What is Quicksand ? Derive the hydraulic condition causing quicksand, as $i_c = \dfrac{G-1}{1+e}$. **6**

**P.T.O.**

2. a) Draw a neat sketch of falling head permeameter and derive the equation to find coefficient of permeability. **6**

   b) Draw neat labelled graphs for :

   1) Uniformly graded soil.

   2) Well graded soil.

   3) Gap graded soil.

   4) Change in volume of soil due to variation in moisture content. **4**

   c) A soil sample have volume of 105 $cm^3$ and mass 201 gm. After drying mass is 168 gm. Calculate $\omega$, $\gamma_d$ and e, take G = 2.7. **6**

3. a) Describe properties of flow net. **4**

   b) Calculate the coefficient of permeability of a soil sample 6 cm in ht. and 50 $cm^2$ in C/S area, quantity of water equal to 430 CC passed down in 10 min. under const. head of 40 cm. Also calculate discharge velocity. **6**

   c) Derive the expression for average permeability, when flow is parallel and perpendicular to bedding plane. **8**

4. a) Explain use of pressure bulb. **4**

   b) With a neat sketch explain Newmarks chart and its use. **6**

   c) Give precise definitions for terms liquid limit, plastic limit and Shrinkage limit. **6**

5. a) Write six assumptions made by Boussinesq to determine vertical stress $\sigma_z$. **6**

   b) The natural density of a soil deposit was found to be 17.5 $kN/m^3$. A sample of the soil was brought to the laboratory and the minimum and maximum dry densities were found as 16 $kN/m^3$ and 19 $kN/m^3$ resp. Calculate the density index for the soil deposit. **4**

   c) Explain with sketch vertical stress distribution on a vertical line. **6**

SECTION – II

6. a) Define shear strength and explain Mohr Coulomb's law in total and effective stress condition. **8**

   b) Explain the various loading and drainage conditions under which the shear tests are conducted. **9**

7. a) Compare the merits and demerits of direct and triaxial shear test. **8**

   b) State the factors on which shear strength of soil depends and explain thixotropy and sensitivity. **9**

8. a) Explain the Rankine’s theory for lateral earth pressure determination for active, passive and at rest test. **8**

   b) State assumptions in Coulomb's wedge theory and explain Culmann's graphical method for earth pressure determination. **8**

9. a) Explain the factors affecting compaction of soil and discuss methods of field compaction. **8**

   b) What are the different modes of failure of slopes and explain Taylor's stability number. **8**

10. Write short notes on **(any four)** : **16**

   a) Field compaction control.

   b) Zero air void line.

   c) Rehbann's Graphical Method.

   d) Vane Shear test.

   e) Swedish slip circle method.

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**S.E. Printing Examination, 2010**
**BASIC ELEMENTS OF PRINTING TECHNOLOGY**
**(2008 Course)**

Time: 3 Hours Max. Marks: 100

SECTION – I

1. Explain basic properties of originals in detail. **16**

OR

Explain in detail Desk top publishing concept. **16**

2. Explain basic principle of Offset Lithography. **16**

OR

Explain direct and indirect screen printing process. **16**

3. Explain processes involved in binding of a centre stitch book. **18**

OR

Explain in brief various processes involved in print finishing **18**

SECTION – II

4. Explain the fundamentals of a print layout. **18**

OR

State the margins to be considered for a book printing layout. **18**

5. Explain additive and subtractive theory in detail. **16**

OR

Explain what is a type. Discuss 2D and 3D typefaces. **16**

6. What are bitmap images ? Explain any three bitmap file formats. **16**

OR

Compare Bitmap and Vector Images in detail. **16**

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**S.E. (Chemical Engg.) Examination, 2010**
**CHEMICAL ENGINEERING FLUID MECHANICS**
**(2008 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) 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**.*

SECTION – I

1. a) Discuss the following : **6**
   i) Rotational and irrotational flow
   ii) Streak line and path line
   iii) Laminar and turbulent flow.

   b) What is difference between dynamic viscosity and kinematic viscosity ? State their units of measurements. **6**

   c) Define density and specific weight, specific volume and specific gravity. **4**

OR

2. a) The velocity distribution for flow over a flat plate is given by $u = 1.5y - y^2$. **8**

   Where u is the point velocity in metre per second at a distance y metre above the plate. Determine the velocity gradient and shear stress at y = 5 and y = 10 cm. Assume dynamic viscosity as 10 poise.

   b) Draw shear stress-shear rate diagram and explain rheological behaviour of different fluids. **8**

3. a) Derive an expression for the pressure difference across two limbs of a differential manometer containing two gauge fluids, mutually immiscible. What factors influence the sensitivity ? **8**

b) The following data were obtained on a section of piping through an incompressible viscous fluid is flowing (See figure). **8**

**Point 1** :

Pressure = $1.25 \times 10^5$ Pa

Cross-sectional area = $15 \times 10^{-4}$ m$^2$

Fluid velocity = 1 m/s

**Point 2** :

Pressure = $1.05 \times 10^5$ Pa

Cross-sectional area = $5 \times 10^{-4}$ m$^2$

Elevation above point 1 = 3 m

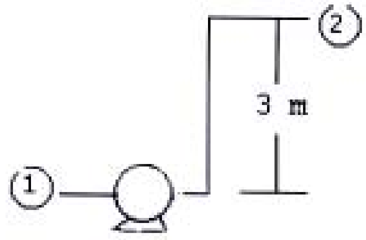
**Other Data**

Density of fluid = 1000 kg/m$^3$

Power delivered by the pump = 7.5 W

(assume efficiency = 100%)

Calculate the head loss due to friction and predict whether flow is taking place from point 1 to 2 or from 2 to 1




c) A U-tube manometer filled with mercury is connected between two points in a pipeline. If the manometer reading is 26 mm of Hg, calculate the pressure difference between the points when (a) water is flowing through the pipe (b) air at atmospheric pressure and 20°C is flowing in the pipe.

Density of mercury = 13.6 gm/cc Density of water = 1 gm/cc Molecular weight of air = 28.8. **2**

OR

4. a) A differential mercury manometer is used to measure the pressure difference between two pipes at A and B containing liquids of specific gravity 0.8 and 0.7 respectively. Center to center distance between pipes A and B is 50 cm, A being above B. The mercury level in the leg of manometer connected to pipe A is 0.3 m below its center while that is the leg connected to pipe B is 0.6 m below its center. Find the differential pressure between pipes A and B in terms of water column. **8**

b) By applying energy balance to the steady flow of a incompressible fluid in a stream-tube, derive Bernoulli equation. **8**

c) What are the limitations of Bernoulli equation ? **2**

5. a) Water is flowing through a pipe of diameter 250 mm with a velocity of 3 m/sec. Find the head loss due to friction for a length of 5.5 m, if the coefficient of friction f is given by

$$f = \left[0.03 + \frac{0.08}{Re^{0.3}}\right]$$

Take kinematic viscosity = 0.01 strokes. **8**

b) Show that for the laminar flow of incompressible fluid flowing through a circular pipe **8**

$$f = \frac{16}{Re}$$

Where, f = friction factor and Re = Reynolds number

OR

6. a) In a pipe 300 mm diameter and 800 m length an oil of specific gravity 0.8 is flowing at a rate of 0.45 $m^3$/s. Find **8**

i) Head loss due to friction

ii) Power required to maintain the flow

Take kinematic viscosity of the oil as 0.3 Stokes.

b) For laminar flow through horizontal circular pipe, show that : **8**

$$u = \left[1 - \left(\frac{r}{r_w}\right)^2\right]$$

SECTION – II

7. a) The resistance R experienced by a partially submerged body depends upon the velocity v, length of the body *l*, viscosity of the fluid $\mu$, density of the fluid $\rho$, and acceleration due to gravity g. Establish a suitable relation involving dimensionless groups. **10**

b) Explain the terms Rayleigh's method of dimensional analysis. **6**

OR

8. a) Calculate the momentum thickness for the following boundary layer velocity flow : **8**

$$\frac{u}{u_\infty} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$$

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

i) Displacement thickness

ii) Momentum thickness.

9. a) With a neat sketch explain the process of fluidization. State any two applications. **8**

b) Discuss different types of fluidization. **8**

OR

10. a) Derive relations for Reynolds number and friction factor and establish the Ergun equation for single-phase flow of fluid through packed bed. **8**

b) Draw a neat sketch and explain the working of a packed bed column. **8**

11. a) A horizontal venturi meter having a throat diameter of 20 mm is set in a 75 mm I.D. pipeline. Water at 15°C is flowing through the line. A manometer containing mercury under water measures the pressure differential over the instrument. When the manometer reading is 500 mm, calculate the flow rate. Take $C_d$ = 0.98. **8**

b) Briefly explain the method of selecting a pump for a given application. **6**

c) Compare between an orifice meter and venturi meter. **4**

OR

12. a) Pitot tube was used to measure the quantity of water flowing in a pipe of 0.3 m diameter. The reading in the vertical limb of the tube inserted at the center of the pipe was 0.25 m. If the mean velocity is 0.75 times the velocity at the center, find the flow rate. Assume static head at the center of the pipe as 0.2 m and the coefficient of discharge of pitot as 0.98. **8**

b) Water flows through a 0.203 m diameter pipe, with an average velocity of 3.6 m/sec. There is a sudden enlargement to 0.406 m diameter pipe. What is the power loss due to the sudden enlargement ? **4**

c) Explain the velocity measurement by pitot tube with the help of a neat sketch. **6**

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**[3862] – 233**

**S.E. (Biotechnology) (Semester – I) Examination, 2010**
**MICROBIOLOGY**
**(2008 Course)**

Time : 3 Hours Max. Marks : 100

SECTION – I

1. Describe in detail structure of Gram positive and Gram negative cell wall. With the help of diagram explain the process of Gram staining and function of each component of Gram stain. Give 3 examples of Gram Positive and negative bacteria. **18**

OR

2. Give 3 examples of each of the types :
   a) Spore forming bacteria,
   b) Capsule forming bacteria,
   c) Gram positive bacteria,
   d) Flagellated bacteria,
   e) Cocci,
   f) Comma and spiral shaped bacteria. **18**

3. Give in detail mathematics of bacterial growth in closed system. How is bacterial culture maintained in log phase continuously ? **16**

OR

4. Write on :
   a) Effect of temperature on growth
   b) Effect of oxygen on growth. **16**

5. Describe working principle and structure of autoclave. What are the different combinations of temperature, pressure and time used for sterilization of various materials ? How will you sterilize
   a) medium containing vitamin B12,
   b) filter paper,
   c) air ? **16**

OR

6. Enlist and describe in detail any two mechanical methods of sterilization. **16**

SECTION – II

7. How is one step growth experiment carried out ? Summarize what occurs in each phase. Define latent period, eclipse period, rise period and burst size. **18**

OR

8. Discuss the ways that viruses can be cultivated. Define the terms pock, plaque, cytopathic effect of viruses and Allantoic cavity. **18**

9. Describe various methods of food preservation. **16**

OR

10. Describe various methods of pasteurization. Write on Spoilage of milk. **16**

11. Write notes on **any four (4** marks **each)** : **16**
   a) Nitrogen cycle,
   b) Soil microbes,
   c) Tuberculosis,
   d) leprosy,
   e) rabies,
   f) OPV,
   g) Food poisoning,
   h) Water quality,
   i) Endospores.
   j) Lytic cycle
   k) Peptidoglycan

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# S.E. (Biotechnology) (Semester – I) Examination, 2010
## BIOCHEMISTRY – I
## (2008 Course)

Time : 3 Hours Max. Marks : 100

***N.B. :*** *i) 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**.*

*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. Answer the following **(9 marks each)** : **18**

 1) Explain in detail fitness of the aqueous environment for living organisms.
 2) Depict the flow chart for glycolysis with all enzymes and coenzymes involved in it.

OR

2 Write short notes on **(9 marks each)** : **18**

 1) Chemical bonds in living cells.
 2) First bypass reaction in the synthesis of glucose molecule.

3. Describe and discuss in detail the synthesis of glycogen with special emphasis on the role of nucleoside diphosphate sugars. **16**

OR

4. Write short notes on **(8 marks each)** : **16**
   1) Oxidative phase of pentose phosphate pathway.
   2) Cori cycle.

5. Write in detail about the classification of amino acids on the basis of R groups. **16**

OR

6. Explain in short about **(8 marks each)** : **16**
   1) Urea cycle.
   2) Digestion and absorption of amino acids.

SECTION – II

7. Answer the following **(9 marks each)** : **18**
   1) Explain in detail the terms acidosis and ketosis.
   2) Role of acetyl – CoA in the formation of ketone bodies.

OR

8. Write short notes on **(9 marks each)** : **18**
   1) Biosynthesis of phosphoglycerides.
   2) Classification of lipids.

9. Answer the following **(8 marks each)** : **16**
   1) Write in short about nucleic acid protein supramolecular complex.
   2) Explain the covalent structure of nucleic acids with neat diagram.

OR

10. Write in detail about the synthesis of pyrimidine ring in de novo synthesis. **16**

11. Write short notes on **(8 marks each)** : **16**
    1) Dietary fibers, their types and its uses.
    2) Functions and deficiencies of any two water soluble vitamins.

OR

12. Enlist the fat soluble vitamins and furnish its sources. Give the detail account of deficiencies for fat soluble vitamins. **16**

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**S.E. (Civil) (Semester – I) Examination, 2010**
**ENGINEERING MATHEMATICS – III**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***N.B :*** *i) In Section **I**, attempt Q. No. **1** or Q. No. **2**, Q. No. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**. In Section **II**, attempt Q. No. **7** or Q.No. **8**, Q. No. **9** or Q. N. **10**, Q.No. **11** or Q. No. **12**.*

*ii) Answers to the **two** Sections should be written in **separate** answer books.*

*iii) **Neat** diagram must be drawn **whenever** necessary.*

*iv) Use of non-programmable electronic calculator is **allowed**.*

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

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

SECTION – I

1. a) Solve (**any three**) : **12**

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

ii) $(D^2 - 3D + 2)y = x^2 + \sin x$

iii) $(D^4 - 2D^3 - 3D^2 + 4D + 4)y = x^2 e^x$

iv) $(D^2 - 2D + 2)y = e^x \tan x$ (Use method of variation of parameters)

v) $x^3 \dfrac{d^3y}{dx^3} + 2x^2 \dfrac{d^2y}{dx^2} + 2y = 10\left(x + \dfrac{1}{x}\right)$

1. b) Solve : $\dfrac{du}{dx} + v = \sin x,\ \dfrac{dv}{dx} + u = \cos x$. **5**

OR

2\. a) Solve (**any three**) : **12**

i) $(D^2 - 9D + 18)y = e^{e^{-3x}}$

ii) $(D^2 - 4D + 3)y = x^3 e^{2x}$

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

iv) $(D^2 - 6D + 9)y = \dfrac{e^{3x}}{x^2}$ (Use method of variation of parameters)

v) $(2x+1)^2 \dfrac{d^2y}{dx^2} - 2(2x+1)\dfrac{dy}{dx} - 12y = 6x$

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

3\. a) The differential equation of a whirling shaft, where W is the weight of the shaft and $\omega$ is whirling speed is given by $EI\dfrac{d^4y}{dx^4} - \dfrac{W\omega^2}{g}y = W$. Taking the shaft of length 2*l*, with the origin at the centre and short bearing at both ends, show that the medium deflection of the shaft is given by $\dfrac{.g}{2\omega^2}(\text{secal} + \text{sechal} - 2)$. **8**

3\. 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. (Use wave equation

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$$ **9**

OR

4. a) Solve : $\frac{\partial v}{\partial t} = k\frac{\partial^2 v}{\partial x^2}$ subject to the conditions **9**

i) $V \neq \infty$ as $t \to \infty$, ii) $\left(\frac{\partial v}{\partial x}\right)_{x=0} = 0, \forall t$

iii) $V(l, t) = 0, \ \forall t$ iv) $V(x,0) = V_0$ for $0 < x < l$.

4. b) The differential equation satisfied by a beam, uniformly loaded with one end fixed and second subject to a Tensil force P given by

$$EI\frac{d^2y}{dx^2} - Py = -\frac{W}{2}x^2$$

Show that the elastic curve for the beam under conditions y = 0, $\frac{dy}{dx} = 0$ when x = 0 is given by

$$y = \frac{W}{2P}\left[x^2 + \frac{2}{n^2} - \frac{e^{nx}}{n^2} - \frac{e^{-nx}}{n^2}\right]$$

where $EI = \frac{P}{n^2}$ . **8**

5. a) Solve by Gauss-Seidel method, the following system of equations :

$20x_1 + x_2 - 2x_3 = 17$

$3x_1 + 20x_2 - x_3 = -18$

$2x_1 - 3x_2 + 20x_3 = 25$. **8**

5. b) Use Runge-Kutta method of second order to solve $\frac{dy}{dx} = \frac{1}{x+y}, x_0 = 0, y_0 = 1$, to find y at x = 0.4 taking h = 0.2. **8**

OR

6. a) Numerical solution of the differential equation $\frac{dy}{dx} = 2 + \sqrt{xy}$ is tabulated as

| | | | | |
|---|---|---|---|---|
| **x :** | 1.0 | 1.2 | 1.4 | 1.6 |
| **y :** | 1.0 | 1.6 | 2.2771 | 3.0342 |

Find y at x = 1.8 by Milne's predictor-corrector method taking h = 0.2. **8**

6. b) Solve the following system by Cholesky's method

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

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

$14x_1 - 5x_2 + 83x_3 = 155.$ **8**

SECTION – II

7. a) An urn contains 6 white and 8 red balls. Second urn contain 9 white and 10 red balls. One ball is drawn at random from the first urn and put into the second urn without noticing its colour. A ball is then drawn at random from the second urn. What is the probability that it is red ? **6**

b) The first four central moments of distribution are 0, 2.5, 0.7 and 18.75 find coefficients of skewness and kurtosis. **4**

c) The two regression equations of the variables x and y are

$x = 19.13 - 0.87\,y$

$y = 11.64 - 0.50\,x.$ **6**

Find :

i) $\bar{x}, \bar{y}$

ii) The correlation coefficient between x and y.

OR

8. a) 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 number of candidates who secured a first class for which a minimum of 60 marks is necessary.
[Area corresponding to z = 1.64 is 0.4495.] **6**

b) Obtain regression lines for the following data : **6**

| | | | | | |
|---|---|---|---|---|---|
| **x** | 6 | 2 | 10 | 4 | 8 |
| **y** | 9 | 11 | 5 | 8 | 7 |

c) In a Poisson distribution, if P(r = 1) = 2 P(r = 2), find P(r = 3). **4**

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

b) Find the directional derivative of $xy^2 + yz^3$ at (1, 2, –1) along a line equally inclined to the three co-ordinate axes. **5**

c) Prove the following (**any two**) : **6**

i) $\nabla^4\left(r^2 \log r\right) = 6/r^2$

ii) $\nabla\left(\frac{\bar{a}.\bar{r}}{r^2}\right) = \frac{\bar{a}}{r^2} - \frac{2(\bar{a}.\bar{r})}{r^4}\bar{r}$

iii) For a scalar functions $\phi$ and $\psi$, show that

$$\nabla^2(\phi\psi) = \phi\nabla\psi + 2\nabla\phi\nabla\psi + \psi\nabla^2\phi$$

OR

10. a) Show that the vector field given by

$\overline{F} = (y^2 \cos x + z^2)\overline{i} + (2y \sin x)\overline{j} + 2xz\overline{k}$ is irrotational and find scalar $\phi$ such that $\overline{F} = \nabla\phi$. **6**

b) Prove that

$\nabla^2 \left[ \nabla . \left( \frac{\overline{r}}{r^2} \right) \right] = \frac{2}{r^4}$. **5**

c) Determine f(r) such that the field $\overline{F} = f(r)\overline{r}$ is solenoidal. Also find f(r) such that $\nabla^2 f(r) = 0$. **6**

11. a) Find work done by the force

$(x^2 - yz)\overline{i} + (y^2 - zx)\overline{j} + (z^2 - xy)\overline{k}$ in taking a particle from (1, 1, 1) to (3, –5, 7). **6**

b) Evaluate $\iint_s (x^3\overline{i} + y^3\overline{j} + z^3\overline{k}).d\overline{s}$, where S is the surface of the sphere $x^2 + y^2 + z^2 = 36$. **5**

c) Evaluate $\iint_s (\nabla \times \overline{F}).d\overline{s}$, where $\overline{F} = (x^3 - y^3)\overline{i} - xyz\overline{j} + y^3\overline{k}$ and s is the surface $x^2 + 4y^2 + z^2 - 2x = 4$ above the plane x = 0. **6**

OR

12. a) Find work done in moving the particle once round the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1, z=0$ and the field of force $\overline{F}=\left(2xy+3z^2\right)\overline{i}+\left(x^3+4yz\right)\overline{j}+\left(2y^2+6xz\right)\overline{k}$. **6**

b) Evaluate $\iint_s \overline{F}.d\overline{s}$, where $F=4x\overline{i}-2y^2\overline{j}+z^3\overline{k}$ and s is a closed surface bounded by $y^2 = 4x$, $z = 0$, $z = 3$ and $x = 1$. **5**

c) Using Greens theorem, evaluate $\int_c \overline{F}.d\overline{r}$ where

$$\overline{F}=\left(2x^2y+3z^2\right)\overline{i}+\left(x^2+4yz\right)\overline{j}+\left(2y^2+6xz\right)\overline{k}$$

and C is the curve enclosing a region $y^2 = 4\ ax$, $x = a$ in the plane $z = 0$. **6**

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**[3862] – 302**

**S.E. (Civil) (Semester – I) Examination, 2010**
**BUILDING MATERIALS AND CONSTRUCTION**
**(2003 Course)**

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. a) Define the foundation. Compare the shallow and deep foundation. **6**
   b) Describe with sketch the following :
      i) Bearing pile  ii) Friction pile
      iii) Under reamed pile. **6**
   c) Explain with neat sketch trapezoidal footing. **4**

OR

2. a) What is underpinning ? Explain its importance in construction. **6**
   b) What are different types of foundation ? Draw sketches for any two. **6**
   c) Explain various important points while setting out foundation on ground. **4**

3. a) Write important requirements for good building stones. **6**
   b) Compare hollow block masonry with brick masonry. **6**
   c) Write a note on Composite Masonry. **4**

OR

4. a) Compare Rubble Masonry and Ashlar Masonry. **6**
   b) What is pointing ? Explain its various types with sketches. **6**
   c) Explain with a neat sketch various advantages of Cavity Wall. **4**

5. a) Enlist various purposes of doors and window. State Merits and Demerits of different materials used for Door. **6**
   b) Describe with sketch the construction of Segmental arch in brick masonry wall. **6**
   c) Differentiate between plastering and pointing. **6**

OR

6. a) State the different defects in oil painting work and discuss causes for the same. Also explain in brief characteristics of good paint. **6**

b) What do you know about Wall cladding and wall papering ? Explain the method for fixing the same. **6**

c) Explain step by step procedure for three coat sand faced plaster. State specific thickness and care required for each coat. **6**

SECTION – II

7. a) Give reasons to justify the following statements : **6**

i) Floors are constructed at some height from the ground

ii) Stone flooring is provided in workshops and godowns.

iii) Corrugations are important in G.I. sheets.

b) What are the different factors which are to be considered while selecting wearing surfaces for ground floors ? **6**

c) Explain merits and demerits of wooden floors. **4**

OR

8. a) Describe in detail damp-proofing of flat roofs. Also draw neat sketches. **6**

b) Explain different important points which are to be considered while selecting roof-covering for a building. **6**

c) Explain with neat sketch jack arch flooring. **4**

9. a) Design Dog-legged stair for a residential building located in a staircase room with following details.

i) Size of staircase room 3 m×5 m

ii) Vertical distance between the floors is 3.0 m

iii) Rise = 15 cm and tread = 28 cm.

Draw dimensional plan and section for the proposed R.C.C. stair. **10**

b) Explain the requirements for good staircase. **6**

OR

10. Write short notes on : **16**

   i) Ramp

   ii) Connections in steel sections

   iii) Splicing of steel sections

   iv) Tubular structure.

11. a) Explain the properties and uses of the following materials : **6**

   i) Asphalt ii) Alloys iii) Gypsum

   b) What is seasoning of Timber ? Explain various defects in timber. **6**

   c) Enlist the different types of glass. Also explain their properties. **6**

OR

12. a) What different measure are taken on site for Prevention of Accidents ? **6**

   b) Enlist various types of shore. Describe any one with neat sketch. **6**

   c) State advantages and disadvantages of ferrous metals and lime. **6**

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*B/II/10/265*

**S.E. (Civil) (Semester – I) Examination, 2010**
**ENGINEERING GEOLOGY**
**2003 Course**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Write in detail the Scope and Subdivisions of Geology. **12**

b) Write a note on Mineral Classification. **4**

OR

Write short notes on :

a) Textures of Igneous rocks. **4**

b) Felspar group of Minerals. **4**

c) Rudaceous rocks. **4**

d) Gneissose and Schistose. **4**

2. a) Define fold. Give neat sketch showing various parts of folds. Describe the types of folds. Discuss how fold changes to a fault. **12**

b) Write a note on products of Volcanoes. **4**

OR

Write short notes on :

a) Angular Unconformity. **4**

b) Inlier and Outlier. **4**

c) Types of Joints. **4**

d) Difference between Normal Fault and Reverse Fault. **4**

3. a) Explain in detail by giving examples about the geological work done by groundwater. **10**

b) Write a note on types of Drainages. **4**

c) Interior of Earth. **4**

OR

Write short notes on :

a) Precambrian Era. **3**

b) Geological time Scale. **4**

c) Physiographic Divisions of India. **3**

d) Features of stream erosion. **4**

e) Relict Mountain. **4**

SECTION – II

4. a) Explain the cone of depression and circle of influence of groundwater consumption. **8**

b) Preventive measures against landslides. **8**

OR

4. a) Artificial recharge of Groundwater. **7**

   b) Causes of Landslides. **5**

   c) Perched water table. **4**

5. Write short notes on : **(4×4)**

   a) Angle holes

   b) Length and Number of pieces of core

   c) Locating core loss

   d) Use of GIS in civil Engineering.

OR

5. a) Write in detail the observations and precautions to be taken during drilling. **10**

   b) Remote sensing and uses of it. **6**

6. a) Influence of divisional planes during tunnelling. **10**

   b) Soundness of rock from dam foundation point of view. **8**

OR

6. a) Earth tremors in the region of some dams. **10**

   b) Tunnelling through folded and faulted rocks. **8**

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# S.E. (Civil) (Semester – I) Examination, 2010
# ENGINEERING ECONOMICS AND MANAGEMENT
# (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions**: 1) Answer **any three** questions from **each** Section.*
*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 Law of substition. **6**

b) Explain Law of Diminishing Marginal Utility. **6**

c) Discuss applications of economics to civil engineering. **6**

OR

2. a) Define the following terms : **6**

| | |
|---|---|
| i) Goods | ii) Wealth |
| iii) Asset | iv) Revenue |
| v) Market | vi) Price |

b) Explain the Law of supply. **6**

c) What is elasticity of supply ? Explain in short with the help of a sketch. **6**

3. a) Explain productivity. List the factors affecting it. **6**

b) Explain any one Law of Returns with the help of suitable example. **6**

c) Explain the process of capital formation. **4**

OR

4. a) Explain perfect and imperfect competition. **6**

   b) What is a product life cycle ? Discuss its usefulness in determination of production strategy. **6**

   c) Enlist the advantages and disadvantages of large scale production. **4**

5. a) Define the term Money. What are its functions ? **4**

   b) Define Annuities. Enlist types of annuities. **4**

   c) Discuss the role of S.E.B.I. in capital market. **4**

   d) Define depreciation. Enlist various methods to calculate depreciation. Explain any one in brief. **4**

OR

6. Write short notes on : **16**

   i) BOT

   ii) Functions of R.B.I.

   iii) Inflation and deflation of currency.

   iv) Break-Even Analysis.

SECTION – II

7. a) Explain evolution of scientific management. **6**

   b) Explain Joint Stock Company. **6**

   c) Explain characteristics and principles of organization. **6**

OR

8. a) Differentiate between public sector and private sector. **6**

   b) Explain in brief types of organisation. **6**

   c) Write a note on functions of management. **6**

9. a) What are the methods of selection of an employee in a industry ? **4**

   b) Explain the concept of a ‘Decision Tree’. **4**

   c) List the different leadership styles. Explain any one in brief. **4**

   d) Explain in brief benefit cost analysis. **4**

OR

10. a) Define motivation. Enlist methods of motivating employees. Explain any one in brief. **4**

    b) Differentiate between programmed and non-programmed decisions. **4**

    c) Explain the importance of training. **4**

    d) List the factors affecting Man-power planning. **4**

11. a) Explain in detail “Work study”. **4**

    b) Explain Deming’s 14 principles of TQM. **6**

    c) Discuss in detail “Quality Circle”. **6**

OR

12. Write short note on **(any four)** : **(4×4)**

    i) Zero Defect.

    ii) MIS through case studies.

    iii) Time and Motion study.

    iv) KANBAN

    v) KAIZEN.

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**[3862] – 306**

**S.E. (Civil) (Semester – II) Examination, 2010**
**FLUID MECHANICS – I**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *i) Answer **three** question from Section **one** and **three** questions from Section **two**.*
*ii) Answer to the **two** Sections should be written in **separate** answer booklet.*
*iii) Neat diagrams must be drawn **wherever** necessary.*
*iv) **Black** figure to the **right** 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) Define five major properties of the Fluid and give their units. What is the relation between Dynamic Viscosity and Kinematic Viscosity ? Prove that the unit of Kinematic Viscosity is $m^2/s$. **6**

b) Define Capillarity. Derive the expression for capillary rise within a tube, when angle of contact is '$\theta$' and surface tension is '$\sigma$'. The diameter of the glass tube is 'd' and specific weight of the liquid is '$\gamma$'. **6**

c) Express the Kinematic viscosity in stokes for a liquid with specific gravity 0.95 and dynamic viscosity 0.011 poise. **6**

2. 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 0.6. 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) What do you mean by metacentre ? What are the three types of equilibrium involved with floating bodies ? Describe them in detail. What do you mean by the moment of inertia of the water line area of a floating body ? **8**

**P.T.O.**

3. a) The velocity potential is expressed by $\Phi = 8\ xy$. Find the 'x' component and 'y' component of velocities and also find the stream function from the given value of the velocity potential. **8**

b) A 25 × 12 cm venturimeter is installed in a vertical pipe carrying oil of relative density 0.8. The flow of oil is in upward direction. The difference of levels between the throat and the inlet section is 25 cm. The oil-mercury differential manometer gives deflection reading of 35 cm of mercury. Find the discharge of oil. Take coefficient of meter as 0.98. **8**

4. a) Derive Bernoulli's equation by integrating Euler's equation considering steady and irrotational flow. **8**

b) What do you mean by end contraction and velocity of approach ? Derive all the four different expressions of discharge for a rectangular notch by considering velocity of approach and end contraction. **8**

5. a) Derive Darcy - Weisbach equation for the expression of head loss in a pipe. **8**

b) A jet of water with a velocity of 8 m / sec is emerging out of an orifice of 30 mm diameter. If the head lost in jet flow is 150 mm of water determine : **8**

i) The head on orifice causing the flow

ii) The coefficient of Velocity

iii) The diameter of the jet.

SECTION – II

6. a) Derive Hagen-Poiseuille Equation for the expression of head loss for laminar flow through a circular pipe. **9**

b) Oil flows through a pipe and the velocity distribution across the pipe section is given by $V/V_{max} = [1 - (r/R)^2]$. Where 'R' is the pipe diameter and 'r' is the radial distance from the central line of the pipe at a distance 'r', the velocity is 'V'. Calculate the energy and momentum correction factors. **9**

7. a) Discuss about the development of Boundary Layer over a flat plate with the help of a sketch. What do you mean by laminar, transition and turbulent boundary layer ? What is laminar sub layer ? Derive the equation for obtaining the expression of displacement thickness $\delta^*$. **8**

b) $u/U = \sin(\Pi y/2\delta)$. Find the ratio between momentum thickness '$\theta$' and the energy thickness $\delta^{**}$. **8**

8. a) Determine the difference in elevation between water surfaces in two tanks which are connected by horizontal pipe of diameter 325 mm and length 425 m. The rate of flow of water through pipe is 0.35 $m^3/s$. Consider all the losses. Take f = 0.008. **8**

b) What is Siphon ? How does it work ? State its two uses. **8**

9. a) Explain Buckingham-$\pi$ Theorem in detail. How to choose the repeating variables ? If there are three dynamic variables mass density, dynamic viscosity and surface tension, which one of these three should be considered as a repeating variable while deriving the $\pi$ terms in a problem related top dimensional analysis. **8**

b) What do you mean by 'Dimensional Homogeneity' ? What is Reynolds Model Law ? Describe it in detail. **8**

10. Write short notes (**any four**) : **16**

i) Momentum Thickness

ii) Prandtl's Mixing Length Theory

iii) Kinematic Variable

iv) Loss due to sudden expansion in a pipe line

v) Total Energy Line

vi) Moody's Diagram.

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**S.E. (Civil) (Semester – II) Examination, 2010**
**BUILDING PLANNING AND BUILT ENVIRONMENT**
**(2003 Course)**

Time: 4 Hours Max. Marks: 100

*N.B.* : *i) Answer* ***three*** *questions from Section* ***I*** *and* ***three*** *questions from Section II.*
*ii) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer books.*
*iii)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
*iv) Figures to the* ***right*** *indicate* ***full*** *marks.*
*v)* ***Use*** *of nonprogrammable (scientific) Calculator is* ***permitted****.*
*vi) Assume suitable data, if* ***necessary****.*
*vii) Section* ***II*** *should be written only on drawing sheets.*

SECTION – I

1. a) Explain grouping principle with respect to planning of a secondary school. **6**
b) State different zones for the purpose of development of city and explain it. **6**
c) Explain following principles of land scaping. **6**
i) Unity ii) Balance iii) Light and shade

OR

2. a) Explain architectural composition with respect to following points
i) Scale ii) Rhythm iii) Proportion **6**
b) What is necessity of rules about built-up area and explain Floor Area ratio. **6**
c) Illustrate the need of interior decoration for commercial and residential buildings. **6**

3. a) State the importance of artificial lighting. **4**
b) Hoe climatic factors affect the design of building ? **6**
c) Explain **6**
i) External reflected component ii) Internal reflected component

OR

4. a) Illustrate with neat diagram wind effect and stack effect. **6**
b) Write short note on heat exchange of building. **4**
c) Explain with diagram winter air conditioning and summer air conditioning. **6**

5. a) Write short note on septic tank with soak-pit. **6**
b) Explain with sketches reflection of sound from different shapes of surfaces. **6**
c) Claculate absorption units required for a hall measuring 30 m×15 m×6 m high to get a reverberation time of 1.2 seconds. **4**

OR

6. a) Enlist different fire protection system and explain any one in detail. **6**

   b) What is the cause of excessive reverberation and formation of echo ? **6**

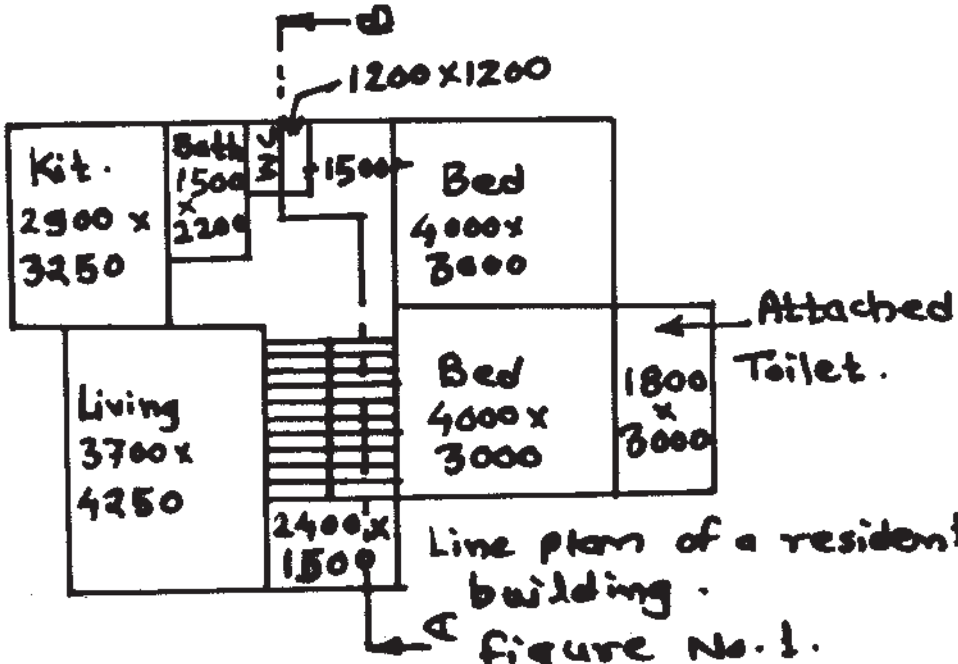
   c) Explain any six points to be followed while designing a house drainage system. **4**

SECTION – II

7. a) Draw a detailed plan of a residential building for the line plan as shown in figure 1. Draw it to a scale of 1 : 50. **12**

   Use following information :

   1) The structure is a framed structure.
   2) All dimensions are in mm.
   3) All the dimensions are internal dimensions of the respective units.
   4) External walls are One brick thick walls and all internal walls are half brick thick wall.
   5) The structure has got ground floor only, however access is provided to terrace using staircase.
   6) Assume suitable sizes of doors and windows. Locate doors and windows at suitable location.
   7) Locat suitable position of columns. All columns are of size 230 × 300 mm.
   8) R.C.C. slab is provided on all rooms.
   9) Use plinth height = 900 mm.
   10) Give detailed dimensions.




Line plan of a residential building.

figure No. 1.

All dimenssions are in mm.

Line AB is a section line

b) Draw a section for the above plan along line AB as shown in the plan. Assume suitable type and suitable dimensions for the footing. **8**

OR

8. a) Draw a detailed plan of a residential building with suitable scale. Use following data. **15**

| **Sr. No.** | **Name of Unit** | **Internal Area of Unit in $m^2$** | **No. of Units.** |
|---|---|---|---|
| 1 | Living room | 20 | 01 |
| 2 | Bed room | 18 each | 03 |
| 3 | Kitchen-cum-dining | 28 | 01 |
| 4 | W.C. | 2.4 | 01 |
| 5 | Bath | 3 | 01 |
| 6 | Stair-case | Min width of each flight 1.2m | 01 |
| 7 | Verandah | 8 | 01 |

b) Plan it as a ground floor only. It is a framed strucutre. Use suitable scale. In the above plan locate suitable positions of columns, doors and windows. **5**

9. a) A secondary school is to be planned in a city. Consider various principles of planning carefully. Use standard norms and rules to finalise the dimensions of various units. Use following data and draw a suitable line plan. **15**

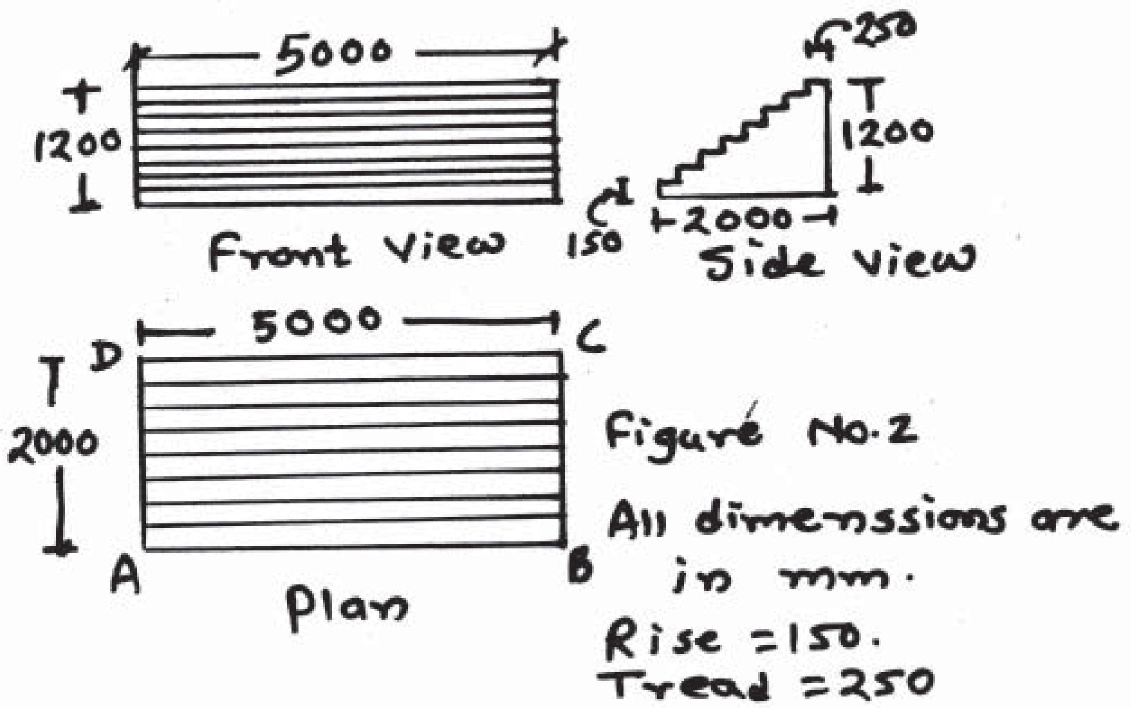
   1) Plan for 5th to 10th standard. Two classes for each standard. 40 students in each class.
   2) Capacity: 40 students in each division
   3) Structure: RCC framed (G+1)
   4) Use additional rooms for supporting facilities, like library, laboratory, common room, WC and Bath, drinking water facility, etc.

   Draw line plan only. Draw separate plan for ground and first floor.

OR

10. a) Draw a line plan for a primary health centre in rural area. Consider all units are located on ground floor only. Provide suitable space for all supplementary services.
Locate position of doors and windows. Use standard norms to finalise the dimensions of various units. **15**

11. a) Draw to scale 1 : 100 or any suitable scale, a two point perspective for the sketch of steps, shown in fig. 2 Tilt the plan at 45 degrees such that point A touches picture plane. Select station point vertically below the point A. Selcet station point 6 m below the picture plane. Select eye level at 1.5 m above ground level. Retain all construction lines. **15**
Take rise for the steps = 150 mm and tread = 250 mm.



**S.E. (Civil) (Semester – II) Examination, 2010**
**CONCRETE TECHNOLOGY**
**(2003 Course)**

Time : 3 Hours | Max. Marks : 100

***N.B. :*** *i) Answer Qu. No.* ***1*** *or Qu. No.* ***2****, Qu. No.* ***3*** *or Qu. No.* ***4****, Qu. No.* ***5*** *or Qu. No.* ***6****, from Section* ***I*** *and Qu. No.* ***7*** *or Qu. No.* ***8****, Qu. No.* ***9*** *or Qu. No.* ***10*** *and Qu. No.* ***11*** *or Qu. 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*** *indicate* ***full*** *marks.*

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

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

SECTION – I

1. a) Explain in detail dry process of manufacturing of cement with flow chart. **6**

b) Write short note on :

i) Rapid hardening cement

ii) Super sulphate cement **6**

c) Explain in detail procedure for Aggregate Crushing Value test. **6**

OR

2. a) Explain the wet process of manufacturing of cement. **6**

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

i) Bulking of sand

ii) Soundness of aggregate.

c) Write short note on classification of aggregates. **6**

**P.T.O.**

3. a) What are different tests to measure the workability of concrete ? Explain Slump test in detail. **6**

   b) What care should be taken while transporting and placing of concrete ? **5**

   c) What are the factors which affect the strength of concrete ? **5**

OR

4. a) Define :

   i) Workability,

   ii) Cohesion and

   iii) Segregation. **6**

   b) Write short note on elastic properties of concrete. **5**

   c) Write short note on factors affecting creep concrete. **5**

5. a) Define Mean strength, Variance, Standard deviation, Coefficient of Variance. **6**

   b) Explain in detail Indian recommended method of concrete mix design. **10**

OR

6. a) Explain the factors influencing the choice of mix proportion of concrete. **5**

   b) What are the different methods of mix proportioning ? **4**

   c) Explain in detail DOE method for mix design. **7**

SECTION – II

7. a) Write short note on light weight concrete. **6**

   b) Write short note on :

   i) Fibre reinforced concrete. **6**

   ii) High density concrete. **6**

OR

8. a) Write short note on Ferro cement. **8**

b) Write short note on : **10**

i) Under water concreting.

ii) Pumping of concrete.

9. a) What is admixture ? What are the functions of admixture and its different types ? **8**

b) Write short note on-Rebound hammer test and Pull out test. **8**

OR

10. a) What are the different types of construction chemicals ? **5**

b) Explain in detail Marsh Cone Test. **6**

c) Write short note on -Ultra sonic pulse velocity method. **5**

11. a) Write short note on : **10**

i) Carbonation of concrete

ii) Corrosion of reinforcement.

b) Write short note on-Symptoms and diagnosis of distress. **6**

OR

12. a) Write short note on : **10**

i) repair by jacketing

ii) Stitching of cracks.

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

i) Sulphate attack

ii) Acid attack.

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# S.E. (Civil) (Semester – III) Examination, 2010
## THEORY OF STRUCTURE – I
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** 1) *Attempt Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6*** *from Section* ***I*** *and Q.* ***7*** *or Q.* ***10****, Q.* ***8****, Q.* ***9*** *or Q.* ***11*** *or Q.* ***12*** *from Section* ***II****.*

2) *Answers to the* **two** *Sections should be written in* **separate** *answer books.*

3) **Neat** *diagram must be drawn* **wherever** *necessary.*

4) *Figure to the* **right** *indicates* **full** *marks.*

5) *Assume suitable data,* ***if necessary*** *and* ***clearly*** *state.*

6) ***Use*** *of cell phone is* ***prohibited*** *in the examination hall.*

7) ***Use*** *of electronic non programmable pocket calculator is* ***allowed****.*

SECTION – I

1. a) Determine static and kinematic degree of indeterminacy for the structure shown in Fig. 1 a. **6**

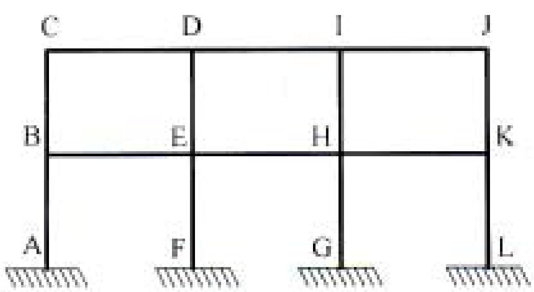


**Fig. 1 a (i) Rigid jointed frame**

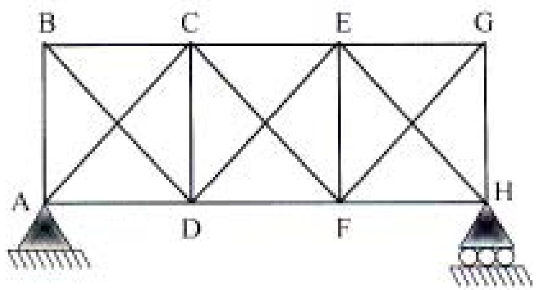


**Fig. 1 a (ii) Pin jointed Truss**

1. b) A cantilever AB of span 1.2 m is loaded with point load of 15 kN at free end B. Find the slope and deflection at B in terms of EI by Castigliano's first theorem. **6**

1. c) A weight of 10 kN falls through 20 mm on a collar rigidly attached to the lower end of a vertical bar of 6 m long and 800 $mm^2$ in c/s sectional area. Find the maximum instantaneous stress. Take E = 200 GPa. **6**

OR

2. a) Explain in brief, classification of structures with suitable examples. **6**

2. b) The bar A is of 40 mm diameter throughout its length, while the bar B has the same length of A but has diameter of 20 mm for middle one-third of its length and the remainder is of 40 mm diameter. Determine the strain energies stored in bar A and B in terms of LE. **6**

2. c) Determine the vertical and horizontal deflection at point C for the frame ABC loaded and supported as shown in Fig. 2 c. **6**

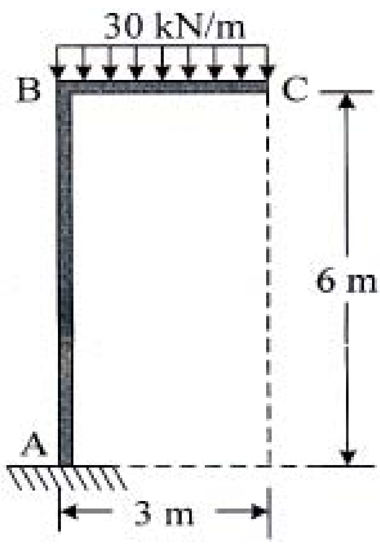


**Fig. 2 c**

3. a) Determine the fixed end moment for the fixed beam shown in Fig. 3 a. Draw shear force and bending moment diagram. **8**

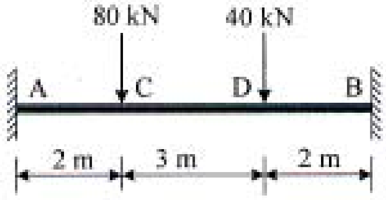


**Fig. 3 a**

3. b) Analyze the continuous beam loaded and supported as shown in Fig. 3 b by Castigliano's second theorem. Draw S F and B M diagram. **8**

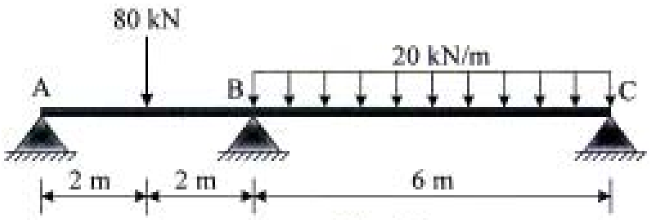


**Fig. 3 b**

OR

4. a) Analyze the continuous beam loaded and supported as shown in Fig. 3 b by theorem of three moment and draw shear force and bending moment diagram. **8**

4. b) Determine the reaction components for the frame loaded and supported as shown in fig. 4 b by Castigliano's second theorem and draw the B M diagram. **8**

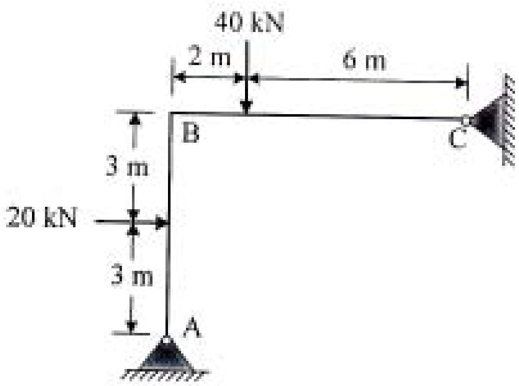


**Fig. 4 b**

5. The pin jointed cantilever truss shown in fig. 5 carries loads of 80 kN at D and F. the panels are 1000 mm long and 1000 mm high and the cross sectional areas in $mm^2$ are marked alongside each member. Determine the vertical displacement at D. Take E = 200 $kN/mm^2$. **16**

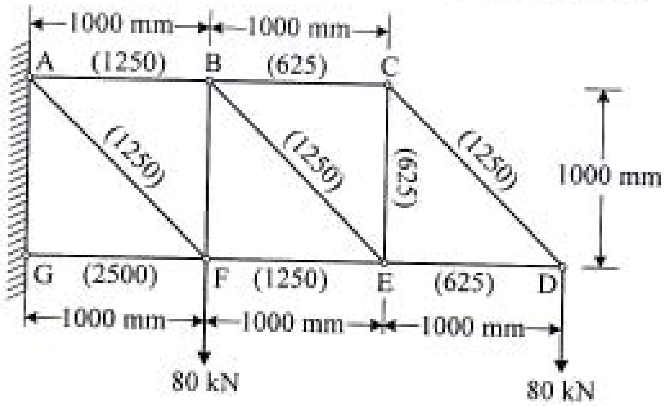


**Fig. 5**

OR

6. The pin jointed truss shown in fig. 6 supports vertical and horizontal loads of 140 kN and 70 kN respectively at the joint D. The ratio of length/area for all members is the same. Determine the forces in all members. **16**

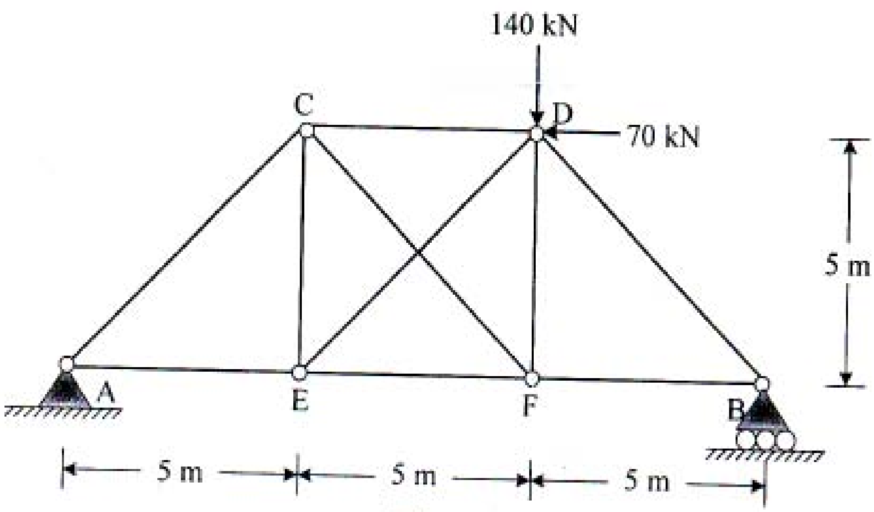


**Fig. 6**

SECTION – II

7. a) Determine the support moments for the beam loaded and supported as shown in fig. 7 a by slope deflection method. EI is constant. **8**

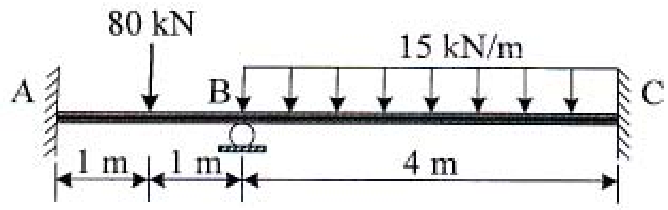


**Fig. 7 a**

7. b) Analyze the frame loaded and supported as shown in Fig. 7 b by slope deflection method. EI is constant. **10**

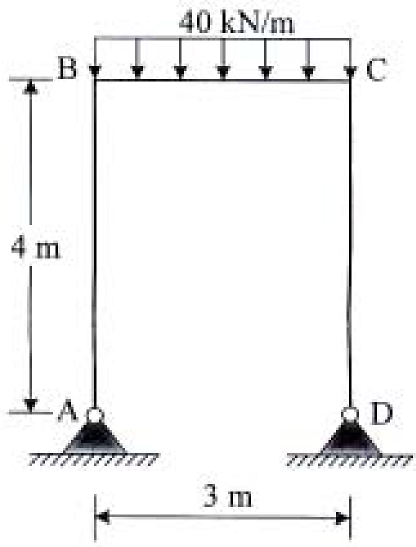


**Fig. 7 b**

OR

8. Analyse the continuous beam loaded and supported as shown in Fig. 8 by moment distribution method. **18**

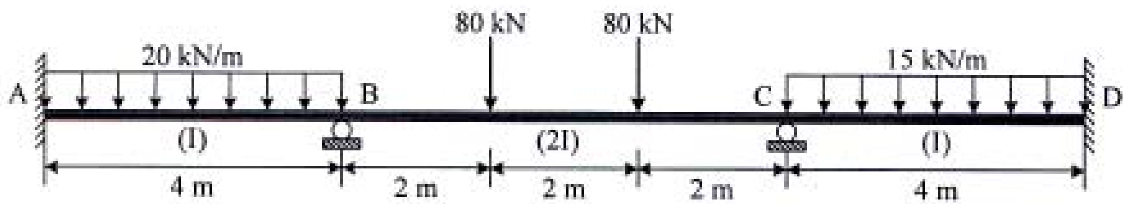


**Fig. 8**

9. a) Two point loads of 120 kN and 90 kN spaced at 2 m apart, cross a girder of 15 m span, from left to right, the smaller load leading. Using influence lines, find the shear force and bending moment at mid span when the leading wheel is 6 m from the right hand support. **8**

9. b) A uniform load of 25 kN/m, 6 m long, crosses a girder of 30 m span. Calculate the maximum shear force and bending moment at 10 m from the left support. Also construct the maximum shar force and bending moment diagram. **8**

OR

10. a) Draw the influence line diagram for the reaction of truss as shown in fig. 10 a. **8**

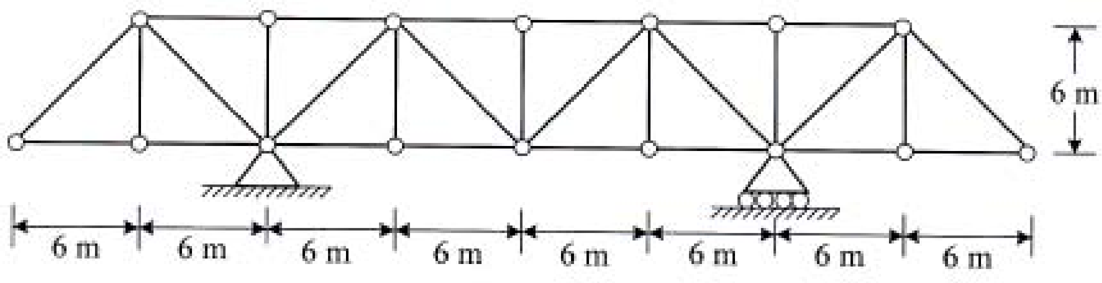


**Fig. 10 a**

10. b) Four point loads of 120, 160, 160 and 80 kN space equally apart at a distance of 2 m between consecutive loads, roll over a girder of 25 m span, from left to right with 120 kN load leading. Calculate the max, bending moment at 8 m from the left hand end. **8**

11. a) A three hinged parabolic arch, hinged at the crown and springings, has a horizontal span of 15 m with a central rise of 3 m. It carries a uniformly distributed load of 40 kN per horizontal meter of span over the left hand half of the span. Calculate the normal thrust, radial shear and bending moment at 5 m from the left hand hinge. **8**

11. b) A two hinged semicircular arch of uniform cross section is hinged at the abutments which are at the same level. It carries a point load W at the crown. Show that the horizontal thrust at the abutment is $W/\pi$. **8**

OR

12. a) A three hinged circular arch of span 40 m and central rise 5 m, carries a uniformly distributed load of 15 kN per horizontal meter run over the entire span and point loads of 100, 150 and 200 kN at horizontal distance of 15, 20 and 25 m from the left hand hinge. Calculate the horizontal thrust and the reaction at the hinge. **8**

12. b) Derive an expression for horizontal thrust H for a two hinged arch when subjected to bending moment at any section x. **8**

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**S.E. (Mechnical) (Semester – I) Examination, 2010**
**APPLIED THERMODYNAMICS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answers to the* ***two*** *Sections should be written in* ***separate*** *Answer books.*
*2)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
*3) Figures to the* ***right*** *indicates* ***full*** *marks.*
*4) Use of Mollier chart, steam tables, electronic pocket calculator is* ***allowed****.*
*5) Assume suitable data,* ***if necessary****.*

SECTION – I

UNIT – I

1. a) Discuss equivalence of Clausius and Kelvin-Plank statement. **6**

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

c) A house is to be maintained at a temperature of 20°C by means of a heat pump pumping heat from atmosphere. Heat losses through the walls of the house are estimated at 0.65 kW per unit of temperature difference between inside of the house and atmosphere.

i) If the atmospheric temperature is –10°C, what is the minimum power required to drive the pump ?

ii) It is proposed to use the same heat pump to cool the house in summer. For the same room temperature, the same heat loss rate and the same power input to the pump, what is the maximum permissible atmospheric temperature ? **6**

OR

2. a) State and explain Carnot theorem. Explain why Carnot cycle is not used as practical cycle. **8**

b) One kg of water at 300 K is first heated to 400 K by bringing it in contact with an inter-mediate heat reservoir at 400 K and then to 500 K as before. What will be the entropy change of the universe in this case ? **8**

UNIT – II

3. a) Derive characteristic equation of a perfect gas. **6**

b) Represent the following processes on P-V and T-S diagram for Ideal gas : **6**

i) Isothermal Compression

ii) Adiabatic Expansion

iii) Polytropic Compression.

c) 0.5 kg of air is compressed reversibly and adiabatically from 80 KPa and 60°C to 0.4 MPa and is then expanded at constant pressure to the original volume. Sketch the process on P-V and T-S diagrams and compute the work transfer and heat transfer. Take R = 0.287 KJ/KgK and $\gamma = 1.4$. **6**

OR

4. a) Derive an expression for Air standard efficiency of Diesel cycle. **8**

b) An amount of a perfect gas has initial conditions of volume 1 $m^3$, pressure 1 bar and temperature 18°C. It undergoes ideal diesel cycle operations, the pressure after isentropic compression being 50 bar and the volume after constant pressure expansion being 0.1 $m^3$. Calculate the temperatures at the major points of the cycle and evaluate the thermal efficiency of the cycle.

Assume, $\gamma = 1.4$ for the gas. **10**

UNIT – III

5. a) What are the limitations of separating calorimeter and throttling calorimeter ? **6**

b) Show the following processes on T-S & h-s diagram for steam : **4**

i) Isothermal Process

ii) Irreversible Adiabatic Process

iii) Reversible Adiabatic Process

iv) Throttling Process.

c) Determine the state of the steam in the following cases :

i) Pressure 10 bar and specific volume 0.185 $m^3$/kg

ii) Pressure 12 bar and temperature 200°C

iii) Pressure 15 bar and 2500 KJ/Kg of heat is required to generate steam from water at 0°C. **6**

OR

6. a) Explain with the help of T-S diagram, the effect of superheating, inlet pressure and condenser pressure on performance of Rankine cycle. **8**

b) In a Rankine cycle, the turbine inlet pressure is 6 MPa and the condenser pressure is 0.08 bar. Determine :

i) Moisture content at the turbine outlet

ii) The cycle thermal efficiency

Determine above parameters for the turbine inlet temperature of :

1) Saturation temperature at 6 MPa and

2) 450°C

Neglect pump work. **8**

SECTION – II

UNIT – IV

7. a) Define the following terms for reciprocating air compressor :

i) Isothermal efficiency. **2**

ii) Volumetric efficiency. **2**

iii) Mechanical efficiency. **2**

iv) FAD. **2**

b) A two stage, single acting reciprocating air compressor draws in air at 1 bar and 300 K. The delivery pressure is 12 bar. The intermediate pressure is ideal for minimum work and the intercooling is perfect. The index of compression is 1.3. Flow rate of air through the compressor is 0.15 kg/sec. Determine :

i) Power required to drive the compressor. **2**

ii) Saving in power compared to single stage. **2**

iii) Isothermal efficiency for multistage and single stage. **2**

iv) Heat rejected in intercooler if $C_p$ = 1 KJ/KgK and R = 0.287 KJ/KgK. **2**

OR

8. a) Deduce on expression for the optimum value of the intercooler pressure in a two stage compressor. Also state the assumptions made. **8**

b) A two stage air compressor compresses air from 1 bar and 20°C to 42 bar. If the law of compression is $PV^{1.35}$ = const. and the intercooling is complete to 20°C, find per kg of air :

i) The workdone in compressing

ii) The mass of water necessary for a abstracting the heat in the intercooler, if the temperature rise of the cooling water is 25°C. Take R = 287 J/KgK and $C_p$ = 1 KJ/KgK. **8**

UNIT – V

9. a) With schematic diagram, explain the use of orsat apparatus used in determining the percentage of flue gases. **8**

b) A sample of coal with C = 0.78; $H_2$ = 0.05; $O_2$ = 0.08; S = 0.02; $N_2$ = 0.02 and ash = 0.05 is burnt in a furnace with 50% excess air. The flue gases enter the chimney at 325°C and the atmospheric temperature is 15°C. Take Cp for $O_2$, $N_2$ and air = 1.008 KJ/KgK and Cp for $CO_2$ and $SO_2$ from the flue gas = 1.05 KJ/KgK. Assume that the heat carried away per Kg of moisture in flue gases is 2940 KJ. Calculate the quantity of heat carried away by the flue gases in KJ/Kg of coal. **8**

OR

10. a) Write short notes on the followings :

i) Bom calorimeter. **4**

ii) Alternative fuels. **4**

b) A blast furnace gas has the following volumetric composition.

$CO_2$ = 11%; CO = 27%; $H_2$ = 2% and $N_2$ = 60%. Find the theoretical volume of air required for the complete combustion of $1m^3$ of the gas. Find the percentage composition of dry flue gases by volume. Assume that air contains 21% of $O_2$ and 79% of $N_2$ by volume. **8**

UNIT – VI

11. a) Explain how it is advantageous using an economiser, air preheater and superheater in a steam power plant. **6**

b) Explain the procedure to draw Heat balance sheet for a boiler plant. **6**

c) A coal fired boiler plant consumes 400 Kg of coal per hour. The boiler evaporates 3200 kg of water at 44.S°C, into superheated steam at a pressure of 12 bar and 274.5°C. If the calorific value of fuel is 32760 KJ/Kg of coal; determine :

i) Equivalent evaporation "from and at 100°C" and

ii) Thermal efficiency of boiler. Assume spectre heat of superheated steam as 2.1 KJ/KgK. **6**

OR

12. a) Explain the concept of available and unavailable energy. **6**

b) Derive an expression for availability in nonflow system. **6**

c) 5 kg of air at 550 K and 4 bar is enclosed in a closed system :

i) Determine the availability of the system if the surrounding pressure and temperatures are 1 bar and 290 K respectively.

ii) If the air is cooled at constant pressure to the atmospheric temperature, determine the availability and effectiveness. **6**

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**S.E. (Mechanical) (Semester – I) Examination, 2010**
**STRENGTH OF MACHINE ELEMENT (2003 Course)**

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　Max. Marks : 100

***N.B.*** *: 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

UNIT – I

1. a) Derive the expression for thermal stresses in composite bars made of copper and steel. **4**

   b) Define the following terms : **4**

      i) Factor of safety.

      ii) Lateral strain.

      iii) Proportional limit.

      iv) Volumetric strain.

   c) A cylindrical bar is 20 mm diameter and 1000 mm long. During a tensile test it is found that the longitudinal strain is 4 times the lateral strain. Calculate the modulus of rigidity and the bulk modulus, if its elastic modulus is $1\times10^5$ N/mm$^2$. Find the change in volume, when the bar is subjected to a hydrostatic pressure of 100 N/mm$^2$ . **8**

OR

2. a) Derive the relation between modulus of elasticity and modulus of rigidity of a material within elastic range. **4**

b) A member ABCD is subjected to a point loads $P_1$, $P_2$, $P_3$ and $P_4$ as shown in fig. 1. Calculate the force $P_2$ necessary for equilibrium if $P_1$ = 45 kN $P_3$ = 450 kN, $P_4$ = 130 kN. Determine the total elongation of the member, assuming the modulus of elasticity to be $2.1\times10^5$ N/mm$^2$. **6**

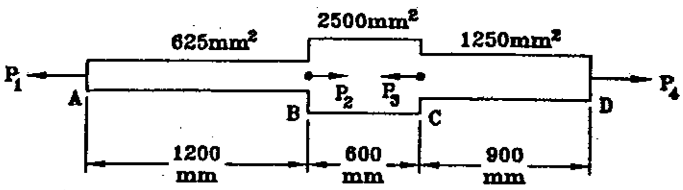


fig. 1 Q. 2 b)

c) The composite bar consisting of steel and aluminium components shown in fig. 2 is connected to two grips at the ends at a temperature of 60°C. Find the stresses in the two rods when the temperature falls to 20°C.

i) If the ends don't yield,

ii) if the ends yield by 0.25 mm.

Take $E_s = 2\times10^5$ N/mm$^2$, $E_a = 0.70\times10^5$ N/mm$^2$, $\alpha_S = 1.17\times10^{-5}$ per °C and $\alpha_a = 2.34\times10^{-5}$ per °C.

Areas of the steel and aluminium bars are 250 mm$^2$ and 375 mm$^2$ respectively. **6**

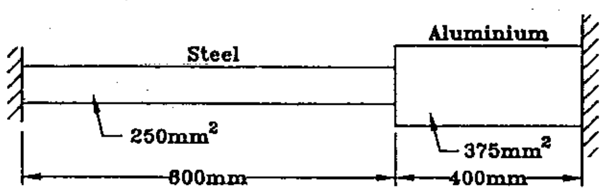


fig. 2 Q. 2 c)

UNIT – 2

3. a) State four assumptions made in theory of pure bending. **2**

b) Derive the expression for shear stress induced at a distance y from neutral axis in the cross-section of a beam subjected to shear force. **6**

c) A simply supported beam carries a uniformly distributed load of 30 N/mm intensity over the entire span of 1 metre. The cross section of the beam is a T-section having the dimension as shown in Fig. 3. Calculate maximum shear stress for the section of beam. **8**

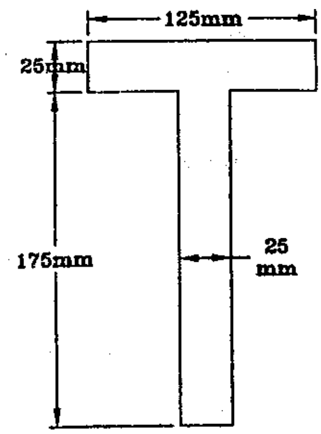

fig. 3 Q. 3 c)

OR

4. a) Explain the following terms in brief

i) Section modulus

ii) Moment of resistance. **4**

b) A cast iron beam section is of I- section with a top flange 80 mm×20 mm thick, bottom flange 160 mm×40 mm thick and the web 200 mm deep and 20 mm thick. The beam is freely supported on a span of 5 metres. If the tensile stress is not to exceed 20 N/mm$^2$, find the safe uniformly distributed load which the beam can carry. Find also the maximum compressive stress. **6**

c) The beam section shown in Fig. 4 is subjected to a shear force of 35 kN. Sketch the shear stress distribution for the section. **6**

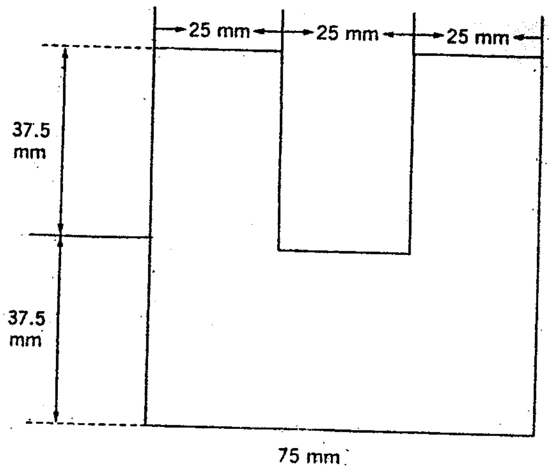


fig. 4 Q. 4 c)

UNIT – 3

5. a) Show that for cantilever of length $l$ carrying a point load at free end i.e. w, deflection at free end is given by :

$$Y = \frac{wl^3}{3EI}$$ **6**

b) A beam is 10 m long and is simply supported at the ends. It carries concentrated loads of 100 kN and 60 kN at distances of 2m and 5m respectively from the left end. Calculate the deflection under each load. Find also the maximum deflection.

Take $I = 18 \times 10^8$ mm$^4$ and $E = 200$ kN/mm$^2$. Use Macaulay's method. **12**

OR

6. a) Derive the equation

$$EI \frac{d^2y}{dx^2} = M$$

with usual notations and further write the relation of shear force and rate of loading. **6**

b) Give the relation between real beam and conjugate beam for the following cases : **6**

i) Roller support

ii) Free end

iii) Hinged support

iv) Overhanging support

v) Fixed end

vi) Deflection at any section.

c) Determine slope and deflection at free end of given cantilever in terms of EI. (Ref. Fig. 5). Use moment area method. **6**

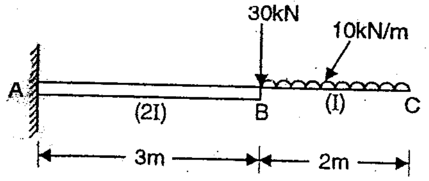


fig. 5 Q. 6 c)

SECTION – II

UNIT – 4

7. a) Explain the concept of principal planes and principal stresses. **4**

b) For the state of plane stress below, determine :

i) Principal stresses

ii) Location of principal planes.

iii) Maximum shear stress. **6**

Use Mohr's circle method.

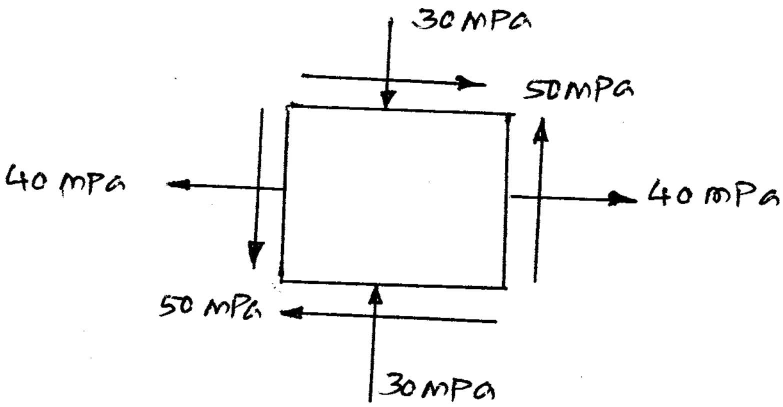


Fig.

c) Derive the expression for change in volume of thin cylindrical shell due to internal pressure. **6**

OR

8. a) What are various theories of elastic failure ? Explain Distortion-Energy theory. **4**

b) Two elastic bars of the same material and length, one of square cross-section of side 40 mm and the other of circular cross-section of diameter 40 mm absorb the same amount of strain energy, delivered due to gradually applied loads. Calculate the ratio of the induced stresses. Also calculate the ratio of applied loads. **6**

c) Determine the diameter of a bolt subjected to an axial pull of 10 kN together with a transverse shear force of 5 kN. Elastic limit in tension is 230 $N/m^2m$. Factor of safety is 3 and Poisson's ratio is 0.3. Use maximum shear stress theory. **6**

UNIT – 5

9. a) Derive Euler's formula for buckling load for column with both ends fixed. Also state the limitations of Euler's formula. **8**

b) Determine the diameter of a solid shaft which will transmit 275 kW at 300 rpm. The maximum shear stress should not exceed 30 $N/m^2m$ and twist should not be more than l° in a shaft length of 2 m. The modulus of rigidity of material is $1\times10^5$ $N/m^2m$. **8**

OR

10. a) A hollow cylindrical cast iron column is of 150 mm external diameter and 15 mm thickness, 3 m long. It is hinged at one end and fixed at the other. Find :

a) The ratio of Euler's and Rankine's load.

b) For what length, the critical load by Euler's and Rankine's formula will be equal ? **8**

b) A solid circular shaft and a hollow circular shaft with internal diameter $2/3$ of external diameter, are of the same material, of equal lengths and are required to transmit the same torque. Compare the weights of the shafts if the maximum shear stress developed in the two shafts are equal. **8**

UNIT – 6

11. a) Give the meaning of the following designation of material.

i) Fe 290

ii) SG 370/17

iii) 45 C8

iv) 20 Mn Cr 5

v) 30 Ni 4 Cr 1

vi) 10 C 8 S 10. **6**

b) State the advantages and drawbacks of cast iron as an engineering material. **6**

c) Explain stress concentration phenomenon and methods to reduce the effect of stress concentration. **6**

OR

12. a) Select suitable material for the following components and justify.

i) Turbine blade

ii) Piston.

iii) Connecting rod.

iv) Pulley.

v) Belt.

vi) Gasket. **6**

b) Explain :

i) Creep

ii) Endurance limit. **6**

c) Define the following properties of material :

i) Malleability.

ii) Resilience.

iii) Toughness.

iv) Rigidity.

v) Brittleness.

vi) Ductility. **6**

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**S.E. (Mechanical) (Semester – I) Examination, 2010**
**ENGINEERING MATHEMATICS – III**
**(2003 Course)**
**Common to Mech. S/W, Prod. and Prod. S/W, Ind. Engg.**
**Metallurgy Engg. (Sem. – II)**

Time : 3 Hours                                                    Max. Marks : 100

***Instructions :*** *i) Answers to the **two** Sections should be written in **separate** answer books.*
*ii) In Section – **I**, attempt Q. No. **1** or Q. No. **2**, Q. NO. **3** or Q. No. **4**, Q. No. **5** or Q. No. **6**.*
*iii) In Section – **II**, attempt Q. No. **7** or Q. No. **8**, Q. No. **9** or Q. No. **10**, Q. No. **11** or Q. No. **12**.*
*iv) **Neat** diagrams must be drawn **wherever** necessary.*
*v) Figures to the **right** indicate **full** marks.*
*vi) **Use** of non-programmable electronic pocket calculator is **allowed**.*
*vii) Assume suitable data, **if necessary**.*

SECTION – I

1. a) Solve **any three** of the following : **12**

i) $\frac{d^2y}{dx^2}+\frac{dy}{dx}=\frac{1}{1+e^x}$

ii) $(D^2-4D+3)\,y=x^3e^{2x}$

iii) $(D^2 + D + 1)\, y = x \sin x$

iv) $\frac{d^2y}{dx^2}+y = \sec x \tan x$ (Use method of variation of parameters).

v) $x^2\frac{d^3y}{dx^3}+3x\frac{d^2y}{dx^2}+\frac{dy}{dx}+\frac{y}{x}=\log x.$

b) Solve $\frac{dx}{dt}+x-y=e^t,\ 2y-\frac{dx}{dt}+\frac{dy}{dt}=e^t.$ **5**

OR

2. a) Solve **any three** of the following : **12**

i) $(D^2 + 5D + 6)\, y = e^{e^x}$

ii) $(D^5 - D)\, y = 12e^x + 8 \sin x - 2x$

iii) $(D^4 + 6D^3 + 13D^2 + 12D + 4)\, y = x^2 e^x$

iv) $(D^2 - 2D + 2)y = e^x \tan x$ (Use method of variation of parameters)

v) $(4x + 1)^2 \dfrac{d^2y}{dx^2} + 2(4x+1)\dfrac{dy}{dx} + y = 2x + 1$

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

3. a) A tightly stretched string with fixed end points x = 0 and x = $l$ is initially in a position given by $y(x, 0) = y_o \sin^3\left(\dfrac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement y at any distance x from one end at any time t (use wave equation $\dfrac{\partial^2 y}{\partial t^2} = c^2 \dfrac{\partial^2 y}{\partial x^2}$). **8**

b) System of differential equations of an undamped system is given by

$\ddot{y}_1 = -10y_1 + 4y_2$

$\ddot{y}_2 = 4y_1 - 4y_2$. **8**

Assuming that there is no friction, find the natural frequencies of the system and corresponding normal modes of vibration using matrix method. Initial conditions are $y_1(0) = 0$, $y_2(0) = 0$, $\dot{y}_1(0) = \sqrt{2}$, $\dot{y}_2(0) = 2\sqrt{2}$.

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) = $\frac{u_0 x}{l}$ for $0 \le x \le l$. **8**

b) A body weighing 20 Kg is hung from a spring. A pull of 40 Kg will stretch the spring to 10 cm. The body is pulled down to 20 cm below equilibrium position and then released. Find the displacement of the body from its equilibrium position in time t seconds, the maximum velocity and period of oscillation. **8**

5. a) Find the Fourier sine and Fourier cosine transform of f(n) = $e^{-x}$. **6**

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

i) $t^2 \sin 4t$

ii) $\frac{\cos at - \cos bt}{t}$

iii) $e^{-4t} \int_0^t t \sin 3t \, dt$. **6**

c) Using Laplace transform solve following differential equation :

$\frac{d^2 x}{dt^2} + 9x = 18t, \; x(0) = 0, \; x(\pi/2) = 0$. **5**

OR

6. a) Solve :

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

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

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

ii) $\frac{s^2}{(s^2+a^2)^2}$

iii) $\frac{s^3}{s^4 - a^4}$.

c) Find the Fourier transform of

$$f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a. \end{cases}$$ **5**

SECTION – II

VII. A) The two regression lines are 2x – y + 1 = 0 and 3x – 2y + 7 = 0. Find the mean of x and y. Also find the regression coefficients byx and bxy and the correlation coefficient. **6**

B) A candidate is selected for 3 posts in an interview. For the first post, there are 3 candidates, for the second post there are 4 candidates and for the third there are 2 candidates. What are the chances of his getting atleast one post ? **5**

C) A set of 5 coins is tossed 3200 times and the number of heads appearing each time is noted. The results are given below.

| **No. of heads** | **:** | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|
| **Frequency** | **:** | 80 | 570 | 1100 | 900 | 500 | 50 |

Test the hypothesis that the coins are unbiased.

[$\chi_5^2$ at 5% level of significance is 11.07]. **6**

OR

VIII. A) The Bombay Municipal Corporation installed 2000 bulbs in the streets of Bombay. If these bulbs have an average life of 1000 burning hours with a standard deviation of 200 hours, what number of bulbs might be expected to fail in the first 700 burning hours ?

Area for z = 1.5 is 0.067. **5**

B) The first 4 moments of a distribution about the values 5 are 2, 20, 40 and 50. From the given information obtain the first 4 central moments, mean, standard deviation and coefficient of skewness and Kurtosis. **6**

C) The following mistakes per page were observed in a book. Fit a Poisson distribution to the data.

| **No. of mistakes per page** | **:** | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|
| **No. of times mistakes occurred** | **:** | 211 | 90 | 19 | 5 | 0 |

**6**

IX. A) Find the directional derivative of $\phi = e^{2x} \cos yz$ at (0, 0, 0) in the direction of tangent to the curve x = a sint, y = a cost, z = at at $t = \frac{\pi}{4}$. **6**

B) Show that the vector field $f(r)\bar{r}$ is always irrotational and determine f(r) such that the field is solenoidal also. **6**

C) Prove that $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$. **4**

OR

X. A) Prove the following **(any two)** : **8**

i) $\bar{b} \times \nabla[\bar{a} \cdot \nabla \log r] = \frac{\bar{b} \times \bar{a}}{r^2} - \frac{2(\bar{a} \cdot \bar{r})}{r^4}(\bar{b} \times \bar{r})$.

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

iii) $\nabla^2 (r^n \log r) = [\, n(n+1) \log r + 2n + 1 ]\, r^{n-2}$ .

B) If $\bar{F}_1 = yz\bar{i} + zx\bar{j} + xy\bar{k}$ and $\bar{F}_2 = (\bar{a} \cdot \bar{r})\, \bar{a}$. Then show that $\bar{F}_1 \times \bar{F}_2$ is solenoidal. **4**

C) Find the constants a and b so that the surface $ax^2 - byz = (a + 2)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at the point (1, –1, 2). **4**

XI. A) Use Divergence theorem to evaluate $\iint_s \bar{F} \cdot d\bar{s}$ where $\bar{F} = 4x\bar{i} - 2y^2\bar{j} + z^2\bar{k}$ and s is the surface bounding the region $x^2 + y^2 = 4$, z = 0 and z = 3. **6**

B) Find the work done if a force $\bar{F} = 2x^2y\bar{i} + 3xy\bar{j}$ displaces a particle in the XY plane from (0, 0) to (1, 4) along a curve $y = 4x^2$. **5**

C) Using Green's theorem evaluate $\int_c (x^2 y dx + x^2 dy)$ where C is the boundary described counter clockwise of the triangle with vertices (0, 0), (1, 0) and (1, 1). **6**

OR

XII. A) Use Stoke's theorem to evaluate $\int_C \overline{F} \cdot d\overline{r}$ where $\overline{F} = y^2 \overline{i} + xy\overline{j} + xz\overline{k}$ and C is the bounding curve of the hemisphere $x^2 + y^2 + z^2 = 9$, $z > 0$ oriented in the positive direction. **6**

B) Evaluate $\int_C \overline{F} \cdot d\overline{r}$ where $\overline{F} = (2xy + 3)\overline{i} + (x^2 - 4z)\overline{j} - 4y\overline{k}$ where C is any path joining (0, 0, 0) to (1, –1, 3). **5**

C) Find the surfaces of equipressure in the case of steady motion of a liquid which has velocity potential $\phi = \log x + \log y + \log z$ and is under the action of force $\overline{F} = yz\overline{i} + zx\overline{j} + xy\overline{k}$. **6**

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# [3862] – 315

**S.E. (Semester – II) (Mechanical) (2003 Course) Examination, 2010**
**MANUFACTURING PROCESSES – I**

Time : 3 Hours | Max. Marks : 100

SECTION – I

1. a) Define the term "Pattern" and "Casting". Why casting is preferred over the other method of manufacturing ? State any one example of casting component. **4**
   b) Explain briefly multipiece pattern with neat sketch. **4**
   c) Describe briefly principle of centrifugal casting with suitable block diagram. **4**
   d) Differentiate between thermoplastic and thermosetting plastic material. **4**

OR

2. a) What is core and core prints ? Explain its use in moulding process with suitable example. **4**
   b) Describe in brief, principle of continuous casting with neat sketch. **4**
   c) Explain following defects of casting. **4**
      i) Mismatch  ii) Hot tear
   d) Compare injection and compression plastic moulding methods. **4**

3. a) Describe in brief working principle of wire drawing with simple block diagram. **4**
   b) Explain with neat sketch, 3-high mill and 4-high mill of rolling process. **4**
   c) Write down advantages and limitations of mechanical and hydraulic presses. **4**
   d) Describe principle of metal spinning sheet metal operation with neat sketch. **4**

OR

4. a) Compare forward and backward extrusion process with sketch. **4**
   b) What do you understand by term "forging" ? How does hand forging differ from machine forging ? **4**
   c) Explain following sheet metal operations with diagram. **4**
      i) Notching  ii) Perforating
   d) Explain following categories of forging : **4**
      i) Open die forging  ii) Closed die forging

5. a) Describe principle, working, and set up of ultrasonic welding with neat sketch. **10**

   b) Explain spot and seam type resistance welding with suitable set up diagram. **8**

OR

6. a) Describe principle, working and set up of laser beam welding with neat sketch. **10**

   b) Describe soldering and brazing processes. **8**

SECTION – II

7. a) With the help of neat sketches, explain briefly the various tool elements and tool angles in case of a single point cutting tool. **8**

   b) Explain taper turning operation by swivelling the compound rest with neat sketch. **8**

OR

8. a) List various accessories used in lathe machine, also explain any two with suitable diagram. **8**

   b) Explain taper turning operation by setting over the tail stock centre with neat sketch. **8**

9. a) Describe contruction, working of horizontal and vertical milling machine with block diagram. **10**

   b) Explain briefly following milling operation with diagram **8**

      i) Form milling ii) Gang milling

OR

10. a) Describe construction and working of radial drilling machine with neat sketch. **10**

    b) Explain briefly following drilling operation with diagram **8**

       i) Counterboring ii) Countersinking

11. a) Explain contruction and working of plain cylindrical grinder with suitable block diagram. **8**

    b) Describe "Honing" and "lapping" finishing process with example of it. **8**

OR

12. a) Explain internal and external type centreless grinder with neat sketch. **8**

    b) Describe buffing and burnishing finishing process with example of each. **8**

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# S.E. (Mechanical) (Semester – II) Examination, 2010
# THEORY OF MACHINES AND MECHANISMS – I
# (2003 Course)

Time : 4 Hours                                                                                    Max. Marks : 100

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

SECTION – I

1. a) Define kinematic pair and discuss various types of kinematic pairs with examples. **10**

   b) Define and explain with neat sketches the various types of constrained motions. **6**

OR

2. a) What do you understand by an inversion of a kinematic chain ? Discuss various types of inversions of a quadric kinematic chain. **8**

   b) Determine the degree of freedom of the mechanisms shown in Fig. 1. **8**

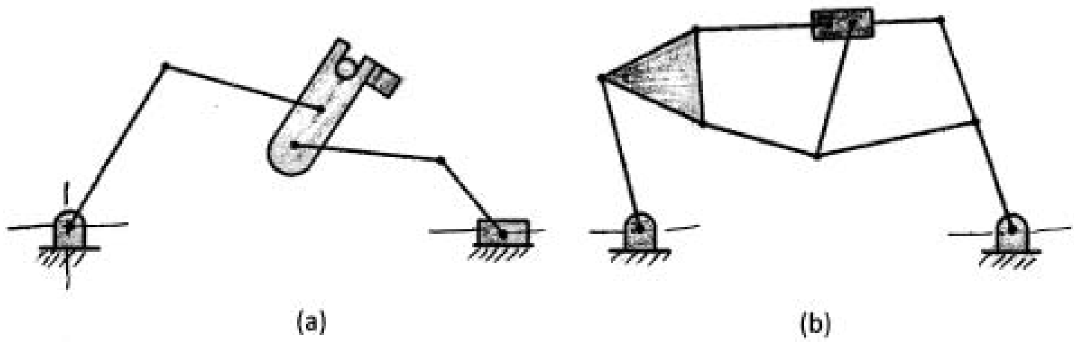



Fig 1

3. a) Draw a neat sketch and explain working of a Pantograph, Prove that the mechanism used for Pantograph satisfies the required condition. **6**

   b) What do you understand by steering gears ? State the condition under which the pure rolling motion of wheel can be obtained when the vehicle take a turn. **6**

   c) Give a neat sketch and explain working of a Indexing mechanism. **4**

OR

4. a) Draw a neat sketch and explain working of any one approximate straight line generating Mechanism. **6**

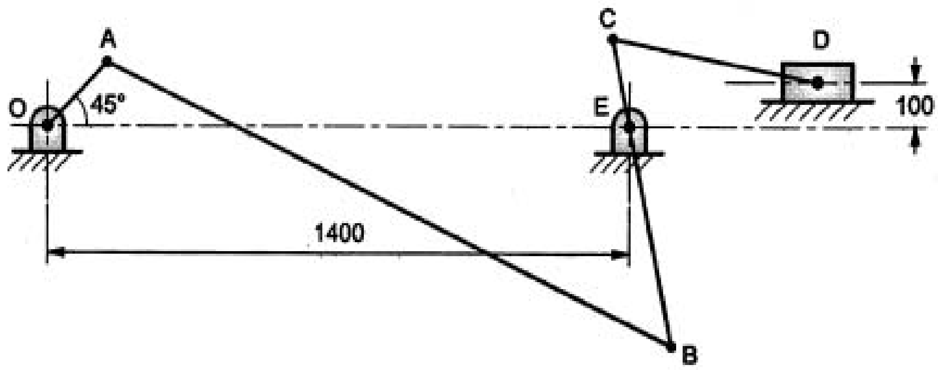
   b) The driving shaft of a Hooke's joint runs at a uniform speed of 260 rpm and angle $\alpha$ between the shafts is 20°. The driven shaft has a attached mass of weight 55 kg at a radius of gyration of 20 cm. Find :

      i) If a steady torque of 25 kg-m resists rotation of the driven shaft, find the torque required at the driving shaft when $\theta$ =45°.

      ii) At what value of $\alpha$ will be total fluctuation of speed of the driven shaft be limited to 30 rpm. **10**

5. a) Discuss various types of instantaneous centre with the help of example. **4**

b) Find velocity of D and angular velocity of link AB, for the mechanism shown in Fig. 2 various dimensions are : OA = 200 mm, AB = 1500 mm, BC = 700 mm, CD = 500 mm, BE = 500 mm. Assume crank OA rotates uniformly at 150 rpm clockwise. **14**




**(All dimensions are in mm)**

**Fig. 2**

OR

6. a) State and explain Kennedy's theorem. **4**

b) Define "Body centrode" and "Space centrode". **6**

c) Fig. 3 shows a toggle mechanism. The length of links are : OA = 100 mm, AB = 250 mm, BC = 300 mm, BD = 350 mm. The crank OA rotates at a speed of 180 rpm in clockwise direction. Draw velocity diagram using velocity image principle.

Determine :

i) Velocity of slider D

ii) Angular velocity of link BD. **8**

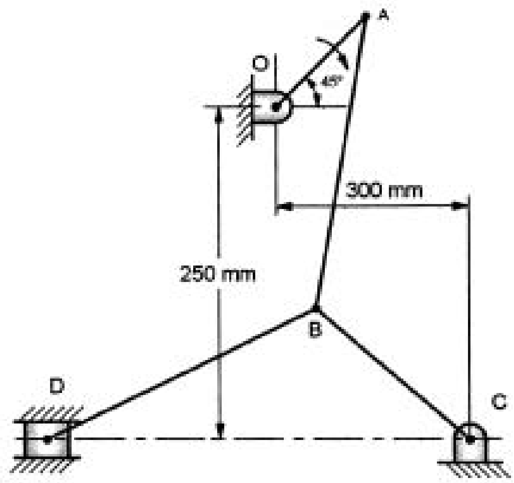



**Fig. 3**

SECTION – II

7. a) Explain the complex algebra method a velocity and acceleration analysis of a slider crank mechanism. **6**

b) A reciprocating engine has a crank 60 mm long, and the connecting rod is 240 mm, long. It runs at 1200 r.p.m. Find by analytical method :

i) Maximum velocity of piston and the corresponding crank angle.

ii) Acceleration of piston when the crank is at 120° past I.D.C. **4**

c) The length of crank in an I.C. Engine mechanism is 20 cm while the obliquity ratio is 4. The angular acceleration of the connecting rod at the instant when crank makes 45° with TDC position is 162 rad/$s^2$. Using Klien's construction method find :

1) The Engine speed in r.p.m.

2) The acceleration of piston.

3) Acceleration of midpoint of connecting rod. **6**

OR

8. a) Derive the loop closure equation for four bar mechanism. **4**

b) For the mechanism shown in the Fig. 4 find the acceleration of the slider B. Angular velocity of OA is 18 rad/sec. **12**

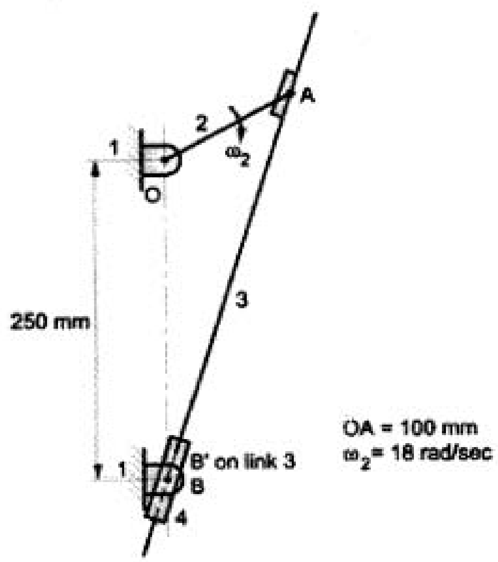



**Fig. 4**

9. a) Explain the concept of two point mass dynamically equivalent system. **4**

b) Write a short note on : Trifilar suspension method. **6**

c) A rigid link, 500 mm long, has mass 2 kg and radius of gyration 200 mm. Replace this link by dynamically equivalent system of two concentrated masses located at the ends of the link. **6**

OR

10. a) Explain inertia of geared system. **4**

b) The following data relate to horizontal reciprocating engine

Mass of reciprocating parts = 50 kg, Stroke length = 200 mm,

Speed of engine = 1000 rpm clockwise, Connecting rod mass = 35 kg,

Length between centres = 425 mm, Distance of C.G. from big end centre = 170 mm,

Time for 25 oscillations when suspended at small end centre = 29 sec.

Determine analytically the inertia torque on crank shaft when piston has moved 25% of outstroke from I.D.C. **12**

11. a) Explain Graphical synthesis of four bar mechanism. **6**

b) A four bar mechanism is used to generate the function y = 1/x for the range $1 \le x \le 3$. Find the three precision position from Chebyshev spacing, if the initial values of the crank angle and follower angle is 30° and 200° respectively. Take $\Delta\theta = \Delta\phi = 90°$. Find the corresponding values of $\theta$ and $\phi$. **12**

OR

12. a) Explain Path generation, Function generation and Motion generation. **6**

b) A four bar mechanism with input link '$l_2$' and output link '$l_4$' angles $\theta$ and $\phi$ for three successive positions are given in the table below :

| | **1** | **2** | **3** |
|---|---|---|---|
| **$\theta$** | 55 | 25 | –25 |
| **$\phi$** | 110 | 40 | –50 |

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**

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# S.E. (Mechanical) (Semester – II) Examination, 2010
## ELECTRICAL TECHNOLOGY
## (2003 Course)
## (Common to Mech. S/W, Industrial, Production, Prod. S/W)

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 electronic pocket calculator is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Draw and explain, electrical and mechanical characteristic of shunt, series and compound d.c. motors. **9**

b) A 200 V d.c. shunt motor draws 50A current when running at 1000 r.p.m. If armature and field winding resistances are $0.1\Omega$ and $100\Omega$ respectively, determine what value of resistance must be inserted in the armature circuit to reduce the speed to 800 r.p.m. Assume, the torque of the motor varies as the square of the speed. **9**

OR

2. a) Explain the speed control of d.c. shunt motor by armature voltage control and field control with the help of diagram and graph. **9**

b) A 200V d.c. series motor has total resistance between its terminals $1.5\Omega$ and draws current of 30A at certain load and speed. Find the extra resistance to be added in series with the motor circuit to reduced speed to 60% of its original value.

Note : Torque produced by the motor is proportional to the cube of the speed. **9**

3. a) Explain with the help of neat circuit diagram and phasor diagram, how one wattmeter is used to measure reactive power of 3 phase balance load circuit. **8**

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

i) Luminous intensity

ii) Glare

iii) Utilization factor

iv) Depreciation factor. **(4×2=8)**

OR

4. a) State and explain in context with illumination :

i) Inverse square law

ii) Lambert's cosine law. **(4×2=8)**

b) Two wattmeter method is used for power measurement of a three phase, star connected balance load with impedance of $(12 + j18)\Omega$ per phase operated from three phase, 50 Hz, 440V A.C. supply. Find the readings on the two wattmeter. **8**

5. a) Explain with diagram and graph, how synchronous impedance method is used to determine regulation of an alternator. **8**

b) OC & SC tests are performed on a 10 KVA, 125 V/250 V, 50 Hz, single phase transformer with following results :

OC Test : 125 V, 0.6A, 50W (on L.V. side)

SC Test : 15 V, 30 A, 1000 W (on H.V. side)

Determine :

i) Components of no load current

ii) Regulation at full load 0.9 leading p.f. **8**

OR

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

i) Current transformer

ii) Potential transformer.

b) A three phase, 6 pole alternator runs at 1200 rpm has flux per pole of 0.1 Wb sinusoidally distributed. Its stator has 54 slots with 10 conductors per slot. If coil span is 160°, calculate emf induced per phase and emf induced between the terminals of this star connected alternator. **8**

SECTION – II

7. a) With the help of neat diagram explain, constructional feature, advantages, disadvantages, applications of :

i) squirrel cage

ii) wound rotor of three phase induction motor. **9**

b) Obtain expression for full load torque of three-phase induction motor and condition for maximum torque under running condition. Also sketch the torque slip characteristic of three phase induction motor. **9**

OR

8. a) State the need of starter for three phase induction motor. List the various starters used in practice and explain any one of them with the help of diagram. **9**

b) A three phase, 4 pole, 50 Hz, 30 KW induction motor runs at 1410 rpm at full load. If mechanical losses are 950 Watt and stator losses are 1.55 KW determine :

i) full load slip

ii) rotor Cu loss

iii) stator input

iv) efficiency at full load

v) net torque developed. **9**

9. a) With the help of neat circuit diagram explain construction, working, advantages, disadvantages and applications of shaded pole single phase motor. **8**

b) What is stepper motor ? How it is different from conventional motors ? What are its types ? Explain any one type construction with applications. **8**

OR

10. a) Explain construction, characteristic features and applications of universal motor. **8**

b) Why single phase induction motor is not self starting ? List the various split phase techniques used in practice. Explain any one technique in detail with diagram. Also state the applications of the same. **8**

11. a) State and explain various selection criterian on which particular electrical motor is selected as a drive for industrial applications. **8**

    b) State the properties of good heating elements used in resistance heating. Also discuss procedure in detail used for heating element design in case of circular and rectangular shape of heating element. **8**

OR

12. a) Write a short note on maintenance procedure adopted for electrical equipments such as transformers and motors in industry. **8**

    b) With the help of neat diagram explain working of dielectric heating. State the advantages, disadvantages and applications of the same heating method. **8**

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**S.E. (Mech.) (Semester – II) Examination, 2010**
**METALLURGY**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section **I** and Q. **7** or Q. **8**, Q. **9** or Q. 10 Q. **11** or Q. **12** from Section **II**.*
*2) 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 – I

1. A) Classify engineering materials. Explain about types and role of polymers in modern engineering industry. **6**
B) Differentiate between slip and twinning. **6**
C) Define 'Line imperfection'. Explain about types of line imperfections. **6**

OR

2. A) Differentiate between cold working and hot working. **6**
B) With the help of neat sketches explain about the defect in crystals. **6**
C) Define 'strain hardening'. Explain it on the basis of slip and dislocation movement. **6**

UNIT – II

3. A) Which factors contribute to 'fatigue failure' ? Explain about measures that improve the fatigue life of the component. **6**
B) Write a note on 'Impact Tests'. **6**
C) Write step by step procedure of Liquid Penetrant Test. What are its limitations ? **4**

OR

4. A) Draw a typical creep curve and explain about various stages of creep. Explain why coarse grained materials are preferred for very high temperature applications. **6**

   B) With the help of neat sketches explain any two techniques of ultrasonic testing. **6**

   C) Write short notes on :

   i) Radiography

   ii) Magnetic Particle Testing. **4**

UNIT – III

5. A) Draw neatly labeled Fe-$Fe_3c$ diagram and explain about phases, critical temperatures and various reactions associated with it. **8**

   B) Write short notes on (**any 2**) : **8**

   i) Types of stainless steels

   ii) Non-equilibrium cooling of steels.

   iii) Structure property relationship.

OR

6. A) Draw typical microstructures of 0.2, 0.4, 0.8 and 1.0% plain carbon steels. Comment on amount of phases present and their influence on mechanical properties of respective steel. **8**

   B) Describe the following in brief (**any 2**) : **8**

   i) Effect of ‘Manganese’ and ‘Chromium’ addition on steel.

   ii) Creep resisting steels.

   iii) Classification of tool steels.

   iv) Heat treatment for high speed tool steel.

## SECTION – II

UNIT – IV

7. A) Explain step by step procedure for drawing T-T-T curve of eutectoid steel. Also draw the same. **6**

   B) Describe merits of case hardening treatments over through hardening treatments. Explain gas carburising treatment and state its advantages. **6**

   C) With the help of neat diagram explain Flame Hardening and Induction Hardening. **6**

OR

8. A) Enlist quenching mediums in the order of increasing severity of quenching. Explain the stages of 'heat removal' during quenching. **6**

   B) Differentiate between hardness and hardenability. Explain any (one) method for evaluation of hardenability of steel. **6**

   C) Explain with neat sketches 'any three' of the following :

      i) Patenting

      ii) Martempering

      iii) Austempering

      iv) Normalising. **6**

UNIT – V

9. A) Compare cast-irons and steels on the basis of mechanical properties and applications. **6**

   B) Enlist the properties bearing material must possess. Give examples of two non-ferrous bearing materials and their compositions. **6**

   C) Explain the influence of carbon and silicon addition on the structure and properties of cast iron. **4**

OR

10. A) How is nodular cast iron produced ? State its advantages over gray cast iron. Draw microstructure of nodular cast iron. **6**

B) Give typical composition, important properties and applications of following (**any 2**) : **6**

i) Naval Brass

ii) Gun metal

iii) Cartridge brass

iv) Invar.

C) Explain the method of manufacturing ferritic malleable cast iron. **4**

UNIT – VI

11. A) What necessiates use of self lubricated bearings ? Explain working of self lubricated bearings. **6**

B) Explain temperature measurement by seger cones and tempil sticks. **6**

C) Describe the steps involved in manufacturing powder metallurgical component. **4**

OR

12. A) State the merits and limitations of powder metallurgy over other manufacturing processes. **6**

B) Write short notes on **any two** of the following : **6**

i) Disappearing filament pyrometer

ii) Sintering

iii) Resistance pyrometer.

C) Explain powder conditioning operations in powder metallurgy. **4**

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**[3862] – 321**

**S.E. (Mechanical Sandwich) (Semester – I) Examination, 2010**
**STRENGTH OF MACHINE ELEMENTS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

UNIT – I

1. a) A specimen of material having original diameter 13 mm and gauge length 50 mm is tested under tension, the final diameter being 9 mm at fracture and the gauge length at fracture being 70 mm. During testing it is found that yielding occurs at a load of 35 kN (lower yield point) and the maximum load the specimen can take is 60 kN (ultimate load) . The specimen breaks at 30 kN. Find

1) Yield strength
2) Ultimate tensile strength
3) The breaking strength
4) % elongation
5) % reduction in area.
6) Youngs modulus if load corresponding to any point on linear portion of stress strain curve is 20 kN with corresponding extension 0.0315 mm. **8**

b) Define and explain following :

1) Poisson's ratio

2) Modulus of rigidity. **6**

c) Explain what is proof stress ? **2**

OR

2. a) Derive a relation between Bulk modulus (K) and Young's modulus 'E'. **8**

b) A metal bar 50 mm × 50 mm section, is subjected to an axial compressive load of 500 kN. The contraction of a 200 mm gauge length is found to be 0.5 mm, and the increase in thickness 0.04 mm. Find the value of Young's modulus and Poisson's ratio. **6**

c) Draw and comment on stress strain diagram for ductile and brittle material. **2**

UNIT – II

3. a) Derive a flexural formula used for bending stress. **8**

b) Find the M.I. of a T-section shown in figure 1 about X-X axis passing through CG of the section. **6**

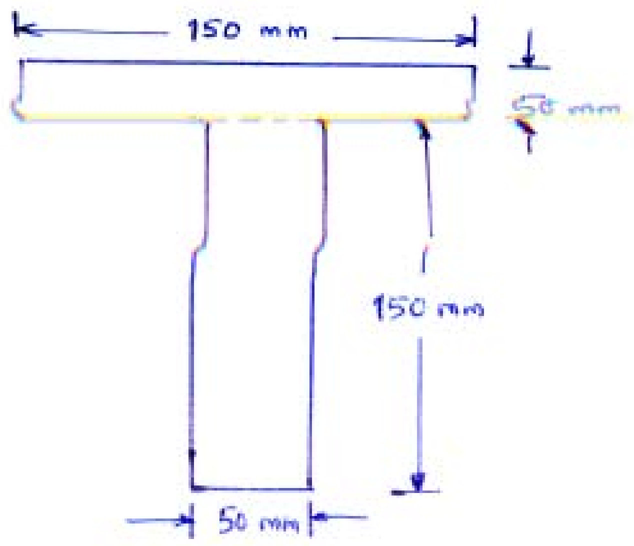


Figure 1

c) Write assumptions made while deriving the flexural formula. **4**

OR

4 a) A beam of square section is used as a beam with its diagonal horizontal. Find maximum shear stress in the cross section of the beam. Also sketch the shear stress distribution across the depth of the section. **6**

b) Two wooden planks 150 mm×50 mm each are connected to form a T-section of a beam (Refer Figure 1). If a moment of 3.4 kN-m is applied around the horizontal neutral axis, including tension below the neutral axis, find the stresses at the extreme fibers of the cross section. Also calculate the total tensile force on the cross section. **8**

c) Discuss briefly the practical shear stress distribution at fange and web junction. **4**

UNIT – III

5. a) For overhang beam shown in Fig. 2. draw bending moment and shear force diagrams. Loads are in kN and length in meter. **10**

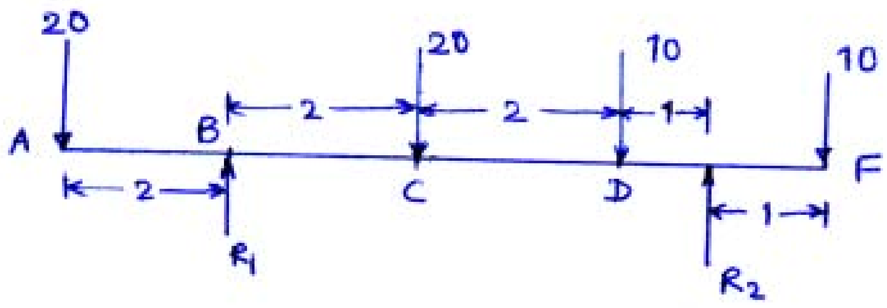


Fig. 2

b) Explain point of contraflexure with suitable diagram. **6**

OR

6. a) Draw the complete shear force and bending moment diagram for overhang beam shown in figure 3 below.

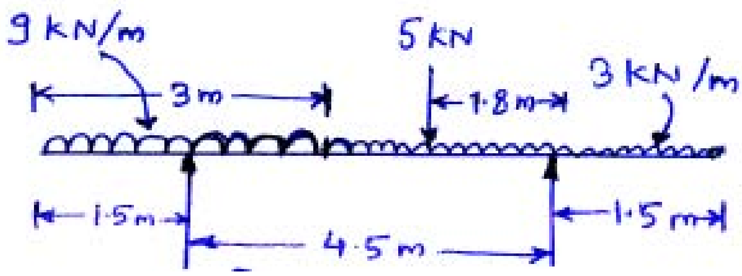


Figure 3

Also find the magnitude of maximum positive and negative moment. **8**

b) A beam of 5 m long and simply supported at each end has a UDL of 1000 N/m extending from left end to a point 2 m away. There is also a clockwise couple of 1500 N-m applied at the centre of the beam.

Neglecting weight of beam draw S.F. and B.M. diagrams and find the maximum bending moment. **8**

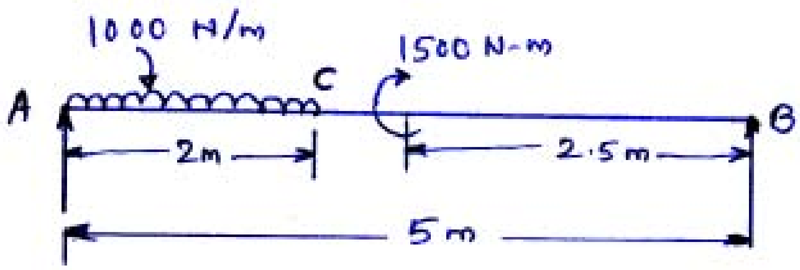


Figure 4

SECTION – II

UNIT – IV

7. a) Explain the following in short : **6**

i) Torsional stiffness.

ii) Statically indeterminate shaft.

iii) Torsional flexibility.

iv) Torsional rigidity.

b) Cantilever beam of length 'L' and subjected to uniformly distributed load 'w' over its entire length. Determine slope and deflection at face end. **6**

c) Design the diameter of solid circular shaft to transmit 50 kw. Power rotating at 100 rpm. Maximum torque is likely to exceed mean torque by 20% . Maximum permissible shear stress is 60 MPa. Also calculate the angle of twist for a length of 3 m. Take G = 80 GPa. **6**

OR

8. a) Derive the equation : **6**

$$EI\frac{d^2y}{dx^2} = M$$

with usual notations and further write the relations of shear force and rate of loading.

b) For the simply supported machine element supported as A and B as shown in fig. 5 find :

i) slope at C and D

ii) deflection at C and D

iii) maximum deflection in portion AB. Assume EI constant. **6**

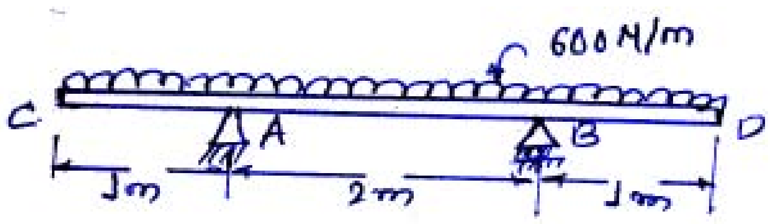


fig. 5

c) Two shafts are made of same material . One is hollow with outside diameter 90 mm and inside diameter 30 mm. The other is solid with 90 mm diameter. Each shaft is to transmit 50 kW power. Compare maximum shear stresses in the shaft at 3 hertz. **6**

UNIT – V

9. a) A square pin is required to resist a pull of 40 kN and shear force at 15 kN. Derive a suitable section according to strain energy theory. Maximum tensile stress is 350 MPa and Poisson's ratio is 0.3, factor of safety 2.5. **6**

b) Explain weighted point method. **6**

c) Define the following terms : **4**

i) Creep

ii) Hardness

iii) Fatigue

iv) Ductility.

OR

10 a) A steel tube has a mean diameter of 100 mm and a thickness of 3 mm. Calculate the torque which can be transmitted by the tube with factor of safety of 2.25. If the criterion of failure is

a) Maximum shear stress

b) Maximum strain energy.

The elastic limit of the steel in tension is 225 $MN/m^2$ and Poisson's ratio is 0.3. **6**

b) Select the suitable material for the following components and justify

i) Boiler shell

ii) Flywheel

iii) Connecting rod

iv) Turbine blade

v) Gasket

vi) Bushes for sliding contact bearing. **6**

c) Give the meaning of the following designation of material

i) 10 C4 ii) 10C8S10

iii) FG 300 iv) 20 MnCr 5. **4**

UNIT – VI

11. a) A thin spherical tank of 10 m diameter is subjected to internal gas pressure of 4.8 MPa. Compute the wall thickness of tank assuming yield stress of 480 MPa and factor of safety 2.50. Also find increase in volume of tank. Take v = 0.30 and E = 208 GPa. **6**

b) A weight 5 kN falls axially from a height of 1 m on a vertical wooden pole 6 m long and 300 mm diameter fixed at lower end. Determine maximum shear stress in the pole assuming weight of the pole to be 4 kN. Assume $E_{wood} = 10 \times 10^3$ $N/mm^2$. **6**

c) State the assumptions made in Euler's theory. State the limitation of Euler's formula for buckling load. **4**

OR

12. a) A circular tube of 3 m length was cut into two equal pieces of length 1.5 m each. One of them was tested in universal testing machine. It was found to elongate by 2.48 mm for axial tension of 112 kN. Outer and inner diameter of tube are 40 mm and 20 mm respectively. The other piece is now to be used as a column with one end fixed and other hinged. Determine axial load this column can carry. **6**

b) A metal bar 10 mm × 10 mm in cross section is 400 mm long. As axial force of 140 kN produces strain energy of 537 kNmm in the bar. If the bar is turned down to a circular rod of 10 mm diameter find :

i) Modulus of elasticity of the material.

ii) Change in strain energy stored for same axial force. **6**

c) A thin cylindrical pressure vessel of 500 mm diameter is subjected to an internal pressure of 2 $N/mm^2$. If the thickness of the vessel is 20 mm. Find the hoop stress longitudinal stress and maximum shear stress. **4**

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**S.E. (Mechanical S/W) (Semester – I) (2003 Course) Examination, 2010**
**THERMAL ENGINEERING – I**

Time : 3 Hours Max. Marks : 100

SECTION – I

UNIT – I

1. a) Explain orsat apparatus with a neat sketch. **8**

   b) A fuel having chemical formula $C_7H_{16}$ is burnt with 10% excess air. Assume 90% carbon is burnt to $CO_2$ and remaining to CO. Determine volumetric analysis of dry fuel gases. **8**

OR

2. a) Explain the following properties of fuel
   i) Flash point
   ii) Pour point
   iii) Fire point. **6**

   b) Write a short note on : Alternative fuels for I.C. engine. **6**

   c) Why is viscosity important property in case of C.I. engine fuels ? **4**

UNIT – II

3. a) Explain – Mollier diagram. **4**

   b) Compare – Carnot and Rankine cycle along with T-S diagram. **4**

   c) Explain the following terms :
   i) Dry steam
   ii) Superheated steam
   iii) Critical point
   iv) Degree of superheat
   v) Sensible heat
   vi) Saturation temperature
   vii) Latent heat
   viii) Wet steam. **8**

OR

4. a) Explain combined separating and throttling calorimeter with a neat sketch. **8**

   b) A steam power plant operates on Rankine cycle. It receives steam from boiler at 30 bar and 250°C. Steam is exhausted into a condenser at 0.5 bar. Condensate is returned to the boiler by a feed pump. Calculate :

      i) Heat supplied

      ii) Net work

      iii) Rankine efficiency

      iv) S.S.C. **8**

UNIT – III

5. a) Explain :

      i) Boiler efficiency

      ii) Equivalent of evaporation

      iii) Factor of evaporation. **6**

   b) Write a short note on : Boiler draught. **6**

   c) Explain spring loaded safety valve with a neat sketch. **6**

OR

6. a) Classify boilers in details. **4**

   b) Explain air preheater with a neat sketch. **4**

   c) Determine equivalent of evaporation from and at 100°C for a boiler which receives water at 60°C and produces steam at 12 bar and 300°C. Steam generation rate is 16000 kg/hr. coal is burnt at the rate of 1800 kg/hr. The C.V. of coal is 34,750 kj/kg. Find thermal efficiency of a boiler.

   If thermal efficiency is increased by 5% due to the use of an economiser, find the savings in coal consumption per hour. **10**

SECTION – II

UNIT – IV

7. a) What are the limitations of the first law of thermodynamics ? Illustrate with examples. **4**

b) Define :

i) Heat engine ii) Heat pump iii) Refrigeration. **3**

c) A reversible engine is supplied with heat from two constant temp. sources at 900 k and 600 k and rejects to a sink at 300 k. Assuming the engine to execute a number of complete cycles while developing 70 kw and rejecting 3200 KJ/min, calculate the heat supplied by each source and efficiency of the engine. **9**

OR

8. a) Write a short note on : Principle of increase of entropy. **4**

b) State and explain various statements of second law of thermodynamics. **6**

c) In a cross-flow heat exchanger, 50 kg of water per minute is heated from 20°C to 60°C by passing hot exhaust gases from boiler at 200°C. The gas flow rate is 100 kg/min, determine the net change of entropy of the system considering the heat exchanger as an isolated system.

Take $Cp_g$ = 1 KJ/kgk and $Cp_w$ = 4.18 KJ/kgk. **6**

UNIT – V

9. a) Mention the various assumptions made in air standard cycle analysis. **6**

b) Derive an expression for air standard efficiency for dual cycle. **10**

10. a) Compare otto and diesel cycle. **4**

b) In an air standard diesel cycle, compression begins at 1 bar and 300 k. The compression ratio is 16. Heat added per kg of air is 2500 KJ. Find :

i) Fuel cut-off ratio

ii) Temp. and pressure at the end of expansion

iii) Thermal efficiency

iv) Mean effective pressure

v) Power output if mass flow rate of air is 0.1 kg/sec.

Take R = 0.286 KJ/kgk and Cp = 1.0 KJ/kgk. **12**

UNIT – VI

11. a) Explain – Methods of cooling of I.C. engines. **6**

b) Explain – Battery ignition system. **6**

c) Explain – Simple carburetter. **6**

OR

12. a) Define the following :

i) B.P.

ii) BSFC

iii) I.P.

iv) Brake thermal efficiency. **4**

b) A single cylinder 4 stroke diesel engine gave the following results while running on full load :

Area of indicator card = 300 $mm^2$

Length of diagram = 40 mm

Spring constant = 1 bar/mm

Speed of the engine = 400 rpm

Load on brake = 370 N

Spring balance reading = 50 N

Dia. of brake drum = 1.2 m

Fuel consumption = 2.8 kg/hr

C.V. of fuel = 41800 KJ/kg

Dia. of cylinder = 160 mm

Stroke = 200 mm

Calculate :

i) IMEP ii) B.P.

iii) BMEP iv) BSFC

v) Brake thermal efficiency. **10**

c) Explain Morse test. **4**

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**[3862] – 323**

**S.E. (Mechanical S/W) (Sem. – I) Examination, 2010**
**PRODUCTION METALLURGY**
**(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) Assume suitable data, if* ***necessary****.*
*4) 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) What is vitrification process ? In what type of ceramic materials vitrification takes place ? **4**

b) Describe slip casting process. **4**

c) Describe stages involved in the manufacturing of spark plug insulator. **4**

d) A glass fibre reinforced polystyrene contains 40 vol. % of parallel fibres. Estimate Young's modulus of the composite in the longitudinal direction of the fibres. **4**

Given : Young's modulus of Glass = 70 GN/$m^2$
Young's modulus of polystyrene = 2.6 GN/$m^2$.

OR

2. a) Distinguish between traditional and engineering ceramic materials. Give example of each. **4**

b) Explain manufacturing of the following fibres Boron and Carbon. **4**

c) What is 'Shape Memory Alloy' ? Explain any one alloy in detail. **4**

d) Write down classification of composite with examples of each. **4**

3. a) Draw the following planes and directions vectors in a cubic unit cell **(any six)**
[100], [110], [112], (221), $(1\bar{1}0)$, (101), $[\bar{3}2\bar{1}]$. **6**

b) A 1.25 cm diameter bar is subjected to a load of 2500 kg. Calculate the engineering stress on the bar in MPa. **2**

P.T.O.

c) Differentiate between the following **(any two)** : **8**

i) Charpy and Izod impact test.

ii) Eddy current test and Magnaflux test.

iii) Brinell and Poldi hardness test.

d) Draw S-N curve for Steel and Aluminium. **2**

OR

4. a) The tensile test specimen of mild steel of 10 mm diameter and 50 mm gauge length shows following results : **5**

Maximum load = 3500 kg

Yield load = 1800 kg

Fracture load = 2500 kg

Increase in gauge length after fracture = 10.5 mm

Diameter at Fracture = 7.5 mm

Calculate – UTS, Yield stress, % elongation Fracture stress, % reduction in area.

b) What is creep ? Draw creep curve and explain. Write three methods of improving creep life of component. Draw creep fracture. **7**

c) Write only principles of the following NDT test **(any three)** : **6**

i) Dye penetrant test ii) Ultrasonic test

iii) Radiography iv) Magnaflux test

5. a) Draw full Fe-$Fe_3C$ equilibrium diagram and show temp., % C, critical temp., phases and reaction points on it. **8**

b) Draw neat label microstructures of the following steel and cast iron **(any four)** : **8**

i) Medium carbon steel ii) High carbon steel

iii) White cast iron iv) Malleable cast iron

v) Nodular cast iron.

OR

6. a) Write the following reactions on the Fe-$Fe_3C$ equilibrium diagram **(any two)** : **8**

   i) Eutectoid Reaction    ii) Peritectic Reaction

   iii) Eutectic Reaction (with temp., % C)

   b) What is weld decay in stainless steel ? How to minimize this problem ? **3**

   c) What do you understand by following specification : **5**

   i) C 40    ii) St 40    iii) AISI 1080

   iv) T 75 W18 Cr 4 V1    v) 80 T 12

OR

   c) Write any two types of tool steel, with their properties and applications. **5**

SECTION – II

7. a) Differentiate between TTT and CCT diagram. **4**

   b) Draw steel portion of the Fe-$Fe_3C$ equilibrium diagram and show temp. bands for heat treatment Annealing , Normalizing and Hardening. **4**

   c) What is age hardening ? Which alloy shows age hardening ? Explain conditions involved in age hardening. **4**

   d) Draw following heat treatment on TTT diagram and write down purpose and application **(any three)** : **6**

   i) Ausforming    ii) Martempering

   iii) Patenting    iv) Isoforming

OR

8. a) What is hardenability ? Explain test which is used to find out the hardenability. **4**

   b) With figure explain any two types of heat treatment furnaces. **4**

   c) Write a note on ‘Cooling media in heat treatment’. **4**

   d) Explain the following **(any three)** : **6**

   i) Temper embrittlement    ii) Quench cracks

   iii) Subzero treatment    iv) Retained austenite

9. a) Explain the principle of Induction hardening. **4**

b) State advantages and limitation of Nitriding over carburising. **4**

c) Write note on **(any two)** : **8**

i) Galvanizing ii) Electroplating iii) Blackodising

OR

10. a) Differentiate between the following **(any two)** : **8**

i) PVD & CVD

ii) Flame hardening and Induction hardening

iii) Carbonitriding and carburising

b) 'Case depth control is easy in induction hardening' Justify. **4**

c) Explain 'Anodising'. **4**

11. a) Give composition, properties and uses of the following Non-Ferrous metals **(any six)** : **12**

1) Tinman's solder 2) Babbit

3) Al-Bronze 4) Gun metal

5) ALNICO 6) LM-6

7) 'Y' Alloy 8) Invar.

b) Differentiate between $\alpha$ and $\alpha + \beta$ Brasses. **4**

OR

12. a) What are the requirements of a bearing materials ? **4**

b) Explain 'Equivalent zinc in Brass' with example. **4**

c) Explain 'Season cracking in Brass'. **4**

d) Draw neat label microstructures of the following **(any two)** : **4**

i) $\alpha$ -Brass ii) $\alpha + \beta$ Brass iii) Babbit.

OR

d) Draw Cu-Zn equilibrium diagram and show effect of zinc on the mechanical properties of Cu-Zn alloy. **4**

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**[3862] – 324**

# S.E. (Mechanical S/W) (Semester – I) Examination, 2010
## 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 – 1**

1. a) What are the common methods used for cleaning the surface of casting ? **4**

b) How does a permanent mould casting method differ from sand casting ? Will you prefer the permanent mould casting method for production of castings in small number ? Give reasons in support of your answer. **6**

c) What are the common materials used for pattern making ? Discuss their relative merits and demerits. **8**

OR

2. a) Sketch a permeability tester and explain how you will use it for determining the permeability number of foundry sand. **6**

b) What different types of gates you know ? Explain them with the help of suitable sketches stating their relative merits and demerits. **6**

c) Step by step, describe complete procedure of investment casting with sketch. What are the main advantages of preheating the investment mould ? **6**

**P.T.O.**

**Unit – 2**

3. a) Explain the 'Mechanical Working' of metals. What do you understand by recrystallisation and recrystallisation temperature ? **3**

b) What is continuous rolling mill ?Sketch it and state its advantages. **5**

c) How direct extrusion differs from indirect extrusion ? Discuss their relative merits and demerits. List few extruded products you know. **8**

OR

4. a) Define forging. Describe with the help of a neat sketch a 'Board drop hammer' used for drop forging. State their relative merits. List few products made by forging process. **8**

b) Sketch and describe construction of

i) OBI press

ii) Straight sided press. **8**

**Unit – 3**

5. a) Compare AC are welding with DC arc welding. **6**

b) Explain in detail Tungsten Arc Gas Shielded (TAGS) welding process with suitable diagram. **6**

c) Describe different types of gas flames used in gas welding. **4**

OR

6. a) Compare gas welding with arc welding process. **6**

b) Explain the principle of operation, advantages and area of application of explosive welding. Draw neat sketch. **6**

c) Write a note on Adhesives and state their applications. **4**

SECTION – II

**Unit – 4**

7. a) List different types of lathes you know ? Describe any one in detail. **6**

   b) Explain the following operations performed on lathe with a simple sketch.
      i) Eccentric turning
      ii) Facing
      iii) Parting off. **6**

   c) Sketch and describe back geared headstock of Lathe. **6**

OR

8. a) List six different accessories used on lathe and state the purpose of each one. **6**

   b) List out various taper turning methods on lathe and explain the taper turning attachment with sketch. **6**

   c) A multi start screw 1.5mm pitch and 7 starts 15 to be cut on a lathe with a lead screw of 6mm pitch. Gears available are from 20 teeth to 110 teeth in a step of 5 and 127 teeth. Calculate the gear train and sketch it. **6**

**Unit – 5**

9. a) Sketch and describe in short following milling cutter :
      i) Plain milling cutter
      ii) End mill
      iii) Angular milling cutter. **6**

   b) What is Twist Drill ? Draw neat sketch of Twist Drill showing various parts and name it properly. State its advantages. **6**

   c) Differentiate between up milling and down milling. **4**

OR

10. a) Calculate differential indexing for 89 divisions.

    Hole circles are 15, 16, 17, 18, 19 and 20.

    Gear set is 24(2), 28, 32, 40, 44, 48, 56, 64, 72, 86 and 100 teeth. **6**

    b) Sketch and describe in brief a Sensitive drilling machine. **6**

    c) What is negative rake milling ? Explain. **4**

**Unit – 6**

11. a) 'Use hard wheel for soft materials and soft wheel for hard materials'. Comment on this statement. **6**

    b) Explain various type of bonds used in grinding wheel. **6**

    c) What is meant by 'Honing' ? State merits and demerits of honing process. **4**

OR

12. a) Define abrasive and differentiate between aluminium oxide and silicon carbide grinding wheel in respect of :

    i) Hardness of wheel
    ii) Applications
    iii) Type of bond
    iv) Cost of wheel. **8**

    b) Explain the principle of centreless grinding. How do the 'Through feed' and 'Infeed' methods differ in centreless grinding and where are they used ? **8**

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**S.E. (Mechanical Sandwich) (Semester – II) Examination, 2010**
**THEORY OF MACHINE AND MACHINE DESIGN – I**
**(2003 Course)**

Time: 4 Hours Max. Marks: 100

***Instructions*** : 1) *Answer **three** quetions from Section **I** and **three** questions form 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) Explain with neat sketches, inversions of four bar chain giving their practical applications. **6**

b) Explain degree of freedom in mechanisms. **4**

c) Draw neat sketch and write a note on ‘Geneva Mechanism’. **6**

OR

2. a) Explain ‘completely constrained motion’ and ‘successfully constrained motion’ by giving example of each. **6**

b) Draw neat sketch and write a note on ‘Peaucelliers Mechanism’. **6**

c) Differentiate between Ackermann steering Gear Mechanism and Davis steering Gear mechanism. **4**

3. a) With the help of figure, explain different types of Instantaneous centres. **4**

b) Fig. I shows a mechanism in which crank OA is rotating anticlockwise at 10 rad./sec.By using relative velocity and relative acceleration method, claculate.

i) Velocity and acceleration of slider D.

ii) Angular velocity and angular acceleration of link BC. **12**

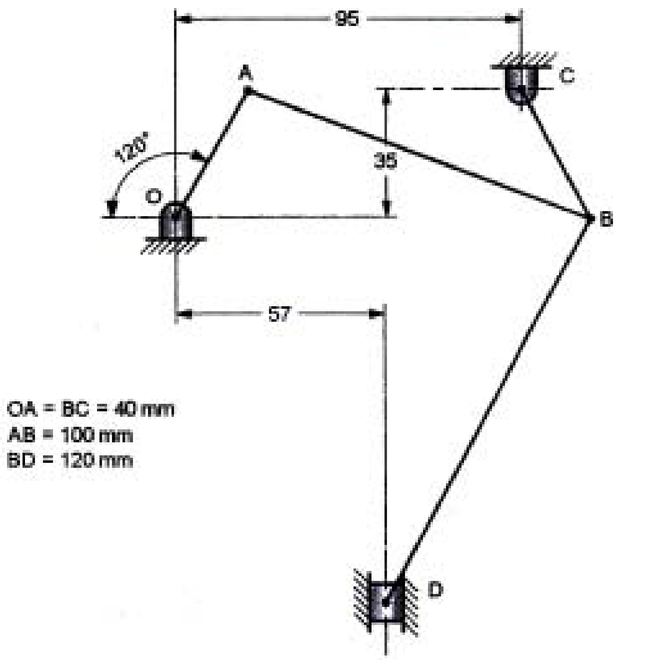


Fig. 1 [For Q. 3 (b) and Q. 4 (b)]

OR

4\. a) Derive the equation by analytical method for finding displacement, velocity and acceleration of slider in case of a slider crank mechanism. **6**

b) For mechanism shown in Fig. 1 in which crank OA is rotating anticlockwise at 10 rad./sec. By using instantaneous centre of rotation method, calculate velocity of slider D and angular velocity of link BC. **10**

5\. a) With the help of neat schematic diagram, derive frequency equation of compound pendulum. **8**

b) What is meant by 'correction couple' ? When do we need to consider it ? **4**

c) A rigid link, 500 mm long, has mass 2 kg and radius of gyration 200 mm. Replace this link by dynamically equivalent system of two concentrated mass located at the ends of the link. **6**

OR

6. a) Explain dynamically equivalent system. **6**

b) The following data relate to horizontal reciprocating engine.

i) Mass of reciprocating parts = 100 kg.

ii) Mass of connecting rod = 80 kg.

iii) Stroke length = 200 mm

iv) Length of connecting rod between centres = 400 mm

v) Radius of gyration of connecting rod about an axis through C.G. = 120 mm

vi) Distance of C.G. from big end centre = 160 mm.

vii) Engine speed = 900 rpm clockwise. **12**

Determine by analytical method, the inertia torque on crankshaft when crank has turned 40° from I.D.C.

SECTION – II

7. a) State Castigliano's theorem and its applications. **4**

b) A shaft supported between two bearings 750 mm apart, receives 12.5 kW power at 300 rpm through a coupling located to the left of left hand bearing. If transmit the power to a belt pulley of weight 300 N and diameter 450 mm, which is located at a distance of 200 mm to the right of right hand bearing. The ratio of belt tensions of tight and slack sides is 2 : 1. The belt tensions act in vertically downward direction. The shaft material has a yield strength of 300 $N/mm^2$ and an ultimate tensile strength of 550 $N/mm^2$. The combined shock and fatigue factor for bending and torsion are 1.5 and 1.0 respectively.

Determine :

i) the shaft diameter using A.S.M.E. code and

ii) the various stresses in rectangular key, if key selected has 12 mm width, 10 mm height and 60 mm length. **12**

OR

8. a) Explain A.S.M.E. code for shaft design. **4**

b) Compare flexible coupling with rigid coupling. **4**

c) Draw a neat sketch of kennedy key and clearly mark the area under shear and area under crushing. Explain the design procedure of Kennedy key. **8**

9. a) State the advantages and limitations of the welded joints. **4**

b) A power screw having double start square threads of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.77 $N/mm^2$, find.

i) the torque required to rotate the screw,

ii) the stresses in screw and

iii) the height of nut. **12**

OR

10. a) What are the 'bolts of uniform strength' ? **4**

b) Differenciate between compound screw and differential screw. **6**

c) Explain the procedure to design a welded joint subjected to eccentric loads in the plane of the weld. **6**

11. a) State the modes of failures in wire ropes. **4**

b) Explain the procedure for the selection of belts from manufacturers catalogue. **6**

c) A rope drive is used to transmit 260 kW power from a 300 mm pitch diameter pulley rotating at 1000 rpm to a 600 mm pitch diameter pulley. The pulley groove angle is 45° and the centre distance is 6 m. The mass of rope is 1.3 kg per meter and the coefficient of friction between the rope and pulley is 0.3. If the permissible pull for cash rope is 2200 N, determine the number of ropes required. **8**

OR

12. a) Explain polygonal effect in chain drive. **6**

b) A fan is driven by an open belt drive from 30 kW, 1000 rpm electric motor. The fan pulley diameter is 900 mm, while the motor pulley diameter is 250 mm. The centre distance between the shaft is 2.25 m and the coefficient of friction between the belt and the pulley is 0.25. The allowable tensile stress in the belt is limited to 2 MPa. The density of belt material is 950 $Kg/m^3$ and belt width is 100 mm. Calculate

i) the belt thickness

ii) the belt length and

iii) the initial tension. **12**

# S.E. (Mechanical S/W) (Semester – II) Examination, 2010
## PRODUCTION ENGINEERING – II
## (2003 Course)

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **three** questions from Section **I** and **three** questions from Section **II**.*
*2) Answer 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) A pipe 38 mm in diameter is being turned on a lathe with a tool having a rake angle of 15° and a feed of 0.15 mm/rev. The length of chip over one revolution of work-piece is 72 mm. The cutting speed is 12.5m/min. The tangential force is 410 N and feed force is 170 N.

Calculate :

i) Coefficient of friction on rake force;
ii) Thickness of chip;
iii) Angle of shear;
iv) Velocity of shear;
v) Velocity of chip along the tool face. **10**

b) Sketch the single point cutting tool geometry and explain back rake angle and side rake angle. **6**

OR

2. a) In a orthogonal cutting operations following are the observations.

i) Cutting speed =120 m/min
ii) Uncut chip thickness = 0.127
iii) Rake angle = 10°
iv) Width of cut = 6.35 mm
v) Cutting force = 567 N
vi) Thrust force = 227 N
vii) Chip thickness = 0.228

Calculate :

Shear angle, Friction angle, Shear stress along shear plane, chip velocity, shear strain, cutting power. **10**

b) Enumerate the factors on which tool life and tool wear depends. **6**

3. i) Discuss the various gear finishing operations. **8**

ii) Explain the principle of gear hobbing. List the advantages and disadvantages of gear hobbing. **8**

OR

4. i) Discuss the geometry of Broach teeth with neat sketch. **6**

ii) Write short notes on : **10**

a) Thread milling

b) Broaching machines.

5. i) Explain with neat sketch NC motion control system. **6**

ii) Explain with neat sketch vertical machining centre. **6**

iii) What are the basic components of CNC system ? Explain the function of each. **6**

OR

6. i) Draw a sketch showing typical set up of FMS. Explain function of each block and state advantages of FMS over conventional CNC system. **8**

ii) Differentiate between CNC and DNC. **4**

iii) Explain following codes :

a) G 81

b) G 88

c) G 17

d) M 30

e) M 23

f) G 03. **6**

SECTION – II

7. i) List the advantages, disadvantages and product applications of 'EDM'. **6**

ii) What is the function of electrolyte in 'ECM' ? List the common electrolytes used in ECM. **4**

iii) Explain with neat sketch EBM. State its advantages, limitations and applications. **6**

OR

8. i) Draw a sketch and explain the principle of AJM. Discuss various parameters that influence the material removal rate of the process. **6**

ii) Explain with heat sketch PAM. **6**

iii) State and explain various factors affecting MRR in EDM process. **4**

9. i) What are the various types of stripper ? Explain their function with the help of suitable sketches. **6**

ii) Sketch the various methods of holding punches. **4**

iii) Differentiate between the compound die and the combination die. **6**

OR

10. i) Define

a) Lancing

b) Piercing

c) Notching

d) Blanking. **4**

ii) Write a note on importance of die radius and die clearance in press tool design. **6**

iii) Explain the various methods of reducing shear forces. **6**

11. i) List and explain different types of drill bushes. **6**

ii) List various types of Jigs and explain any one. **6**

iii) Describe the use of :

a) Slip renewable bushings

b) Fixed bushings. **6**

OR

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

1) Conical Locator and strap clamp

2) 3-2-1 principle of location

3) Milling fixtures.

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**[3862] – 333**

# S.E. (Production & Industrial Engg. /Prod. S/W) (Semester – I) (2003 Course) Examination, 2010
# MANUFACTURING PROCESSES – I

Time : 3 Hours    Max. Marks : 100

***Instructions*** *:1) Attempt* ***one*** *question from* ***each*** *Unit in Section* ***I*** *and Section* ***II****.*
*2) Answer to* ***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.*

## SECTION – I

### Unit – I

1. a) Sketch a common gating system. Lable all parts on it and explain function of each part . Also draw only sketches for Top gate, Parting gate, Horn gate, Pencile gate. **10**

b) Sketch the following hand tools of moulder and state their uses. **6**

i) Rammet    ii) Swab    iii) Strike off bar.

OR

2. a) Sketch and describe the following pattern used for making sand mould : **6**

i) Match plate pattern

ii) Sweep pattern

iii) Segmental pattern.

b) Sketch and explain following types of core : **6**

i) Balanced core

ii) Drop core

iii) Kiss core.

c) What are the function of additives used in molding sand ? **4**

**P.T.O.**

## Unit – II

3. a) Define the following casting defects along with their sketch, causes and remedies. **9**
   i) Blow holes ii) Scabs iii) Misruns

   b) Suggest a suitable casting method and justify it for following components. **7**
   i) Pipe ii) Fly wheel iii) Scooter engine block

OR

4. a) Why automation is necessary in modern foundry ? Explain how will you achieve automation in different area in foundry ? **8**

   b) Compare the hot chamber and cold chamber die casting. **8**

## Unit – III

5. a) A hollow work piece of 65 mm in OD and 150 mm in length, is hold between centres and turned over the entire length in 4 passes. If tool approach length is 2 mm, over travel is 10 mm, Average feed 0.6 mm/rev$^n$ and cutting speed 30 m/min calculate machining time. **4**

   b) Describe any two types of taper turning processes used on lathe. Compare their relative merits and demerits. **8**

   c) Highlight the specification of lathe machine. **6**

OR

6. a) Calculate change gears to cut double start RH threads of 1.2 mm pitch on a lathe having lead screw of 6 mm pitch. Available gear train 20T to 120T in step of 5. Draw the sketch and what modification is required for cutting of LHT ? **4**

   b) Explain with neat sketch appron mechanism. **8**

   c) Differentiate capstan and turret lathe. **6**

SECTION – II

**Unit – IV**

7. a) Draw a neat sketch for a universal radial drilling machine and lable it. **4**

b) Write a note on the following : **8**

i) Hand and machine reamer.

ii) Self centering chuck.

c) Calculate machining time to drill a hole of $\phi$ 12 mm in diameter and 25 mm in length by using a drill of size $\phi$ 12 mm, feed 0.5 mm/rev$^n$ and cutting speed 20 m/min. **4**

OR

8. a) What is core drill ? When is it used ? Write its advantages over a standard twist drill. **5**

b) Draw sketches for following operation and state their uses. **6**

- Counter sinking - Trepanning - Tapping

c) Write down the difference between multispindle drilling machine and Gang drilling machine. **5**

**Unit – V**

9. a) Explain with neat sketch a friction disc feed mechanism of planer machine. **5**

b) Explain with neat sketch following operation to be perform on milling machine :

i) T slot ii) Concave profile iii) Dovetail groove. **6**

c) Calculate compound indexing for 87 division. **5**

The hole circles available are :

Plate 1 = 15, 16, 17, 18, 19, 20

Plate 2 = 21, 23, 27, 29, 31, 33

Plate 3 = 37, 39, 41, 43, 47, 49.

OR

10. a) Explain with neat sketch the angular surface machining and keyway grooves machining in case of shaper machine. **6**

b) Explain with a neat sketch a hydraulic shaper mechanism. **6**

c) A face milling cutter of 90 mm in diameter has 20 teeth, the cutting speed is 20 m/min, if feed/ tooth/ revn is to be 1 mm find machining time for one cut along a work piece of 1000 mm long. **4**

**Unit – VI**

11. a) Explain with neat sketch the in feed and End feed centreless grinding. **6**

b) Explain with neat sketch the horizontal broaching machine. List the product application of broaching process. **6**

c) Compare buffing and lapping process. **6**

OR

12. a) Explain with the help of neat diagram honing process list the product application of honing process. **6**

b) Explain standard marking system of Grinding wheel. **6**

c) Draw the sketch and write the application of following grinding wheel shape. **6**

i) Recessed two side

ii) Dish type

iii) Straight cup type.

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**[3862] – 334**

**S.E. (Prod. & Industrial Engg./Prod. S/W) (Semester – I) Examination, 2010**
**INDUSTRIAL ELECTRONICS**
**(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 V-I characteristics of following devices.
   i) SCR   ii) MOSFET
   Give any one application of each device. **8**

   b) What are the different types of protection ckt. of power supply ? Explain any two in detail. **10**

OR

2. a) Explain :
   i) Fan regulator
   ii) Off.line UPS with the help of suitable diagram. **10**

   b) Explain V.I characteristics of UJT. Comment on intrinsic stand off ratio ($\eta$). Also list the applications of UJT and explain UJT as a relaxation oscillator. **8**

3. a) Explain S.R. F/F with waveform. **2**

   b) Define counter. State various types of counter and explain any one in detail. **8**

   c) List various types of shift register. Explain 3-bit left shift register along with o/p waveform. **6**

OR

**P.T.O.**

4. a) State ideal characteristics of op-amp. **2**

b) Explain schmitt trigger with application. **6**

c) Draw and explain square wave generator using op-amp. Sketch the o/p waveform and waveform across capacitor. **8**

5. a) Explain PID controller with neat diagram. Also state advantages and disadvantages of PID controller. **8**

b) Explain the procedure to control speed of AC motor along with neat block diagram. **8**

OR

6. a) Explain induction heating and low hardening can be done by it. **8**

b) Explain various types of D.C. motors. Explain any one application in detail. **8**

SECTION – II

7. a) Explain the following with block diagram.

i) Proximity sensor ii) Weighing machine **8**

b) Draw and explain scheme to control automatic bottle filling plant using conveyor belt. Empty bottle is moved to filling station. It is then filled with liquid and copped and moved further. **8**

OR

8. a) Explain how ultrasonic waves are used to measure the level and flow of liquid in detail. **8**

b) Explain in detail what features you will consider while selecting a transducer for particular applications. **8**

9. a) For first order system, find out o/p of the system when i/p applied to the system is unit ramp. **8**

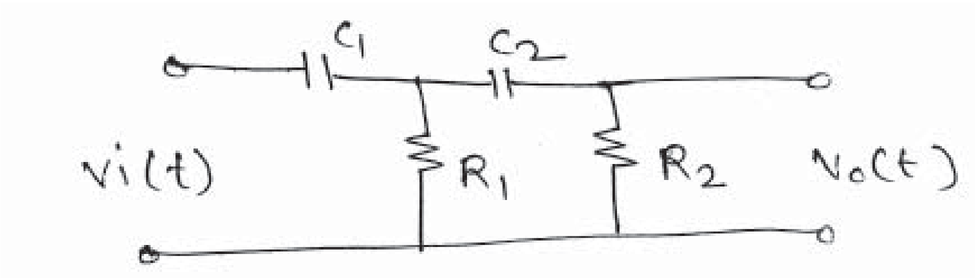
b) State and explain the following specifications of first order system : **8**

i) Rise time ii) Time constant

iii) Delay time iv) Percentage overshoot

OR

10. a) For the n/w given in figure below find $\frac{V_o(s)}{V_i(s)}$




Also give significance of laplace transform. **8**

b) Obtain the solution of differential equation given below using Laplace transform. Neglect initial conditions.

$$\frac{d^2y(t)}{dt^2}+\frac{2dy(t)}{dt}+4y(t)=8e^{-t}.$$ **4**

c) State the advantages of laplace transform technique in solving linear differential equation. **4**

11. Write short note on :

i) SCADA

ii) Direct digital control system

iii) Robotics **18**

OR

12. Write short note on :

i) Steel plant

ii) Thermal Power Plant

iii) Cement Plant. **18**

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**S.E. (Prod. and Industrial/ Prod. S/ W) (Sem. – II) Examination, 2010**
# THEORY OF MACHINES
**(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 electronic pocket calculator is **allowed**.*
*6) Assume suitable data, **if necessary**.*

SECTION – I

1. a) What do you understand by an inversion of kinematic chain ? Explain various types of inversions of a 4 bar chain with suitable diagrams. **8**

   b) What do you mean by constrained motion ? What are different types of constrained motions ? Explain each type with examples and neat sketches. **8**

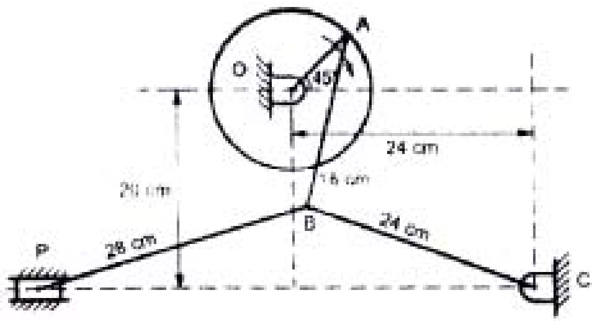
OR

2. a) On which kinematic chain a whitworth quick return motion is based ? Discuss its working with the help of neat sketch. How will you determine the ratio of time of cutting to return stroke ? **8**

   b) Define kinematic link and discuss various types of kinematic links with example. **8**

3. a) Discuss various types of instantaneous centres with the help of example. **4**

   b) In a toggle mechanism as shown in fig. below, crank OA rotate 105 rpm clockwise. Determine velocity and acceleration of slider ‘P’. Take OA = 8 cm, AB = 18 cm, BC = 24 cm, BP = 28 cm. **12**




OR

4. a) The crank and connecting rod of steam engine are 0.3 meter and 1.5 meter in length. The crank rotate at 250 rpm clockwise. Determine by analytical method the velocity and acceleration of piston when crank is 50° from IDC position. Also determine the position of crank for zero acceleration of piston. **6**

**P.T.O.**

b) The following data relate to horizontal reciprocating engine. Mass of reciprocating parts = 50 kg., Stroke length = 200 mm, Engine speed = 1000 rpm clockwise, Connecting rod mass = 35 kg, Length between centres = 425 mm, Distance of C.G. from big end centre = 170 mm, Radius of Gyration of connecting rod about C.G. = 156.8 mm, Crank angle with IDC = 55°.
Determine inertia torque on crank shaft. **10**

5. a) What do you understand by epicyclic gear train ? What are merits and demerits of epicyclic gear train compared to compound gear train. **5**

b) Explain under cutting with suitable sketch. **5**

c) Two gear wheels of 10 cm and 15 cm pitch diameters have involute teeth of 0.16 diametral pitch and pressure angle 20°. The addenda are 3 mm. Determine :

i) Length of path of contact

ii) Contact ratio

iii) Angle turned by pinion, while any pair of teeth is in contact. **8**

OR

6. a) Explain following terms in gears with suitable diagram :

i) Circular pitch

ii) Tooth thickness

iii) Addendum. **6**

b) A gear wheel 'A' having 44 teeth is rigidily mounted on driving shaft. It gears with compound wheel C-D. Wheel 'C' has 22 teeth and wheel 'D' has 26 teeth. Wheel 'C' gears with A and 'D' gears with internal wheel 'B'. The compound wheel revolves freely on a pin which projects from an arm rigidly mounted on the driven shaft. The internal wheel B is fixed and module of all gears is same. The driving and driven shafts and internal wheel are co-axial. Driving shaft rotates at 300 rpm and transmits 2.5 kW power. Determine :

i) Speed of driven shaft

ii) Torque transmitted by driven shaft

iii) Fixing torque, neglect losses. **12**

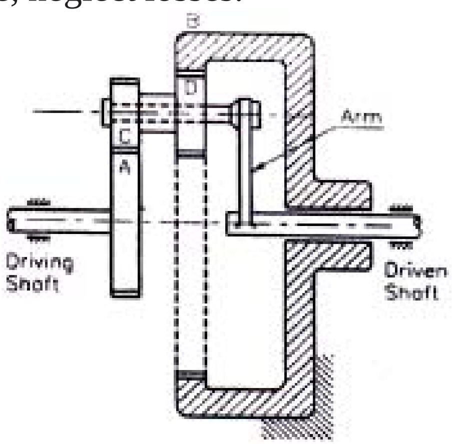



Fig. for Que. 6 (b)

SECTION – II

7. a) Give detail classification of follower. Explain any three types of follower with suitable diagram. **8**

b) Draw profile of a cam operating a knife-edge follower from the following data :

i) Follower to move outward through a distance of 20 mm during 120° of cam rotation.

ii) Follower to dwell for next 60° of cam rotation.

iii) Follower to return to its initial position during 90° of cam rotation.

iv) Follower to dwell for the remaining 90° of cam rotation.

The cam is rotating clockwise at uniform speed of 500 rpm. Minimum cam radius is 40 mm and follower stroke line is offset 15 mm from cam axis. Follower moves with uniform acceleration and retardation during outstroke and return stroke. **8**

OR

8. a) Draw and explain displacement diagram when follower moves outstroke with cycloidal motion. **6**

b) From the following data draw the profile of cam in which follower moves with SHM during ascent while it moves with uniform acceleration and retardation during descent.

Least cam radius = 50 mm, Angle of ascent, $\theta_0$ = 48°, Angle of dwell between ascent and descent, $\theta_d$ = 42°, Angle of descent, $\theta_R$ = 60°, Lift of follower = 40 mm, Diameter of roller = 30 mm, Distribute between follower stroke line and cam axis = 20 mm. If cam rotates at 360 rpm anticlockwise, find maximum velocity and acceleration of follower during descent. **10**

9. a) Explain effect of partial balancing of locomotive. **6**

b) Four masses 200 kg, 300 kg, 240 kg, and 260 kg are attached to a shaft. These masses are revolving at radii 270 mm, 210 mm, 300 mm and 360 mm respectively in planes measured from $A_1$ at 270 mm, 420 mm and 720 mm respectively. The angles measured anticlockwise are $M_1$ to $M_2$ 45°, $M_2$ to $M_3$ 75°, $M_3$ to $M_4$ 135° and the distance between the planes L and M in which the balance masses are to be placed is 500 mm. The distance between planes $A_1$ and L is 120 mm and M and $A_4$ is 100 mm. If the balancing masses revolve at a radius of 72 mm, find their magnitude and angular positions. **10**

OR

10. a) Explain how a single revolving mass is balanced by two masses revolving in different planes. **4**

b) The cranks of a two cylinder uncoupled outside cylinder locomotive are at right angles and arc 300 mm long. The distance between the centre lines of the cylinder is 1.8 m. The wheel centre lines are 1.4 m apart. The rotating masses per cylinder 350 kg and masses of reciprocating parts per cylinder is 285 kg. The whole of rotating and two third of the reciprocating masses are to be balanced in a plane of driving wheels at radius of 800 mm. Find :

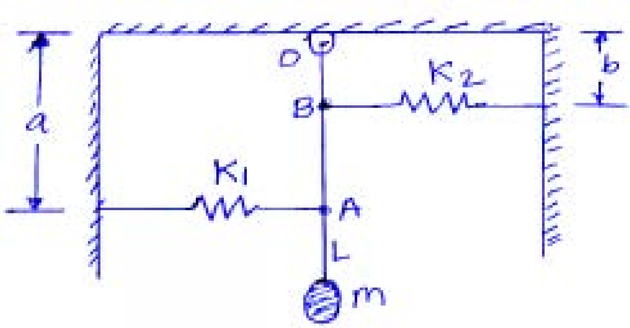
i) The magnitude and angular positions of balance masses

ii) The maximum speed of the locomotive in km/hr without lifting the wheels from the rails if the dead load (static load) on each driving wheel is 28000 N and diameter of driving wheels is 1.8 m. **12**

11. a) What do you mean by damping ? What are various types of damping ? **6**

b) Explain working principle of seismic instrument. **6**

c) Determine the natural frequency of vibration of a system show in fig below : **6**




OR

12. a) Write a short note on : **10**

i) Vibration Transmissibility

ii) Critical speed of shaft.

b) A machine of 75 kg mass is mounted on three springs, each of stiffness 10 N/mm and is fitted with a dashpot to damp out vibrations. During vibrations, it is found that the amplitude of vibration diminishes from 40 mm to 6 mm in two complete cycles. **8**

Determine :

i) Resistance of dashpot at unit velocity

ii) Frequency ratio of damped vibrations to undamped vibrations

iii) The time period of damped vibrations.

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**S.E. (Prod. & Ind. Engg.) (Semester – II) Examination, 2010**
**ENGINEERING METALLURGY – I**
**(Common to Production S/W)**
**(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**, Q. **11** or Q. **12**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) **Use** of Logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*

SECTION – I

1. a) Explain the property and microstructural changes during cold working and annealing of metals. **5**
   b) Differentiate between slip and twinning. **4**
   c) Show the following planes in cubic unit cell (111), (100), (110), (101). **4**
   d) What is composite material ? **3**

OR

2. a) Derive Schmid's law for critical resolved shear stress for single crystal. **4**
   b) What are point defects in crystal ? **4**
   c) Explain 'strain hardening'. **4**
   d) Calculate resolved shear stress of a single crystal if applied tensile stress is 30 kg/mm$^2$ and slip plane is oriented at 45° to the tensile axis. **4**

**P.T.O.**

3. a) Explain the following terms **(any five)** : **10**

i) Transition temp.

ii) Resilience.

iii) Toughness.

iv) Endurance limit.

v) Proof stress.

vi) Hardness.

b) State only limitations of the following NDT method **(any three)** : **6**

i) Magnaflux test.

ii) Gamma Ray – Radiography.

iii) Ultrasonic test.

iv) Dye penetrant test.

OR

4 a) Write only disadvantages of the following test **(any five)** : **10**

i) Poldi Hardness Test.

ii) Brinell Hardness Test.

iii) Creep Test.

iv) Vicker's Hardness Test.

v) Rockwell Hardness Test.

vi) Charpy and Izod impact Test.

b) Draw following schematic figures : **6**

i) Creep curve.

ii) Principle of magnaflux test.

iii) Charpy specimen.

iv) S – N curve.

v) Brale indenter.

vi) X-Ray Radiography.

5. a) Derive 'Lever Rule'. **4**

b) Explain the following with example. **10**

i) Layer type system.

ii) Isomorphous system.

c) Write uses of Eutectic alloy. **4**

OR

6. a) Explain equilibrium cooling of partial eutectic system. (Draw figure, microstructure). **5**

b) What is ordered and disordered substitutional solid solution along with example ? **4**

c) What is coring ? How to eliminate coring ? **4**

d) Explain plotting of equilibrium diagram. **5**

SECTION – II

7. a) Explain the following **(any two)** : **6**

i) Grain refinement strengthening mechanism.

ii) Martensitic transformation.

iii) Solid solution strengthening.

b) Explain the principle and working of the following type of pyrometer **(any two)** : **10**

i) Thermo-electric pyrometer.

ii) Resistance pyrometer.

iii) Photo electric pyrometer.

c) Write any two types of thermocouple material composition. **2**

OR

8. a) Explain Age Hardening with example. **5**

b) Calculate the yield strength of polycrystalline iron with an average grain diameter of 0.1 mm. The constants in the Hall - Petch eq$^n$ are $\sigma_i = 50\ \mathrm{MN/m^2}$ and $K = 0.7\ \mathrm{MN/m^{3/2}}$. **4**

c) Explain the working of 'Disappearing Filament Type Pyrometer'. **5**

d) Derive the formula for Iso stress condition in composite material. **4**

9. a) Differentiate between the following : **8**
   i) Dry and wet corrosion.
   ii) PVD and CVD.
   b) Explain with the help of example 'cathodic protection'. **4**
   c) State the principle and working of Electroplating. **4**

OR

10. Write short notes on **(any four)** : **16**
   a) Metal spray deposition.
   b) Ion implantation.
   c) Anodising.
   d) Inhibitors.
   e) Coating surface preparation.

11. a) Explain 'powder conditioning'. **4**
   b) Write four important advantages of powder metallurgy method. **4**
   c) Explain manufacturing of 'self lubricated bearing'. **4**
   d) What are different methods of obtaining powders in powder metallurgy. **4**

OR

12. a) Write short note on **(any three)** : **12**
   i) Particle size and distribution in powder metallurgy.
   ii) Sintering process.
   iii) Manufacturing of 'cermet'.
   iv) Compaction methods for powder.
   b) Explain following terms : **4**
   i) Apparent density.
   ii) Tap density.
   iii) Flow rate.
   iv) Green spring.

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**S.E. (Electrical) (Semester – I) Examination, 2010**
**MATERIAL SCIENCE**
**(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) Your are advised to attempt **not** more than **6** questions.*
*4) Assume suitable data, **if necessary**.*

*Physical Constants* :

1) Angstrom unit (AU) = $10^{-10}$ metres.
2) Avogadro's number ($N_A$) = $6.0254 \times 10^{23}$/gram molecule.
3) Boltzmann's constant (k) = $1.380 \times 10^{-23}$ Joule degree$^{-1}$.
4) Dielectric constant of free space ($\in_0$) = $8.85 \times 10^{-12}$ Faradmetre$^{-1}$.
5) Charge on electron (e) = $1.601 \times 10^{-19}$ Coulomb.
6) Mass of electron (m) = $9.107 \times 10^{-31}$ kg.
7) Electron volt (eV) = $1.602 \times 10^{-19}$ Joules.
8) Permeability of free space ($\mu_0$) = $4\pi \times 10^{-7}$.
9) Mass of proton ($m_\rho$) = $1.627 \times 10^{-27}$ kg.
10) Velocity of light (C) = $2.998 \times 10^{8}$ metre second$^{-1}$.
11) Debye unit = $3.33 \times 10^{-30}$ Coulomb-metre.

SECTION – I

1. a) Write different materials used for photovoltaic material. Describe its construction and working principle. **8**

b) Explain orientation polarization in detail. How is it different than ionic polarization ? **8**

OR

2. a) Explain with a neat sketch principle and applications of photoemission. **8**

   b) Compare between electronic and ionic polarization. **8**

3. Write down properties or applications of Paper Press Board, Fibrous Materials, Ceramics, Asbestos., Varnish, Askarel Insulating Gases like Air and SF6. **16**

OR

4. Describe insulating materials used in switch gears, capacitor, rotating machines and line insulators. **16**

5. a) Describe between :

      i) Breakdown voltage and breakdown strength. **4**

      ii) Primary ionization and secondary ionization. **5**

   b) With a neat sketch explain oil filtration method. **9**

OR

6. a) What do you understand by technically pure and contaminated liquid ? **9**

   b) Describe various breakdown mechanisms in vacuum. **9**

SECTION – II

7. Write down properties and applications of

   i) Constantan

   ii) Tungsten

   iii) Copper

   iv) Nickel chromium alloys. **16**

OR

8. Describe various materials used with reasons and their properties for

   i) Solders

   ii) Bimetals and thermocouples

   iii) Transmission lines

   iv) Brushes. **16**

9. a) Write short note on – Carbon Nano tubes. **8**

b) What are various conducting mechanisms in Nano structures ? Explain Nano structures. **8**

OR

10. a) Describe carbon molecules and carbon clusters. **8**

b) Draw figures of BN Nano tubes. Explain it. Where are they used ? **8**

11. a) How will you measure loss angle with Schering bridge ? **9**

b) What is sphere gap voltmeter ? What is its use ? **9**

OR

12. a) Describe measurement of flux density with Gauss meter. What is the principle of operation of Gauss meter. **9**

b) Explain various tests conducted on high voltage bushings. **9**

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# S.E. (Electrical) (Sem. – II) Examination, 2010
## POWER SYSTEMS – I
## (2003 Course)

Time : 3 Hours                                                                 Max. Marks : 100

SECTION – I

1. a) Define and explain load curve. What information is obtained from it ? How load duration curve is obtained from load curve ? **8**

b) The incremental costs in RS/MWh of two 250 MW units are as under,

$$\frac{dc_1}{dp_1} = 0.2\ p_1 + 30$$

$$\frac{dc_2}{dp_2} = 0.15\ p_2 + 40$$

The minimum load of each unit is 20 MW. Find the load division between the two units as total load varies from 40 MW to 500 MW.

Compute the savings per year for economical load allocation as compared to equal load sharing for a total system load of 225 MW. **8**

OR

2 a) Show that the system transmission loss in case of two plants sharing the load on a power system is given by

$$P_L = B_{11}P_1^2 + B_{22}P_2^2 + 2P_1P_2B_{12}$$

Where $P_1$, $P_2$ : Power outputs

$B_{mn}$ : Loss coefficients. **8**

b) A 60 MW power station has annual peak load of 50 MW. The power station supplies loads having maximum demand of 20 MW, 17 MW, 10 MW and 9 MW. The annual load factor is 0.45. Find,

i) Average load.

ii) Energy supplied per year.

iii) Diversity factor.

iv) Demand factor. **8**

3. a) Derive expression for maximum and minimum dielectric stress in a single core cable. **8**

b) Derive the expression for most economical size of the cable.

Find the most economical size of a single core cable working on a 132 kv, three phase system if a dielectric stress of 60 kv/cm can be allowed. **8**

OR

4. a) What is grading of cables ? Write a note on practical difficulties in grading of cables. **8**

b) The capacitance of a three core belted type of cable are measured as,

i) Between three cores bunched together and sheath is 8 $\mu F$.

ii) Between a conductor and the other two connected to sheath together is 6 $\mu F$.

Calculate the capacitance per phase. Also find the charging current when connected to 66 kv, 50 Hz supply. **8**

5. a) What are the different excitation systems for alternators ? Explain any one in brief with a neat diagram. **8**

b) Define the term string efficiency and show that in a string of suspension insulators, the disc nearest to the line conductor has the highest voltage distributed across it. State any assumptions made in the derivation. **10**

OR

6. a) What are the different types of voltage regulators used for voltage control in power stations ? Explain any one in brief. **8**

b) A three unit insulator string is fitted with a guard ring. The capacitance of link pins to metal work and guard ring is 15% and 5% of the capacitance of each unit. Determine voltage distribution across the units and string efficiency. **10**

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SECTION – II

7. a) Derive the expression for inductance/km of a three phase overhead transmission line when three conductors are spaced at the corners of an equilateral triangle having its each side equal to 'd' meters. **8**

b) A single phase 10 km line is 8 m above the ground. The diameter of the conductors is 2 cm and is separated by 4 m horizontally. Find,

i) Capacitance between conductors including the effect of ground.

ii) Capacitance between phase and neutral including effect of ground.

iii) Capacitance when effect of ground is neglected.

iv) Charging current when the $\overline{E}$ line is charged at 33 kv, 50 Hz supply. **8**

OR

8. a) Discuss the 'method of images' in determining the effect of earth on the capacitance calculation of transmission lines. **8**

b) Calculate the inductance and inductive reactance per phase per km of a three phase 33 kv, 50 Hz line with conductor spacing of 1.5 m and diameter of each conductor is 1.5 cm, assume transposed lines. Consider the following cases separately.

i) Conductors placed at the corners of an equilateral triangle.

ii) Horizontal spacing of conductors. **8**

9. a) Derive expression for the regulation of a short transmission line in terms of line parameters and discuss qualitatively its dependance on the load power factor. **8**

b) A 200 km long, three phase overhead transmission line has resistance of 48.7 $\Omega$/ph, inductive reactance of 80 $\Omega$/ph and capacitance (line to neutral) of 8.42 nF/km. It supplies a load of 13.5 MW at 88 kv and 0.9 lagging power factor. Use nominal pi circuit and find the sending end voltage, regulation and power angle. **8**

OR

10. a) Obtain the relationship for the sending end voltage and current in terms of receiving end voltage and current for medium transmission line with nominal T method. Evaluate the generalised circuit constants from it. **8**

b) Three phase transmission lines are having generalised constants as,

$$A_1 = D_1 = 0.98\angle 2°,\ B_1 = 28\angle 69°\ \Omega,\ C_1 = 0.0002\angle 88°\ \mho$$

$$A_2 = D_2 = 0.95\angle 3°,\ B_2 = 40\angle 85°\ \Omega,\ C_2 = 0.0004\angle 90°\ \mho$$

They are connected in series and deliver a load current of 200 A at 0.95 power factor at 110 kv. Find overall generalized constants of the series connection and determine sending end voltage. **8**

11. a) What is receiving end power circle diagram ? From first principle obtain equation from which co-ordinates, centre of circle, radius of circle is obtained. What type of information is obtained from it ? **10**

b) A transmission line has a span of 275 m between level supports. The conductor has an effective diameter of 1.96 cm and weighs 0.865 kg/m. Its ultimate strength is 8060 kg. If the conductor has ice coating of radial thickness 1.27 cm and is subjected to a wind pressure of 3.9 gm/cm$^2$ of projected area. Calculate sag for a safety factor of 2. Weight of 1 cubic cm of ice is 0.91 gm. **8**

OR

12. a) What are the different factors affecting the sag of a transmission line ? Explain in detail. **6**

b) Write a note on universal power circle diagram. **6**

c) Write a short note on ACSR conductors. **6**

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**S.E. (Electrical) (Semester – II) Examination, 2010**
**NETWORK ANALYSIS**
**(2003 Course)**

Time: 3 Hours Max. Marks: 100

SECTION – I

1. a) With necessary examples and sketches, explain the following terms, related to networks.

   i) Active network and passive network

   ii) Dependent and independent sources

   iii) Practical and ideal sources. **6**

   b) Discuss the methods : (i) super-mesh analysis (ii) super-node analysis, used for network analysis. Give the examples of such circuits where these methods are recommended. **6**

   c) Find out the current in branch AC of the network shown in fig 1c. **6**

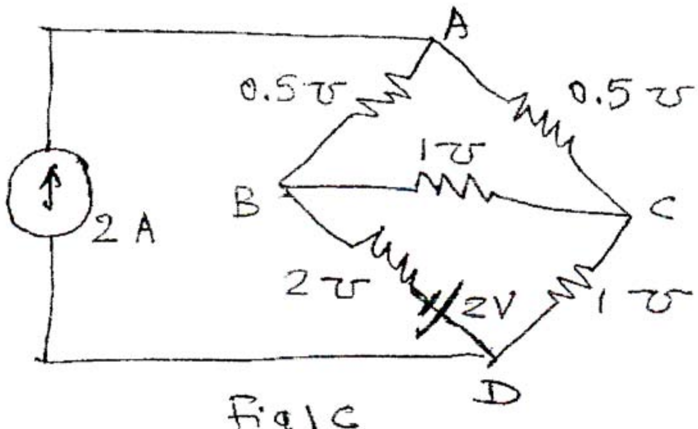



Fig 1c

OR

P.T.O.

2. a) Explain 'Dot convention' used for couplled circuits. **2**

b) Determine node voltage $V_b$ for the circuit shown in fig 2b. **6**

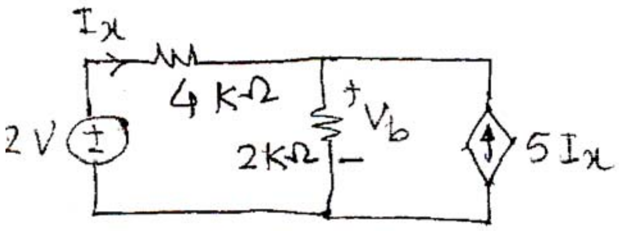



Fig 2b

c) Determine the current $i_x$ in the circuit shown in fig 2C using mesh analysis and confirm the value of current using nodal analysis. **10**

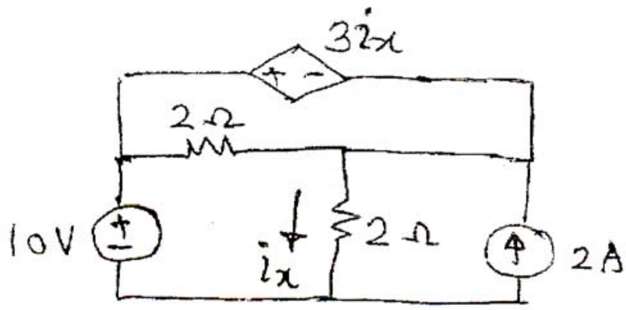



Fig 2c

3. a) Write short notes on Natural and forced response of RL series circuit. **6**

b) The switch in fig 3b is opened at t = 0 after having been closed for a long time. Find **10**

a) $i_L$ (t) for t > 0 b) $i_L$ ( 5 m sec)

c) $t_1$ if $i_L$ $(t_1)$ = 0.5 $i_L$ (0)

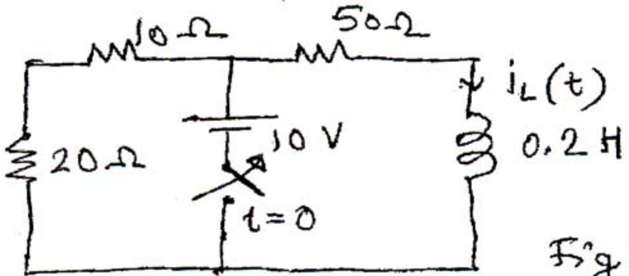
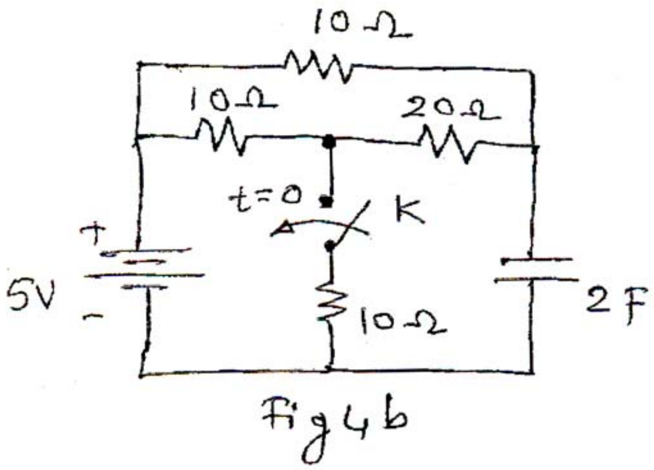



Fig 3b

OR

4. a) Discuss initial conditions in network elements R, L and C. **4**

b) In the circuit shown in fig 4b, determine $V_a(0^-)$ and $V_a(0^+)$ if switch K is closed. **4**




c) Determine $V_c$, $\frac{dV_c}{dt}$ at $t = 0^+$, if switch 'K' is opened at t = 0 in the circuit shown in fig 4c. **8**

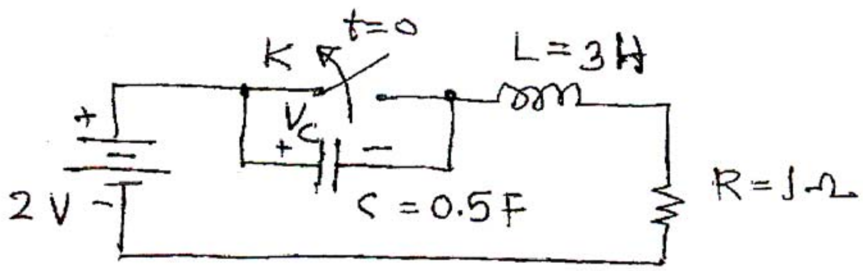



Fig 4c

5. a) Discuss S-domain networks and their solution using Laplace transform. What are the advantages of Laplace transform solution against classical method ? **8**

b) In the circuit of fig 5b, find the expression for voltage v(t) for t > 0. **8**

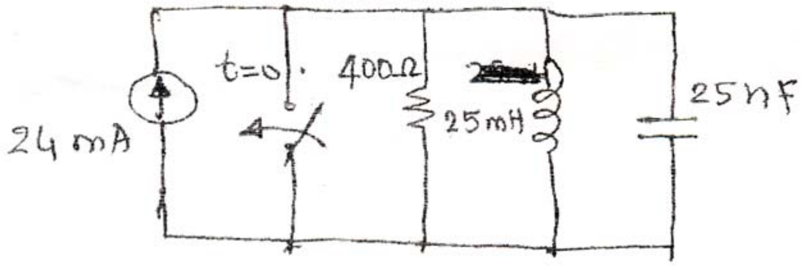



fig 5b

OR

6. a) Explain standard time signals **7**

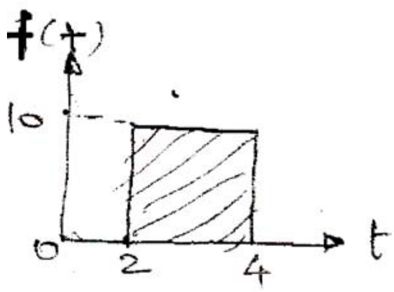
i) Step function

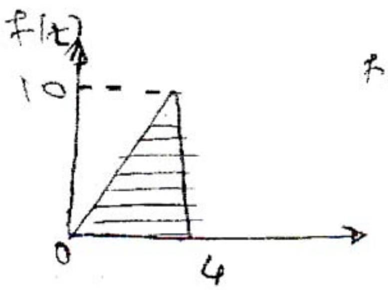
ii) Ramp function

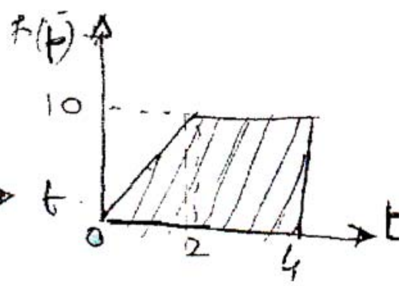
iii) Impulse functions

State their Laplace transform.

b) Find the Laplace transform of the function whose nature is as shown in figures $6b_1$ to $6b_3$ **(3×3)**



SECTION – II

7. a) State and explain : **(4×3)**

   i) Thevenin's theorem

   ii) Norton's theorem

   iii) Maximum power transfer theorem.

   b) Verify Tellegen's theorem for the network shown in fig 7 b. **6**

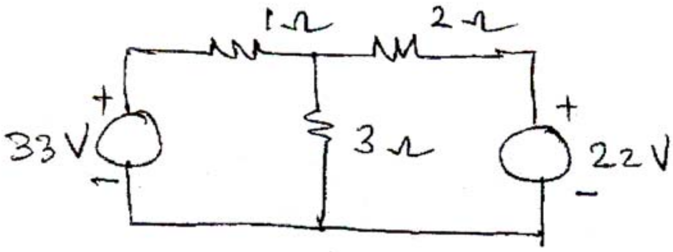



Fig 7b

OR

8. a) State and explain : **(4×3)**

   i) Superposition theorem

   ii) Millman's theorem

   iii) Compensation theorem.

   b) For the circuit shown in figure 8b, using Millmans's theorem, find the current in load impedence $Z_L$ = (2+j4)$\Omega$. **6**

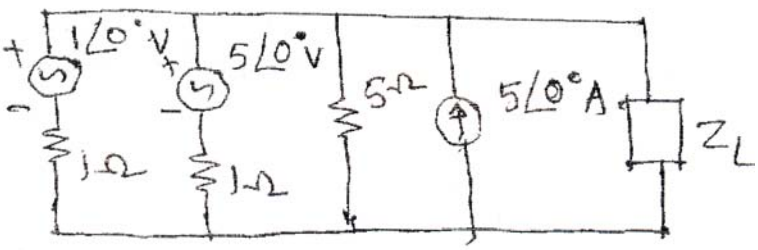



Fig 8b

9. a) Explain two port network parameters **8**

i) Z-parameters

ii) Y - parameters

iii) h-parameters

iv) transmission parameters.

b) Find Z-parameters of the 2-port network shown in fig 9b. **8**

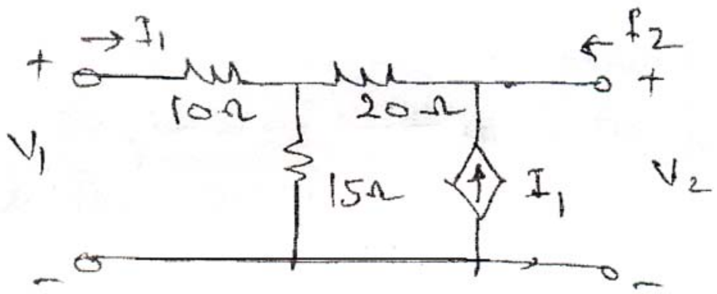



Fig 9b

OR

10. a) Derive the expression for resonant frequency in a parallel circuit shown in fig. 10 a. **8**

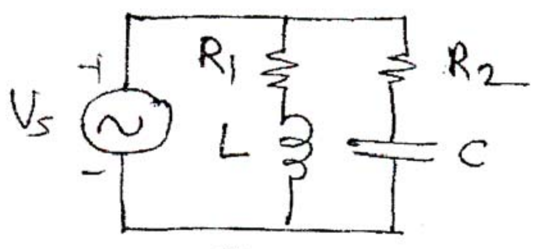



Fig 10 a

b) Prove that for an RLC series circuit the resonant frequency is geometric mean of upper and lower half power frequencies. **8**

11. a) Write short note on ‘Evaluation of Fourier coefficients. **6**

b) Find the trigonometric Fourier series for the periodic signal f(t) shown in fig. 11 b. **10**

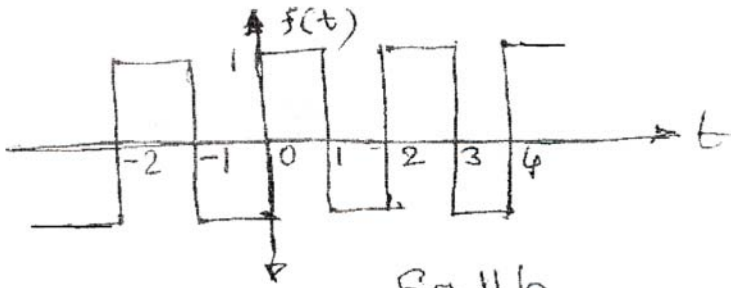



Fig 11 b

OR

12. a) 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. (Electrical) (Semester – II) (2003 Scheme) Examination, 2010**
**DIGITAL COMPUTATIONAL TECHNIQUES**

Time: 3 Hours Max. Marks: 100

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

SECTION – I

1. a) Compare the following :
   i) Accuracy and precision
   ii) Data uncertainity and error propagation
   iii) Syntax error and formulation error
   iv) Absolute and relative error. **8**

   b) Apply Descarte's rule of signs to discuss the nature of the roots of the equation.
   i) $x^{2n} - 1 = 0$
   ii) $x^4 - 3x^3+4x^2+3x - 2=0$ **8**

OR

2. a) Find the range of values of K for which all the roots of the following equation are real.

   $F(x) = x^3 - 3x + K = 0.$ **8**

   b) Explain the term significant digits. Roundoff the following numbers to four significant figures.
   i) 38.46235 **8**
   ii) 0.70029
   iii) 0.0022218

3. a) Solve using secant method to find root of
$F(x) = x. \log_{10} (x) - 1.9 = 0$, show 3 iterations. **8**

b) Describe Graeffe's squaring method for obtaining the root of a polynomial equation. **8**

OR

4. a) Obtain $\sqrt{12}$ , to five places of decimals by Newton's Raphson method. **8**

b) Obtain the more general formula for the root of $F(x) = 0$,

$$x_1 = x_0 - \frac{F(x_0)}{F'(x_0)} - \frac{1}{2}\frac{\{F(x_0)\}^2 F''(x_0)}{\{F'(x_0)\}^3}.$$ **8**

5. a) Compare Gauss-Seidal method with Gauss-Jordan method. **8**

b) Solve by using Gauss-Jordan method,
$10x_1 - 7x_2 + 3x_3 + 5x_4 = 6$
$-6x_1 + 8x_2 - x_3 - 4x_4 = 5$
$3x_1 + x_2 + 4x_3 + 11x_4 = 2$
$5x_1 - 9x_2 - 2x_3 + 4x_4 = 7$ **10**

OR

6. a) Why pivoting is used ? Explain partial and full pivoting process with examples. **8**

b) Solve by using Gauss-Seidel method.
$10x - 2y - z - t = 3$
$-2x + 10y - z - t = 15$
$-x - y + 10z - 2t = 27$
$-x - y - 2z + 10t = -9$
Show 3 iterations. **10**

SECTION – II

7. a) The following table is given :

| | | | | | | |
|---|---|---|---|---|---|---|
| **x** | : | 0 | 1 | 2 | 3 | 4 |
| **f(x)** | : | 3 | 6 | 11 | 18 | 27 |

**8**

What is the form of the function f(x) ?

b) The observed values of a function are respectively 168, 120, 72 and 63 at the four positions 3, 7, 9 and 10 of the independent variable. What is the best estimate you can give for the value of the function at the position 6 of the independent variable ? Solve using divided difference interpolation formula. **8**

OR

8. a) Derive Lagrange's interpolation formula for unequal intervals. **6**

b) Find the form of the function given by : **6**

| | | | | | |
|---|---|---|---|---|---|
| **x** | : | 3 | 2 | 1 | –1 |
| **f(x)** | : | 3 | 12 | 15 | –21 |

c) Prove the operators relation $(I+\Delta)(I-\nabla)=I$ **4**

9. a) Prove Simpson's $3/8^{th}$ rule for numerical integration as a follow up of Newton-Cote's quadrature method. **8**

b) Show that

$\int_0^1 \frac{dx}{1+x} = 0.69315$ using Simpson's $1/3^{rd}$ rule. **8**

OR

10. a) Fit an exponential curve of the form $y = ab^x$ to the following data. **8**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **x** | : 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **y** | : 1.0 | 1.2 | 1.8 | 2.5 | 3.6 | 4.7 | 6.6 | 9.1 |

b) Evaluate $\int_0^{\pi} \frac{\sin^2\theta}{5+4\cos\theta} d\theta$ by Simpson's $3/8^{th}$ rule taking $h = \frac{\pi}{6}$. **8**

11. a) Solve $dy/dx = x - y^2$ by Taylor's series method to calculate y at x = 0.4 in two steps. Take x = 0, y = 1 as a initial values. **10**

b) Explain modified Euler's method with graphical interpretation to obtain solution of ordinary differential equation. **8**

OR

12. a) Derive Milne's (predictor) formula to solve the differential equation. **8**

b) Solve $dy/dx = [1/(x+y)]$ for x = 0.5 to x = 2 (h = 0.5) by using R –K method, with $x_0 = 0$, $y_0 = 1.0$. **10**

**S.E. (Electrical) (Semester – II) Examination, 2010**
**INSTRUMENTATION**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer **3** questions from Section **I** and **3** questions from Section **II**.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Assume suitable data, if necessary.*

SECTION – I

1. a) What is meant by the term-Instrumentation ? What are its objectives ? **8**

b) Give classification of measuring instruments in detail. **8**

c) Define the term-process lag. **2**

OR

2. a) Draw a block diagram of generalised measurement system. Explain functions of each block. **8**

b) Explain first order and second order time response for sensors. **8**

c) Define the term-control lag. **2**

3. a) Draw block diagram of dual trace CRO and explain its working. **8**

b) Give detail classification of transducers. **8**

OR

4. a) Explain principle of working of inductive and capacitive transducers. Give types of inductive and capacitive transducers. **8**

b) State advantages of electrical transducers over other transducers. **4**

c) Suggest a suitable transducer for following measurements and justify your answer.

i) Water level in tank

ii) Flow measurement of petrol pump. **4**

5. a) Give suitable setup for measurement of temperature of a furnace and describe it in brief. **8**

b) Explain level measurement using radioactive method. **6**

c) Draw diagram showing constructional details of RTD. **2**

OR

6. a) Describe pressure measurement by McLeod gauge with a neat sketch. **8**

b) State different types of manometers. Explain inclined tube manometer. **6**

c) State properties of PT 100 element. **2**

SECTION – II

7. a) State methods of flow measurement. Explain differential flow meter. **8**

b) Explain construction and working of RVDT. **8**

OR

8. a) Explain construction and working of load cell. **8**

b) Define strain. Give types of strain gauges. **8**

9. a) State the basis for control valve selection. Explain any two types. **8**

b) Explain construction and working of X-Y recorder with a suitable sketch. **8**

OR

10. a) Compare electric and pneumatic actuators. **8**

    b) Explain construction and working of magnetic tape recorder. **8**

11. a) Draw basic block diagram of PLC and explain it in detail. **10**

    b) Explain the terms HMI and MMI. **8**

OR

12. a) Explain various configurations of SCADA system and give applications of this system. **10**

    b) Explain ladder diagram and notations involved in it. **8**

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# S.E. (Elex. and Electronics & Telecommunication) (Semester – I) (2003 Course) Examination, 2010
# SIGNALS AND SYSTEMS

Time : 3 Hours Max. Marks : 100

*Instructions :* 1) *Answer* ***any 3*** *questions from* ***each*** *Section.*
2) *Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) *Assume suitable data,* ***if necessary****.*

SECTION – I

1. a) Find whether the following signals are periodic , if yes, find the period. **8**

i) $x(t) = \cos t + \sin \sqrt{2}\, t$ ii) $x(t) = \cos\frac{\pi}{3}t + \sin\frac{\pi}{4}t$

iii) $x[n] = \cos \frac{1}{4} n$ iv) $x[n] = \cos^2 \frac{\pi}{8} n$.

1. b) Carry out the following operations on the signal with neat sketches and by sequence. **8**

$x_1[n] = \{\underset{\uparrow}{1}, 2, 3, 0, 0, 2, 2\}$

$x_2[n] = \{-2, -2, \underset{\uparrow}{2}, 2, 0, -2\}$

i) $y_1[n] = x_1[n] + x_2[n]$
ii) $y_2[n] = 2x_1[n]$
iii) $y_3[n] = x_1[n].x_2[n]$
iv) $y_4[n] = x_1[2n]$

OR

2. a) Determine whether CT system is

$y(t) = x(t). \cos \omega_c t$

i) Memoryless ii) Causal
iii) Linear iv) Time invariant
v) Stable. **10**

2. b) Find whether the following signals are energy or power signals and find the value

i) $x(t) = A \cos(2\pi ft + \theta)$ ii) $x[n] = \left(\frac{1}{2}\right)^n, u[n]$ **6**

3\. a) Evaluate contineous time (CT) convolution integral given below. Also sketch the result. **10**

$y(t) = t$ for $0 < t < 2$

$= 0$ elsewhere

$x(t) = 1$ for $0 < t < 1$

$= 0$ elsewhere

3\. b) Express the output y(t) as a function of the input and the system transformations, for the system of figure. 1 **6**

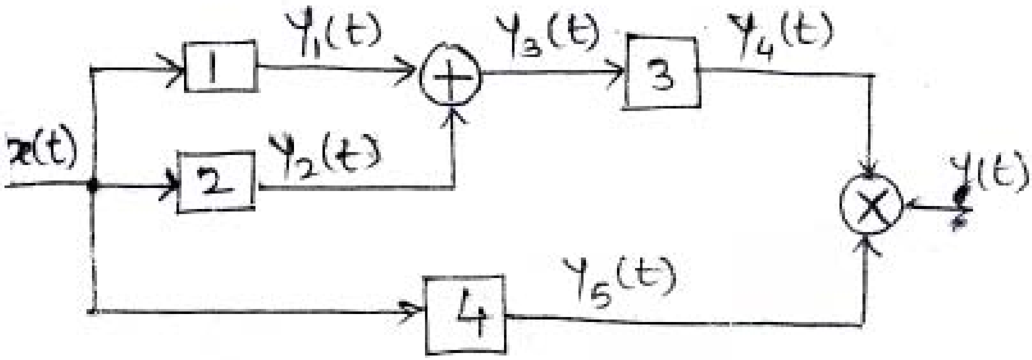


Fig. 1

OR

4\. a) Evaluate the DT convolution sum given below :

$y[n] = x[n]*h[n]$

where $x[n] = 2^n.u[n]$

$h[n] = u[n]$ **10**

4\. b) State and prove any three properties of convolution of CT signals. **6**

5\. a) Find the Exponential Fourier series and plot the magnitude and phase spectra for the periodic signal x(t) shown in fig.2. **10**

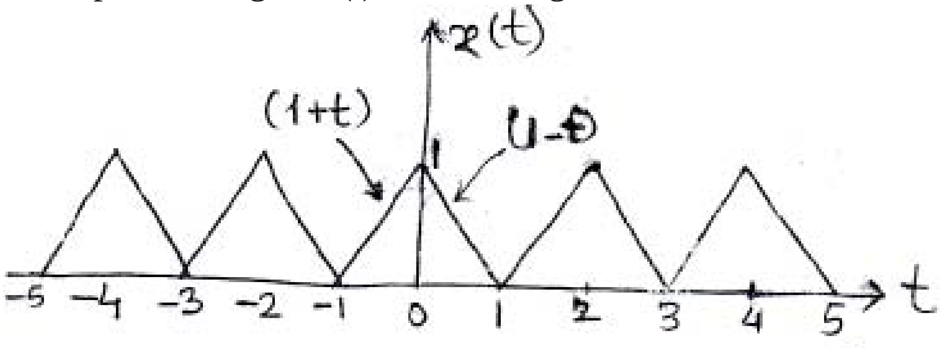


Fig. 2

5. b) State and verify properties of Fourier transform : **4**

   i) Scaling ii) Duality.

5. c) Write the Dirichlet conditions for the Fourier Transform to exists. **4**

OR

6. a) Prove the frequency shifting property of Fourier Transform and hence find the Fourier transform of $x(t) = \sin\omega_0 t$. **8**

6. b) Find the Fourier Transform of x(t) $x(t) = e^{-at}.u(t)$. **8**

6. c) State equations for trignometric Fourier series. **2**

SECTION – II

7. a) What are advantage of Laplace transform over Fourier transform ? Explain with example. **4**

7. b) Find the Laplace Transform of a periodic function shown in fig. 3. **8**

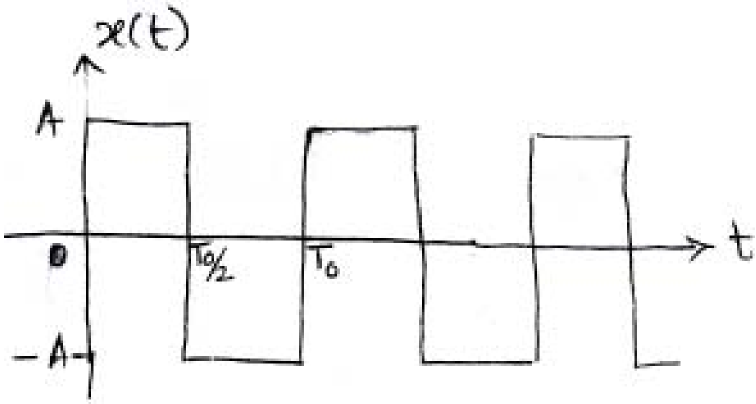


Fig. 3

7. c) Find initial and final value for the function using Laplace transform $f(t) = 2 - e^{3t}$. **6**

OR

8. a) Explain the following properties of Laplace transform :

   i) Frequency shifting

   ii) Convolution. **4**

8. b) Find the Laplace transform of the following using linearity property

   $f(t) = 4e^{5t} + 6t^3 - 3\sin 4t + 2\cos 2t$. **8**

8. c) Find the Inverse Laplace transform of

$$F(s) = \frac{3s+7}{(s^2 - 2s + 3)}$$

   if ROC is

   a) $b > 3$ b) $b < -1$ c) $-1 < b < 3$ **6**

9. a) State and prove Sampling Theorem. **8**

9. b) Find Nyquist sampling frequency and interval for the following signal : **8**

i) $\sin 400\pi t + \sin 2000\ \pi\ t$; ii) $\sin 600\pi t . \cos 200\pi t$;

iii) sin C(2000 t) iv) sin C(2000 t) + sin C(3000 t)

OR

10. a) Find the auto-correlation of the DT energy signal. **8**

$x[n] = \cos(\pi n).\text{sinc}\left(n/2\right)$.

10. b) Define cross-correlation of periodic signals and explain its properties. **8**

11. a) List and explain properties of CDF and PDF. **8**

11. b) CDF for a random variable x is given by

$$f_x(x) = Kx^3 \quad 0 \le x < 3$$
$$= 1 \quad x \ge 3$$
$$= 0 \quad x < 0$$

If p(X = 3) = 0 find

i) K ii) Density function

iii) P(X > 1) iv) $P(1 < X \le 2)$ **8**

OR

12. a) Define the terms mean, moments, expectation and standard deviation. **4**

12. b) Sketch Gaussian PDF and write expression for Gaussian PDF. **4**

12. c) The PDF of random variable ‘x’ is given by **8**

$F_x(X) = x.e^{-x}\, 4x$

Find :

i) CDF $F_x(x)$

ii) $P(X \le 1)$

iii) P(1 < X < 2)

iv) P(X > 2).

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**S.E. (Elex. Electronics and Tele Communication) (Semester – I)**
**Examination, 2010**
**SEMICONDUCTOR DEVICES AND CIRCUITS**
**(2003 Course)**

Time: 3 Hours                                                                                    Max. Marks: 100

SECTION – I

1. a) Determine junction potential for a silicon junction (P-n) at T = 300°K for
   i) NA = $10^{15}$ $cm^{-3}$; $N_D$ = $10^{17}$ $cm^{-3}$  ii) NA = $N_D$ = $10^{17}$ $cm^{-3}$. **10**

   b) Explain the difference between Drift current and diffusion current. **6**

OR

2. a) The resistivity of two sides of step graded germanium diode 2Ω-cm (P-side) and 1Ω-cm (n-side) calculate the height of potential barrier.
   Given : $\mu n$ = 3800 $cm^2$/v–sec
   $\mu p$ = 1800 $cm^2$/v – sec
   ni = $2.5 \times 10^{13}$ per $cm^3$. **10**

   b) Explain the difference between mobility and conductivity. **6**

3. a) Find the diode current $I_D$ in fig.-1 when **10**
   i) diode is ideal                    ii) Vr = 0.7V and Rf = 30Ω

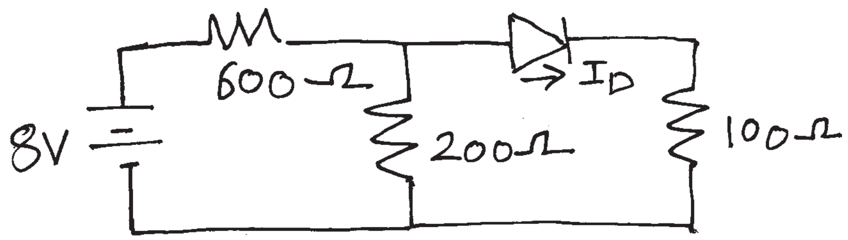


Fig-1 [Q 3 (a)]

   b) What is ohmic contact ? State the important properties of ohmic contact. **6**

OR

4. a) Calculate the anticipated factor by which the reverse current of Germanium diode is multiplied when the temperature is increased from 25°C to 80°C. **10**

   b) Define the following for P-n junction diode
   i) Cut-in voltage                    ii) Forward dynamic resistance
   iii) Reverse break down voltage. **6**

**P.T.O.**

5. a) An FET used in the amplifier circuit shown in fig.-2 has following parameters.
$I_{DSS}$ = 2 mA ; $V_{GS_{(OFF)}}$ = –2.4V.
Determine i) $V_{GSQ}$ ii) $T_{DQ}$ iii) $V_{DSQ}$ iv) gmo v) gm. **12**

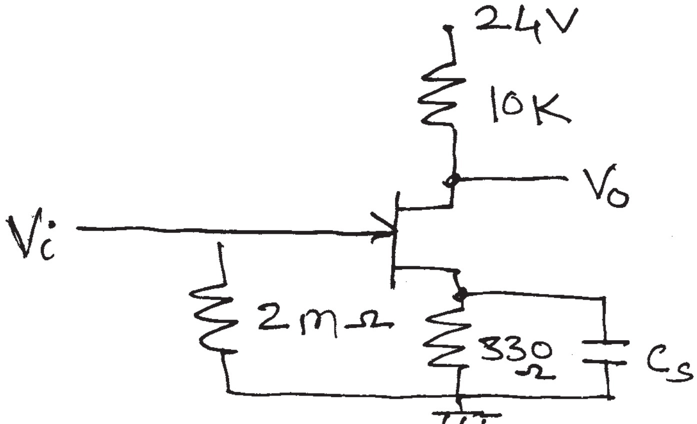


Fig-2 [Q 5 (a)]

b) Define gm, rd and μ of JFET. Give relation between them. **6**

OR

6. a) For the JFET amplifier circuit shown in fig.-3
i) Draw small signal model ii) Calculate AV; Ri, Ro. **12**
Given : gm = 8 mA/V ; rd = 20KΩ.

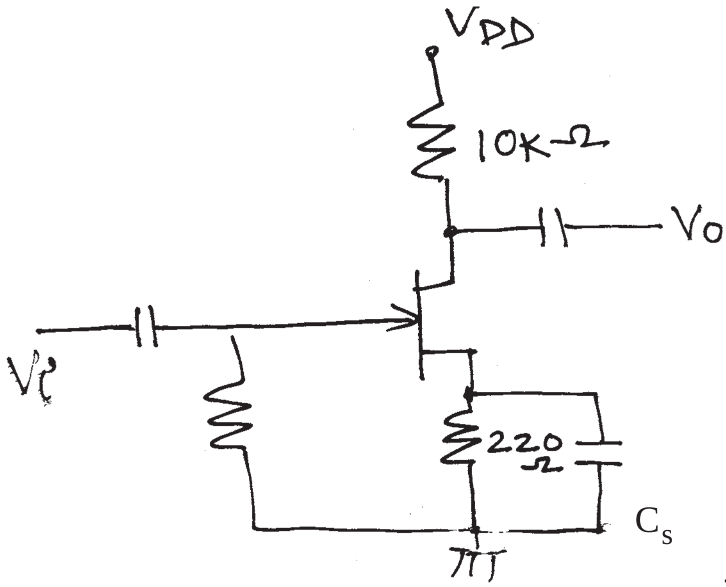


Fig-3 [Q 6(a)]

b) Draw drain and Transfer characteristics of n-channel JFET. Indicate various region of operation. **6**

SECTION – II

7\. a) Explain the following biasing circuits used for EMOSFET.

i) Voltage divider bias      ii) Voltage feedback bias. **6**

b) For the EMOSFET amplifier circuit shown in fig.-4, calculate the D.C. bias values $V_{GSQ}$, $I_{DQ}$ and $V_{DSQ}$.

Given $I_{D(ON)} = 6$ mA ; $V_{Gs(ON)} = 8V$, $V_T = 3V$. **10**

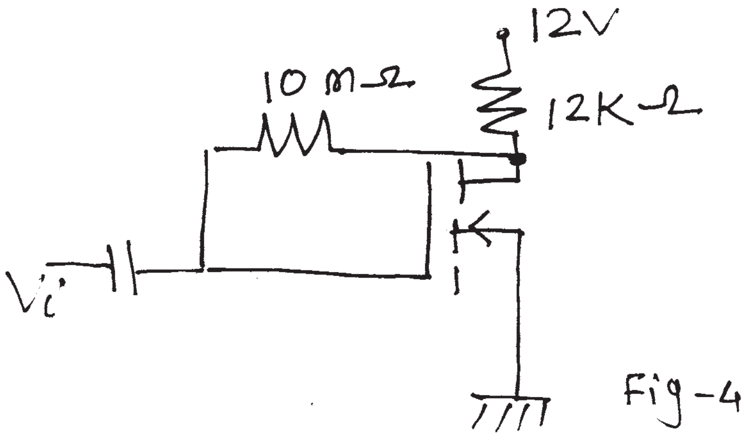


Fig-4[Q7b]

OR

8\. a) Explain the following non ideal characteristics of MOSFET.

i) Breakdown effect

ii) Subthreshold conduction. **12**

iii) Temperature effect.

b) State true or false :

i) MOSFET is unipolar device

ii) MOSFET is voltage controlled device

iii) In EMOSFET conducting channel is induced at $V_T$.

iv) MOSFET is prefered as VLSI device. **4**

9. a) Define S, $S'$ and $S''$ with repect to stability. **6**

b) In CE amplifier shown in fig. - 5 the transistor has $\beta$ -100; $V_{BE}$ = 0.6V. Calculate the values of $R_1$ and $R_C$ such that the transistor has $I_C$ = 1mA and $V_{CE}$ = 2.5 V. **12**

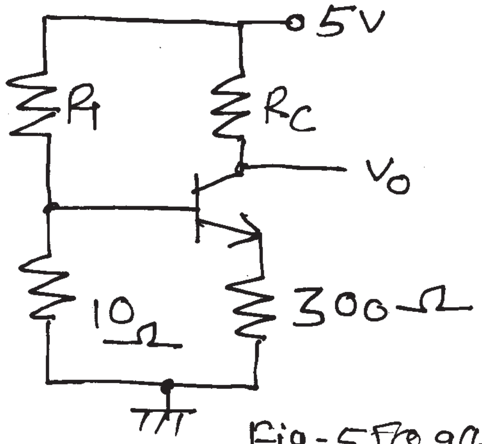


Fig-5 [Q 9(b)]

OR

10. a) Define in word and also as a partial derivative i) hie ii) hfe iii) hre iv) hoe. Indicate what variable is held constant. **6**

b) The transistor amplifier as shown in fig.-6 uses a transistor whose h-parameters are hie = 1.1K, hfe = 50, hre = $2.4\times10^{-4}$
hoe = 25 $\mu$A/V. calculate.
i) AV ii) $A_{VS}$ iii) $R_i$ iv) $R_o$. **12**

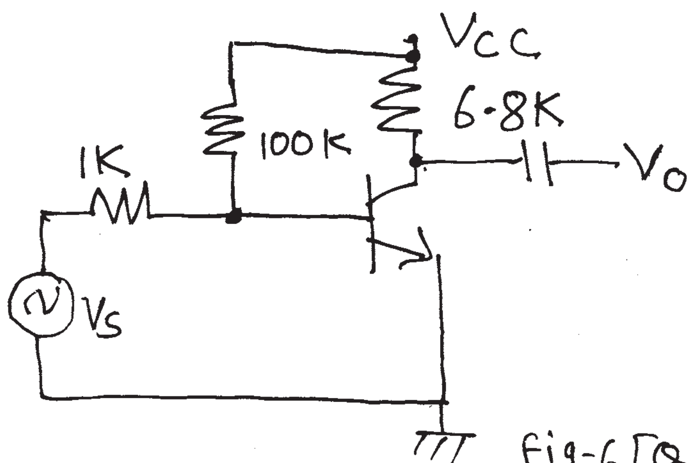


Fig-6 [Q 10(b)]

11. a) The RC coupled amplifier is to pass 50 Hz square wave with no more than 10% tilt. Calculate the maximum lower cutoff frequency allowed for the amplifier. **6**

b) In an R-C coupled amplifier derive the following relations.

$$tr = \frac{0.35}{FH} \text{ and } \%S = \frac{\pi F_L}{F}$$ **10**

OR

12. a) Explain the effect of coupling bypass and junction capacitors of transistors used in amplifier circuits on the frequency response of an amplifier. **6**

b) A three identical non-interacting stage FET amplifier has gm = 2 mA/V, rd = 10K$\Omega$, $R_D$ = 15 K$\Omega$, $R_G$ = 500 K$\Omega$. Assuming the last stage has a load of 500K$\Omega$. Calculate overall voltage gain (mid band) in dB. **10**

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**S.E. (ELEX. & E & TC) (Semester – I) Examination, 2010**
**CONTROL SYSTEMS**
**(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

I. a) With suitable example distinguish between
1) Open loop control and closed loop control
2) Linear system and non-linear system. **8**

b) For the network shown in Figure 1, obtain $\frac{V_o(s)}{V_i(s)}$ using Block Diagram Reduction Technique. **8**

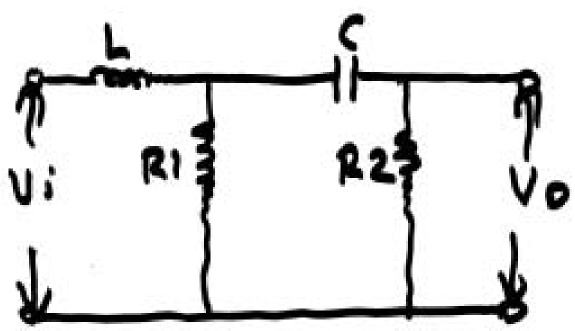


Fig. 1

OR

**P.T.O.**

II. a) With proper example, explain "Feed Forward Control". How it is superior to feedback control ? **8**

b) For the network shown in Figure 2, obtain $\frac{V_o(s)}{V_i(s)}$ using Signal Flow Graph Technique. **8**

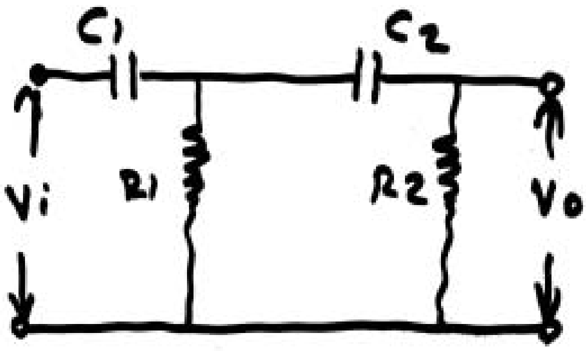


Fig. 2

III. a) What are the standard test signals considered for error calculation analysis ? Explain. **4**

b) Sketch the root locus of the system with G (s) H (s) = $\frac{K}{s(s^2+2s+25)}$.

Determine the position of the closed loop poles, undamped natural frequency for 50% of the marginal value of k. **12**

OR

IV. a) A unity feedback control system has $G(s) = \frac{20}{s\,(1+s)\,(1+4s)}$. Determine different static error coefficients. Determine the steady state error for an input $r(t) = 2 + 4^t + \frac{t^2}{2}$. **6**

b) Write short notes on Dynamic error coefficients. **4**

c) A unity feedback system has $G(s) = \frac{K}{s(s+2)(s^2+4s+1)}$. Obtain the value of K for the system to be stable. **6**

V. a) Write short note on "Correlation between Time Domain and Frequency Domain". **6**

b) Sketch the Bode plot for the system with $G(s)H(s)=\dfrac{242\,(s+5)}{s(s+1)\,(s^2+5s+121)}$.

Obtain $\omega_{gc}$, $\omega_{pc}$, GM and PM. Comment on stability. **12**

OR

VI. a) State and explain Nyquist stability criterion. **8**

b) For the system having $G(s)\,H(s)=\dfrac{10}{s(s+1)\,(s+2)}$. Sketch the Nyquist plot and comment on stability. **10**

SECTION – II

VII. a) What are the advantages of State Space Analysis techniques over transfer function techniques ? **6**

b) Find out the time response for unit step input of a system given by

$$\dot{X}(t)=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}X\,(t)+\begin{bmatrix}0\\ 5\end{bmatrix}U\,(t)\ \text{ and}$$

$$Y(t)=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}X\,(t);\ X\,(0)=\begin{bmatrix}1\\ 0\end{bmatrix}$$ **10**

OR

VIII. a) Define :

1) State
2) State variable
3) State vector
4) State space **4**

b) State the properties of State Transition matrix. **4**

c) Obtain a state space model of the system with transfer function.

$$\frac{Y(s)}{U(s)}=\frac{6}{s^3+6s^2+11s+6}.$$ **8**

IX. a) Explain the working of an Electromagnetic flow meter with a neat sketch. What is its limitation ? **8**

b) Sketch a Piezoelectric type accelerometer. Explain its working. Where it is used ? **8**

OR

X. a) A thermistor is to monitor room temperature. It has a resistance of 3.5 K at 20°C with a slope of – 10%/°C. The dissipation constant $P_D$ = 5 mW/°C. Devise a divider circuit for this to provide a voltage 5.0 V at 20°C. Evaluate the effect of self heating. **4**

b) With a neat sketch, explain how to use synchros as an error detector. **8**

c) Compare between Metallic strain gauge and semiconductor strain gauge. **4**

XI. a) Justify the statement.

"Proportional Controller is a natural extension of ON-OFF Controller". **4**

b) Sketch the output of a PID controller for

1) Step input 2) Ramp input. **4**

c) Draw the block diagram of a PLC and explain the function of each block. What are the different types of inputs which can be connected to PLC ? **10**

OR

XII. a) Sketch the outputs of P, I, D, PI, PD and PID Controllers for a step input. **6**

b) Draw the PLC ladder diagram for an "Elevator Control System". Consider all sensors as direct inputs to PLC. **12**

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**[3862] – 355**

# S.E. (Elex. & E&TC) (Semester – I) Examination, 2010
# DIGITAL 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.*

SECTION – I

1. a) Draw and explain the working of 2 I/P TTL and CMOS NAND gate. **12**

   b) Draw and explain TTL input profile and TTL output profile. **6**

OR

2. a) Explain the interfacing of TTL to CMOS and CMOS to TTL. **12**

   b) Explain the operation of CMOS NOR gate (2 I/P). **6**

3. a) Minimize the function using K map and implement using NAND gate only.

   $F(A, B, C, D) = \sum m(0, 1, 3, 5, 6, 9, 11, 13)$. **8**

   b) Perform the following conversions :

   i) $(1101101 \cdot 1011)_2 = (\quad\quad)_8$

   ii) $(499 \cdot 4)_8 = (\quad\quad)_{10}$

   iii) $(758 \cdot 64)_{10} = (\quad\quad)_2$. **8**

OR

4. a) Design and implement BCD adder using binary adder. **8**

   b) Design 2 bit comparator using logic gates. **8**

P.T.O.

5. a) Implement the following function using PLA :

   i) $F_1(A, B, C) = \sum m(4, 5, 7)$

   ii) $F_2(A, B, C) = \sum m(3, 4, 5)$ . **8**

   b) Design and implement full adder using suitable decoder. **8**

OR

6. a) Design and implement 3 bit binary to gray code converter using PLA. **8**

   b) Implement 16:1 max using 4:1 max. **8**

SECTION – II

7. a) Design MOD 78 using IC 7490. Explain its working. **8**

   b) With circuit diagram explain the function of 4 bit bidirectional shift register. **10**

OR

8. a) Convert JK FF to

   i) DFF  ii) TFF. **10**

   b) Draw and explain the operation of 4 bit ring counter. Draw its waveform. **8**

9. a) Design and implement 3 bit ripple upcounter using JK FF. **8**

   b) Design a sequence generator using shift register ...10010... **8**

OR

10. a) Design and implement Mod 7 synchronous counter using DFF. **8**

    b) Design and implement the following sequence detector using TFF. (Use Mealy model) ...110... **8**

11. a) With the help of block diagram and waveform explain dual slope AID converter. **8**

    b) Discuss various types of read only memories. **8**

OR

12. a) Explain in brief, successive approximation method of ADC. **8**

    b) With neat circuit diagram, explain the operation of bipolar static RAM cell. **8**

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[3862] – 356

**S.E. (Elex. & E and TC) (Semester – II) Examination, 2010**
**ELECTRONICS CIRCUITS AND APPLICATIONS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

*N.B. : 1) **All** questions are **compulsory**.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) **Black** figures to the **right** indicate **full** marks.*

SECTION – I

1. A) Compare voltage multiplier circuits. **6**

B) Write a notes on : **6**

i) Clipper

ii) Clamper.

C) How will you minimise parasitic effect in CMOS Inverter ? Explain in detail. **4**

OR

2 A) Write a notes on CMOS characteristics. **4**

B) For the circuit shown in fig. 1.Assuming ideal diode sketch $I_R$ and $V_O$. **6**

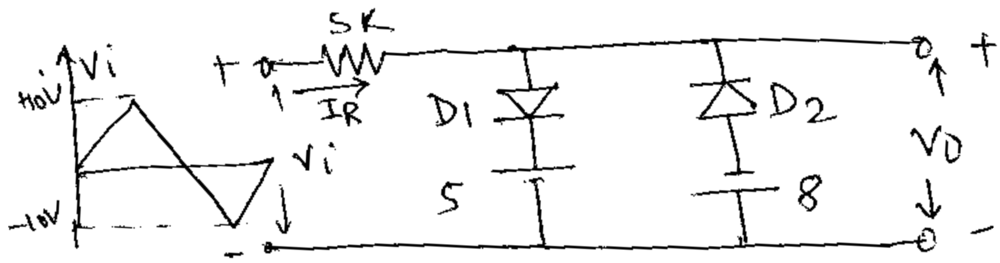


Fig. 1

C) Draw the PSPICE n-channel MOSFET model. **6**

**P.T.O.**

3. A) Explain turn-off characteristics of Power BJT. **8**

B) Write a notes on SOA. **8**

OR

4. A) Explain switching model of MOSFET and turn-off characteristics. **8**

B) Explain different drive circuit of POWER MOSFET. **8**

5. A) Derive the expression for second order harmonic distortion (3 point method). **8**

B) Explain operation of Class-B power amplifier. **6**

C) The dynamic transfer characteristics curve for a given transistor is **4**

$i_c = 100\, i_b + 500\, l_b^2$

Where, $i_b = 10 \cos 2\pi\, 100\, t$

Calculate the percent harmonic distortion.

OR

6. A) A complementary push-pull amplifier has capacitive coupled load $R_L = 4\Omega$ supply voltage $\pm 15V$ calculate : **8**

i) $P_{ac(max)}$

ii) $P_D$ of transistor

iii) Efficiency.

B) Explain operation of a Class -A Push-Pull amplifier. **6**

C) Compare class -B push pull and complementary symmetry amplifier. **4**

SECTION – II

7. A) Explain behavioral of transistor at high frequency using T-model. **8**

B) The following frequency parameters are known for given transistor at $i_c = 1.2$ mA, $V_{CE} = 8$ V at room temperature and h-parameters are $h_{fe} = 50$, $h_{je} = 1000\ \Omega$, $h_{re} = 2.8\times10^{-4}$, $h_{oe} = 28\ \mu$A/V. At the same point $f_T = 50$ MHz and $C_{ob} = 2$ pf. Compute all the values of hybrid $\pi$ parameters of CE transistor model. **10**

OR

8. A) A single stage CE amplifier is measured to have bandwidth of 4 MHz with a resistive load of 600 $\Omega$. Find the value of source resistance $R_S$ that will give the required Bandwidth. Assume the following parameters for transistor.

   $h_{fe}$ = 75, $g_m$ = 60 mA/V, $r_{bb}$ = 50 $\Omega$, $C_c$ = 2 pf, $F_T$ = 250 MHz, make suitable assumption. **10**

   B) Explain the different characteristics of tuned circuits. **8**

9. A) Derive the expression for output resistance with feedback and show that due to negative feedback the output resistance reduces for voltage series feedback amplifier. **8**

   B) A quartz crystal has following components : **8**

   L = 0.06 H, $C_1$ = 0.001 PF, $C_2$ = 1 Pf and R = 250 $\Omega$,
   Calculate the values of series and parallel resonant frequencies.

OR

10. A) Show that the lower 3 dB frequency with feedback is less than the lower 3 db frequency without feedback. Derive expression for it. **8**

    B) Write a notes on : **8**

    i) Miller crystal oscillator

    ii) Hartley oscillator.

11. A) Explain the block diagram of three terminal regulator. Define load regulation and line regulation. **8**

    B) Design an adjustable voltage regulator for following specifications **8**

    $V_0$ = 5 V to 12 V

    $I_0$ = 1.2 Amp using LM 317.

OR

12. A) Draw circuit diagram for transistorised series feedback regulator. Derive expression for output voltage. **8**

    B) Write down features of three terminal voltage regulator. **4**

    C) How will you boost output current in 3 terminal voltage regulator ? Show necessary arrangement. **4**

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**S.E.(Elex. & E&TC (Semester – II) Examination, 2010**
**DATA STRUCTURES AND FILES**
**(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) Compare sequential and random file organizations. **4**

b) What is recursion ? Explain with example. **6**

c) Write a ‘C’ function to swap two numbers using pointers. **6**

OR

2. a) Write down difference between Structure and Union. **4**

b) Explain what do you mean by Row major and Column major representation with respect to Array representation. **6**

c) Compare Static and Dynamic Memory Allocation. **6**

3. a) Define ADT. Write down ADT of STACK. **8**

b) What do you mean by collisions in Hashing ? Explain with example. **8**

OR

4. a) Explain method of binary search with example in detail. **8**

b) Sort the following numbers using Bubble Sort and Insertion Sort. Show array after each pass.

10 67 12 34 2 23 56 53 **8**

5. a) Write a 'C' function to insert a node in SLL. Consider all possibilities. **8**

b) Define GLL. Represent following polynomial using GLL. **6**

$9x^2y^2 + 6\ xy^2 + 6\ y^2 + y + x^2$

c) Compare SLL and DLL. **4**

OR

6. a) Explain node structure of DLL. Using 'C' Write down structure template for a node in DLL. **4**

b) Write a function in 'C' to delete a node in DLL. **8**

c) Write algorithm to create SLL. **6**

SECTION – II

7. a) Write algorithm in detail to convert an infix expression to postfix expression. Convert following infix expression to postfix using above algorithm.

$(a + b) * (c - d) / (a\$b)$. **8**

b) Define Stack. Explain with example operation performed on STACK. **8**

OR

8. a) Differentiate between Circular Queue and Linear Queue. **4**

b) Write function in 'C' to insert and delete an element in linear queue. **8**

c) Explain Priority queue with example. **4**

9. a) Define the following terms with examples : **10**

   1) Binary Tree
   2) BST
   3) Completely Binary Tree
   4) Strictly Binary Tree
   5) Forest.

   b) What is Threaded Binary Tree ? Explain in detail with example. **6**

OR

10. a) For following data, form BST. Show steps in detail **10**

    Traverse the tree in inorder, preorder and postorder form

    34, 23, 12, 67, 89, 45, 67, 90, 23, 88

    b) Write a function in 'C' to create BST. **6**

11. a) What is Spanning Tree ? Explain with example algorithm to find minimum spanning tree. **8**

    b) Explain in detail shortest path algorithm with example. **10**

OR

12. a) Define DFS and BFS for a graph. Show BFS and DFS for any graph. **8**

    b) With proper example of graph show adjacency matrix and adjacency list representations. **10**

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**[3862] – 360**

# S.E. (ELEX & E&T.C.) (Sem. – II) Examination, 2010
# ANALOG COMMUNICATION
# (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) What is modulation ? Explain different types of modulation in detail. **8**

b) What is TDM ? Explain in detail with the help of block diagram. **6**

c) Explain different types of baseband signals. **4**

OR

2. a) Explain need of modulation and hence explain basic block diagram of communication system. **9**

b) Explain generation and detection of PPM with help of waveforms. **6**

c) State different types of communication channel with their bandwidth and application. **3**

3. a) Explain generation of DSB-SC modulator using FET in detail. **8**

b) Compare high level and low level modulation, hence explain high level modulator. **8**

OR

4. a) A modulating signal m(t) is given by

i) $m(t) = \cos 2000\pi t$

ii) $m(t) = \cos 10{,}000\pi t + 2 \cos 3000\pi t$

In each case,

i) Sketch the spectrum of m(t).

ii) Sketch the DSBSC signal spectrum for carrier of 2cos $20{,}000\pi t$.

iii) Sketch the SSB signal spectrum if carrier is 4 cos $40000\pi t$. **8**

b) Sketch AM signal for a periodic triangular signal m(t) having $V_{PP}$ equal to 6V and frequency of 1 KHz at m = 0.5 and carrier frequency of 50 KHz. **4**

c) Explain VSB transmission. **4**

5. a) Explain Armstrong method of FM Generation. **8**

b) Compare NBFM and WBFM. **4**

c) Why FM is known as constant bandwidth modulation. **4**

OR

6. a) Explain direct method of FM Generation. **6**

b) What is the need of pre-emphasis ? Draw and explain its working. **6**

c) Compare AM and FM. **4**

SECTION – II

7. a) Explain Block diagram of superheterodyne receiver in detail. **9**

b) Explain various characteristics of Radio Receiver in detail. **9**

OR

8. a) Draw the simple diode detector and hence explain practical diode detector in detail. **9**

b) What is tracking ? Explain the types of tracking in detail. **9**

9. a) Explain different sources and types of noise. **8**

b) Derive the equations of following

i) Friiss Formula. **8**

OR

10. a) Explain noise factor. Derive the expression for noise factor in detail. **8**

b) If $R_1 = 20K\Omega$ and $R_2 = 10K\Omega$, calculate the thermal noise generated by :

i) $R_1$ iii) $R_1$ in series with $R_2$

ii) $R_2$ iv) $R_1$ in parallel with $R_2$. **8**

Assume 12 MHz noise bandwidth.

11. a) State different types of propogation with their frequency ranges. Explain any one type in detail. **8**

b) Draw and explain the Yagi Uda antenna. **8**

OR

12. a) Explain the following : **8**

1) Line of sight propogation

2) Duct propogation.

b) Explain in detail : **8**

i) Virtual height

ii) Skip distance

iii) MUF

iv) Fading.

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# [3862] – 361

**S.E. (Instrumentation and Control) (Semester – I) Examination, 2010**
**ANALOG TECHNIQUES**
**(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) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed.***
*5) Assume Suitable data, if **necessary.***

SECTION – I

1. a) What are the different configurations in which a transistor can operate ? With the help of a neat labeled diagram, explain the working and plot input-output characteristics for CE configuration of a transistor. **10**

1. b) Compare BJT and FET based on the following points : **6**
   1) Input impedance
   2) Thermal Runaway
   3) Controlling parameter
   4) Direction of current flow

OR

2. a) List and compare various Biasing techniques. Derive the expression for the different resistors used in circuit of voltage divider bias. **10**

2. b) Explain the Construction and working principle of FET. **6**

3. a) What is AC degeneration ? Explain why coupling and bypass capacitors are required ? **6**

3. b) Draw the hybrid equivalent circuit of a transistor and explain how the 4 h-parameters are defined. **8**

3. c) For a CE amplifier circuit, if $I_C = 1.5mA$, $R_C = 4.7K\Omega$ and $R_L = 56K\Omega$ then calculate $r_e'$ and $A_V$. **2**

OR

4. a) Explain the Darlington pair with the help of circuit diagram. **8**

4. b) Describe the transformer type of coupling. Compare it with direct and RC coupling. **8**

5. a) Define the following terms : **8**
   1) Slew Rate
   2) CMRR
   3) Bandwidth
   4) Offset voltage and current.

5. b) Draw and Design a non-inverting amplifier for a gain of 10. If the OP AMP used is IC741, calculate the available workable frequency range and the common mode gain value. **10**

OR

6. a) Explain the block diagram, equivalent circuit and ideal characteristics of the operational amplifier. **12**

6. b) In the Inverting configuration of the operational amplifier if the feedback resistor $(R_F) = 5K\Omega$ and the input Resistor is $(R_1) = 1K\Omega$, then
   i) If 1 V peak to peak sine wave is applied as the input signal, what will be the amplitude of the signal at the inverting terminal of the op-amp. Why ?
   ii) If the amplitude of input signal is 2mv, what will be the amplitude of signal at the output terminal. Why ?
   iii) If the unity gain point of the op-amp is 1MHz, what is the bandwidth of the circuit ? **6**

## SECTION – II

7. a) State the Barkhausen criteria. Compare Wien bridge oscillator and Phase shift oscillator based on the following points : **6**
   1) Gain desired
   2) Type of feedback
   3) Phase shift between input and output
   4) Frequency formula

7. b) State the four types of feedback and draw the block diagram representation for each. **10**

OR

8. Derive the expression for following terms, in the manner they affect the amplifier after using negative feedback
   i) Bandwidth
   ii) Gain
   iii) Input impedance
   iv) Output impedance **16**

9. a) What are power amplifiers ? How are they classified ? Explain the working of class A amplifier with a suitable diagram. **8**

9. b) Derive the relation for the maximum efficiency of the class B power amplifier. **8**

OR

10. a) Explain the transformer coupled Push Pull Amplifier with the help of circuit diagram and characteristic curve. **8**

10. b) For a Class B amplifier providing a 20-v peak signal to a 16 $\Omega$ load and a power supply of $V_{CC}$ = 30 V, determine the input power, output power, and circuit efficiency. **8**

11. Write short note on : **[any 3]** **18**
   1) Optocupler.
   2) Working of SCR based on the 4 layered semiconductor construction.
   3) UJT relaxation oscillator.
   4) Zener series regulator.

OR

12. a) Discuss the construction and working principle of Photo transistor and DIAC in detail. **10**

12. b) For a transformer output of 15V and a filter capacitor of 250 $\mu$F, calculate the minimum input voltage when connected to a load drawing 400mA. **8**

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**[3862] – 364**

**S.E. (Instrumentation & Control) (Semester – I) Examination, 2010**
**BASIC INSTRUMENTATION**
**(2003 Course)**

Time : 3 Hours  Max. Marks : 100

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

SECTION – I

1. a) A voltmeter has sensitivity of 1000 $\Omega$ / V and used to measure voltage across a 2.7 k$\Omega$ resistance. It is operated in 50 V range. The open circuit voltage is 27 V. Find the percentage error in measurement. **6**

b) Explain :

I) Drift

II) Dead zone

III) Precision

IV) Accuracy

V) Speed of Response. **10**

OR

2. a) Write a note on virtual Instrumentation. **8**

b) Explain loading effect due to series connected instruments. **8**

3. a) Explain different infrastructural requirements for a calibration laboratory. **8**

   b) Write a note on traceability and traceability chart. **8**

OR

4. a) Explain

   1) Reproducibility and Repeatability

   2) Calibration Uncertainty ratio. **10**

   b) Write a note on 'Calibration Report'. **6**

5. a) Explain with neat circuit diagram explain series type ohm-meter. **6**

   b) With neat constructional diagram explain the attraction type moving iron instrument. **8**

   c) Write a note on Swamping Resistance. **4**

OR

6. a) Design multirange ammeter by individual shunt method by using a basic meter movement having $250\,\Omega$ internal resistance and full scale deflection current of $500\ \mu A$. The desired measurement ranges are 5 mA, 10 mA, 50 mA and 100 mA. **8**

   b) Explain basic dc potentiometer. **8**

   c) Define deflection sensitivity and deflection factor of a voltmeter. **2**

SECTION – II

7. a) Explain in detail giving advantages and limitations the Wheatstone bridge. **10**

   b) How Schering bridge can be used for measurement of unknown capacitance ? Derive the equations. **8**

OR

8. a) How Kelvin double bridge eliminates the limitation of Wheatstone bridge for resistance measurement lower than 1 ohm ? Explain. **10**

   b) It is desired to measure inductances having the Q values greater than 10. Suggest and explain suitable method. **8**

9. a) Explain Galvanometric type recorder. **8**

   b) With neat constructional diagram explain CRT. **8**

OR

10. a) Give classification of recorders and explain XY recorder. **10**

    b) How unknown frequency can be measured by using Z - modulation technique ? **6**

11. a) Write a note on electrical comparator. **8**

    b) With neat figures, explain different types of fits. **8**

OR

12. a) Write a note on inclinometer. **8**

    b) Explain digital vernier caliper. **8**

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**[3862] – 365**

**S.E. (Instrumentation and Control) (Semester – II) Examination, 2010**
**DIGITAL TECHNIQUES**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***N.B. :*** *i) Answer* ***any three*** *questions from* ***each*** *Section.*
*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 logarithmic tables, slide rules, Mollier charts, electronic pocket calculator and steam tables is* ***allowed****.*
*vi) Assume suitable data,* ***if*** *necessary.*

SECTION – I

1. a) Convert the following : **8**
   i) $238_{10}$ to binary
   ii) $F3B_{16}$ to decimal
   iii) $62_{10}$ to excess-3
   iv) $1AF_{16}$ to octal.

   b) i) Add $B2CE5_{16}$ and $AB2C3_{16}$
   ii) Subtract $53254_8$ from $72565_8$. **8**

OR

2. a) i) Add +9 and –8 using 2's complement method.
   ii) Add –15 and –20 using 2's complement method. **8**

   b) Design a four bit Gray to binary code converter and implement using gates. **8**

3\. a) Compare EPROM, $E^2$PROM and FLASH memory. **8**

b) Implement following flipflops : **8**

i) D using SR flipflop.

ii) T using D flipflop.

OR

4\. a) Compare the static RAM and dynamic RAM. What is contact bounce phenomenon? **8**

b) Write a note on PAL programming. **8**

5\. a) Design a MOD 56 counter using MOD 8 X MOD 2 COUNTER ICs. **10**

b) Design a divide by 86 counter by using 7490 ICs. **8**

OR

6\. a) Design a synchronous counter for $4 \rightarrow 6 \rightarrow 7 \rightarrow 2 \rightarrow 1$ avoid lock out condition. **10**

b) Design MOD-22 counter by using IC7493. **8**

SECTION – II

7\. a) What is multiplexed display system ? List the advantages and disadvantages over non multiplexed display system. **8**

b) Implement the following functions using 3 : 8 decoder and external gates. **8**

$F_1 (A, B, C) = \Sigma m (1, 3, 5, 7)$

$F_2 (A, B, C) = \Sigma m (2, 3, 6, 7)$

OR

8\. a) Explain the following with respect to display driver IC. **8**

i) $\overline{RBI}$ ii) $\overline{LT}$ iii) $\overline{BI}$ / $\overline{RBO}$ iv) $A_0 - A_3$

b) Implement the following by using PLD. **8**

$Y_1 = \overline{A}B\overline{C} + A\overline{B}C + ABC$

$Y_2 = A\overline{B} + C$

$Y_3 = \overline{B}\,\overline{C} + \overline{A}C + A\overline{B}$

9. a) Write a note on tristate logic. **8**

b) Explain different schemes for interfacing TTL to CMOS. **8**

OR

10. a) Define following with respect to logic family : **8**

i) Power dissipation ii) Fan out

iii) Propagation delay iv) Noise margin.

b) Compare TTL and CMOS families. **8**

11. a) Design a sequence generator for the following sequence : **9**

.. 101110 ...

b) Design alarm annunciator. The alarm annunciator is having Error input, Test input, Accept input and Reset input. **9**

OR

12. Design a frequency counter to measure a maximum frequency of 100 Hz the frequency is to be displayed on three digit seven segment displays. **18**

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**[3862] – 366**

**S.E.(Instrumentation and Control) (Semester – II) Examination, 2010**
**AUTOMATIC CONTROL SYSTEMS**
**(2003 Course)**

Time: 3 Hours Max. Marks: 100

***Instructions** : 1) Answer to the **two** sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary .*
*3) **Black** figures to the right indicate **full** marks.*
*4) Assume suitable data, if **necessary.***

SECTION – I

1. a) Compare between linear and non-linear system and open loop and close loop control systems (any four points). **8**

b) Find out the transfer function of the given network. **8**

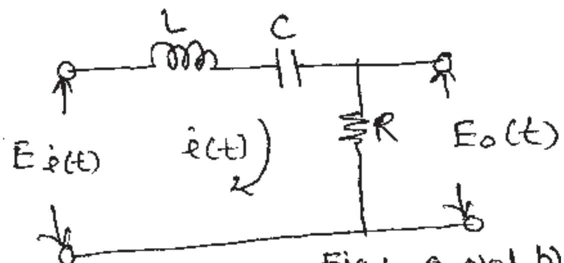



Fig :- Q.No1 b)

OR

2. a) State and explain the rules of block diagram reduction techniques. **8**

b) Reduce the given block diagram to its canonical form and hence obtain the equivalent tranfer function. **8**

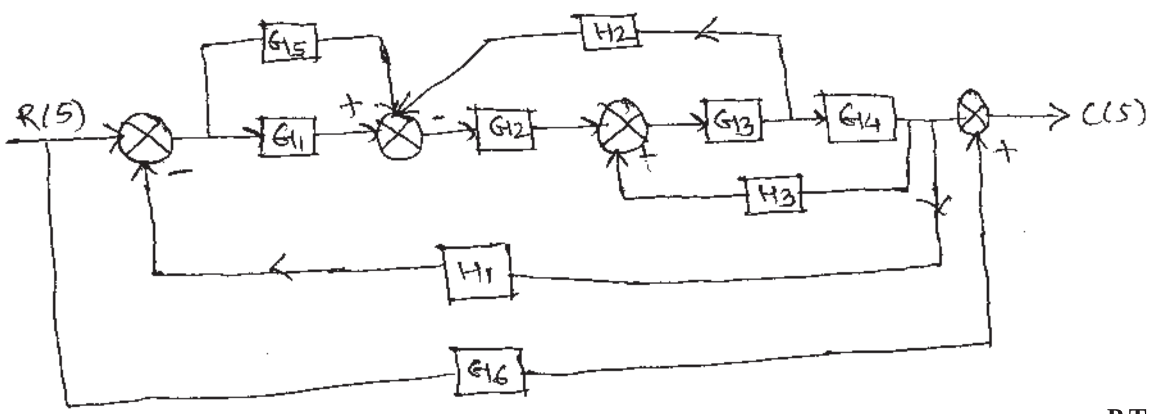



Fig. Q.2 b)

P.T.O.

3. a) Explain dynamic models of hydraulic and pneumatic systems. **8**

b) Draw signal flow graph for the system shown below, find overall T.F.using mason's gain formula. **8**

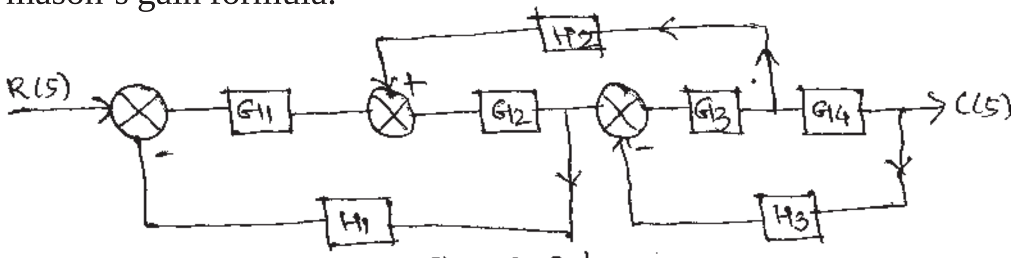



Fig- Q.3b

OR

4. a) Define Analogous system. Explain force-voltage and force current analogy. **8**

b) Draw the equivalent mechanical system of the given system. Hence write set of equilibrium equations for it and obtain electrical analogus circuits using i) F-V analogy ii) F-I analogy. **8**

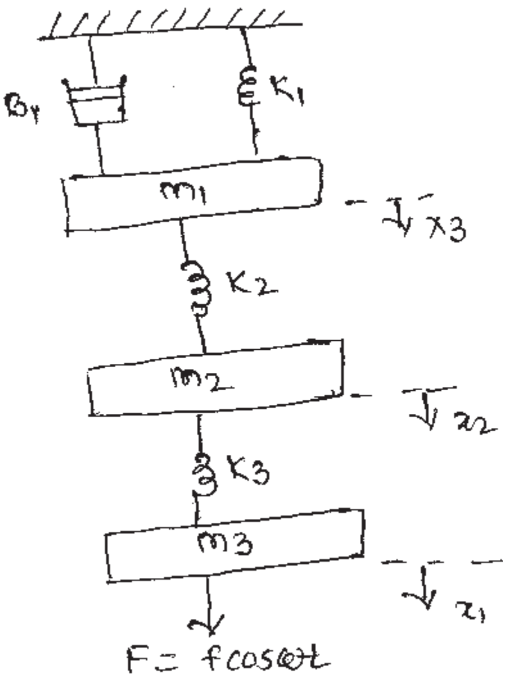



Fig-Q.4 (b)

5. a) Derive the expression for step response of the second order system for underdamped case from derived expression get the expression for rise time and delay time. **10**

   b) Determine the stability of the system having characteristic equation $F(S) = S^6 + 3S^5 + 4S^4 + 6S^3 + 5S^2 + 3S + 2$
   Examine stability. **8**

OR

6. a) What is meant by the steady state and transient response of the system ? Define and state the equations of the static error constants and steady state error for type 0 and type 1 system. **9**

   b) A system is given by differential equation **9**

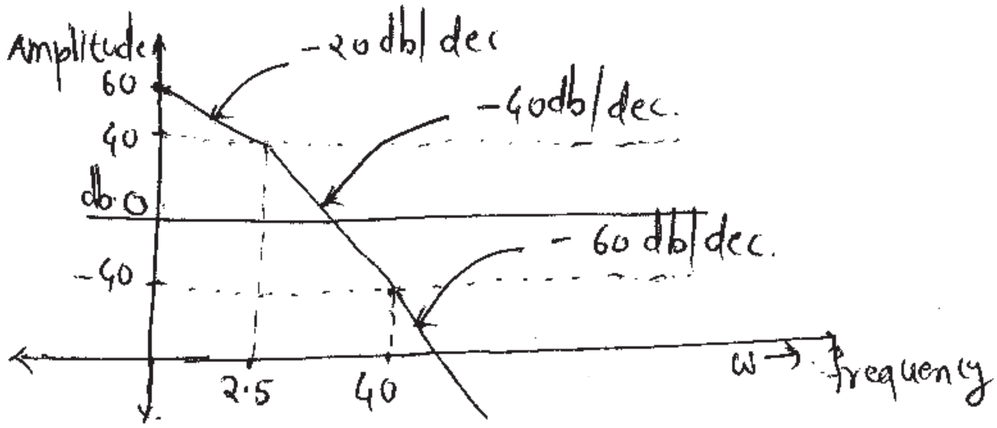
   $\frac{d^2y}{dt^2} + \frac{8dy}{dt} + 16y = 16x$, where y = output, x= input. Determine all time domain specifications for unit step input.

SECTION – II

7. A) State whether following statement is **true** or **false**. Justify your answer. **3**

   "Sine Signal is used as Standard test signal for frequency response analysis".

   B) Find the transfer function of the system whose bode plot magnitude plot is shown in the figure 1. **5**




Q. 7(B) Figure- 1

C) Find gain and phase margins for a unity feedback control system having. **10**

$$G(s) = \frac{10}{(1+0.1s)(1+0.05s)}$$

Determine also the open loop gains when

i) The gain margin is 20 db

ii) The phase margin is 24°

OR

8. A) Select correct answer from the following multiple choice questions given below only **one** correct answer and carry **three marks** with Justification of your **choice**.

I) The loop transfer function of a system is given by $G(s) = \frac{e^{(-0.1s)}}{s}$. The phase crossover frequency is given by **6**

a) Pi/2 b) pi/10 c) pi/0.2 d) pi/4

II) Consider the following systems **3**

System 1 : $\frac{1}{(2s+1)} = G(s)$ System 2 : $G(s) = \frac{1}{(5s+1)}$

The true statement regarding the system is

a) Bandwidth of system 1 is greater than the bandwidth of system 2

b) Bandwidth of system 1 is lower than the bandwidth of system 2

c) Banwidth of both the systems is the same

d) Bandwidth of both the systems is infinite.

B) What are the effects and limitations of lag Compensator control applications ? **9**

For certain system $G(s) = \frac{0.025}{s(1+0.05s)(1+0.5s)}$

Design a suitable lag compensator to give
Velocity error constant = 20 sec ;

Phase margin = 40°;

9. A) Select correct answer from the following multiple choice questions given below only **one** correct answer and carry **three marks** with Justification of your **choice**.

I) The open loop transfer function of a unity feedback system is **6**

$$G(s)H(s) = \left(\frac{s+2}{s^2-1}\right)$$

Nyquist stability criteria will give

i) N=1, P=1 and Z= 0.

ii) Open loop system is unstable

iii) Close loop system is stable.

Codes :

a) Only (i) is true

b) Both (i) and (ii) are true

c) Both (i) and (iii) are true

d) All (i), (ii) and (iii) are true.

II) The open loop function of a unity feedback control system is

$$G(s)H(s) = \frac{k(s+3)}{s(s-1)}$$ **3**

Nyquist Stability Criteria will give

i) For k = 1, the system is on verge of instability

ii) N = 1, P = 1, z = 0;

iii) The open loop is unstable

iv) The close loop is stable.

Code :

a) Only (i) is true

b) Both (i), (ii) and (iii) are true

c) Both (i), (ii) and (iv) are true

d) All (i), (ii) , (iii) and (iv) are true

9. B) State whether following statement is True or False. Justify your answer :

"Root Locus can be used for time domain analysis". Desgin a suitable lead compensator for a system with unity feedback and having open loop transfer function.

$$G(s) = \frac{k}{s(s+1)(s+4)}$$

To meet the specification of

1) Damping ratio $\zeta = 0.5$
2) Undamped natural frequency Wn = 2 rad/sec by using Root Locus technique. **9**

**OR**

10. A) State whether following statement is True or False. Justify your answer : **3**

"Nyquist path does not contain L.H.S. of S-plane".

B) State and explain Mapping theorem OR principle of argument ? **6**

Sketch the Nyquist plot and comment on closed loop stability of a system whose open loop transfer function is

$$G(s)H(s) = \frac{10}{s^2(s+2)}$$ **9**

11. A) Select correct answer from the following multiple choice questions given below only one correct answer and carry three marks with Justification of your choice. **6**

I) The state equation of a linear system is given by $\dot{x}$ = Ax + Bu. The state transition matrix of the system is

a) $\begin{bmatrix} e^{2t} & 0 \\ 0 & e^{2t} \end{bmatrix}$ b) $\begin{bmatrix} e^{-2t} & 0 \\ 0 & e^{-2t} \end{bmatrix}$

c) $\begin{bmatrix} \sin 2t & \cos 2t \\ -\cos 2t & \sin 2t \end{bmatrix}$ d) $\begin{bmatrix} \cos 2t & \sin 2t \\ -\sin 2t & \cos 2t \end{bmatrix}$

II) The value of the matrix A in X=Ax for the system described by the differential equation $\ddot{y}+2\dot{y}+3y=0$; is

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

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

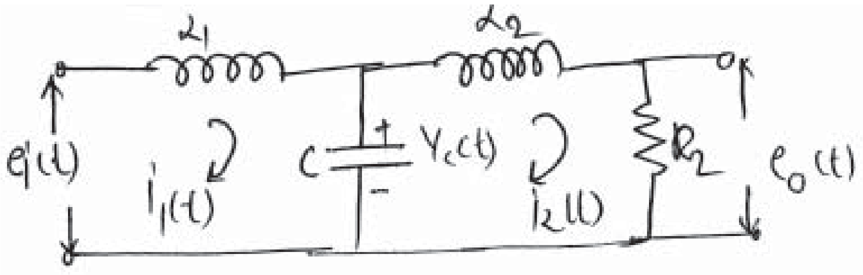
c) $\begin{bmatrix} 0 & 1 \\ -2 & 1 \end{bmatrix}$

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

B) State whether following statement is **True** or **False**. Justify your answer. **3**

"The state space approach of system analysis is a frequency domain analysis"

C) Obtain the state model of the Network **7**




OR

12. A) Select correct answer from the following multiple choice questions given below only **one** correct answer and carry **three** marks with Justification of your choice. **6**

I) A state space representation for the transfer y(s)/u(s) = (s+6)/ ($s^2$ + 5s + 6)

is $\dot{x}=Ax+Bu$ y= Cx where $A=\begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$; $B=\begin{bmatrix} 0 \\ 1 \end{bmatrix}$ and the value of C is

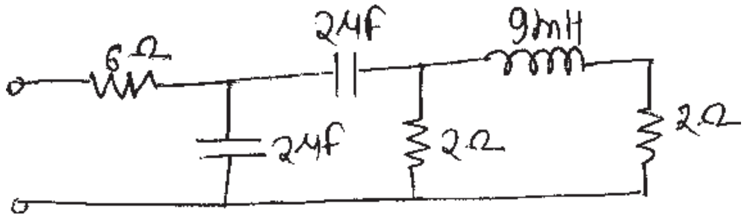
a) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$

b) $\begin{bmatrix} 6 & 1 \end{bmatrix}$

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

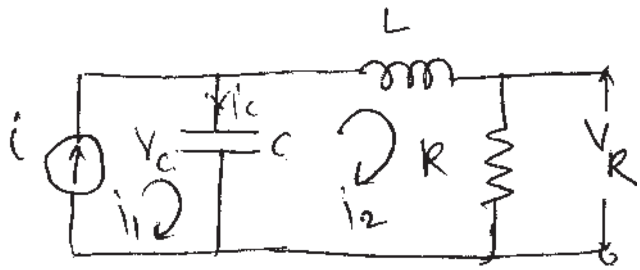
d) $\begin{bmatrix} 1 & -5 \end{bmatrix}$

II) The minimum number of state variable necessary to describe the network shown below in a state variable form is




a) 2 b) 3 c) 4 d) 6

B) Write a set of state equations for the network shown the figure. Choose $i_1$ $i_2$ and $V_c$ as state variables. **6**




C) State and explain properties of state transition matrix. **4**

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**[3862] – 367**

# S.E. (Instrumentation and Control) (Semester – II) Examination, 2010
# LINEAR TECHNIQUES
# (2003 Course)

Time : 3 Hours Max. Marks : 100

SECTION – I

1. State any eight characteristics of operational amplifier and write their units. **16**

OR

2. Draw circuits to derive/measure practically following op-amp parameters : **16**

   a) offset voltage

   b) bias current

   c) slew rate

   d) voltage gain (closed loop).

3. A) Analyse integrator or differentiator circuit using op-amp; for voltage gain and frequency considerations. **8**

   B) Design a voltage to current converter that will convert 1 to 5 V DC into 10 to 50 mA using op-amp. **8**

OR

4. A) Design a schmitt trigger circuit in which IC 741 is used. Resistor between pin 6 and pin 3 is 10K$\Omega$ and resistor between pin 3 and ground is also 10K$\Omega$. Assume saturation voltage = $\pm 10$ Volts. How much input voltage is required for above operation ? **8**

   B) For a precision rectifier circuit, let input voltage be 0.5V peak 500 Hz sine wave. Assume half wave or full wave circuit and draw input output waveforms of above (precision rectifier) circuit. Also draw circuit diagram; assume voltage gain if required as one. (voltage gain magnitude). **8**

5. A) For a monoshot using IC 555, output pulse width is three seconds. Supply voltage is + 15V. Draw circuit and draw waveforms. Show calculations for component values-selection. **10**

   B) What are specifications of IC-555 ? Explain/state any four. **8**

OR

6. A) State Barkhausen criteria. **4**

   B) State equation for output frequency of wein bridge oscillator. **4**

   C) Draw circuit diagram of RC phase shift oscillator. **4**

   D) State feedback factors of above two oscillators. **4**

   E) What is function of IC 8038; state in two lines. **2**

SECTION – II

7. A) Draw ideal responses (frequency response) for Low pass, High pass, Band pass and Band reject filter. **16**

   B) What is cut-off frequency ? **2**

OR

8. A) Design a first order Butterworth low pass filter; for a cut off frequency of 1000 Hz using op-amp. Let capacitor value = 0.01 μF. Draw the expected filter response. Assume suitable voltage gain. **12**

   B) What is the use of 'All Pass filter' ? Explain with circuit diagram. **6**

9. A) Draw circuit diagram of a Flash type analog to digital converter (simplified diagram). Explain its operation. Assume suitable data. **10**

   B) Comment on features of above ADC type. **6**

OR

10. Draw circuit diagram of any one digital to analog converter. Assume four bit input. Show calculation for any two set of input bits and its equivalent analog output voltage.

    State advantages and limitations of circuit you have explained. **16**

11. Draw ideal voltage regulator load current v/s load voltage response. Draw a neat circuit diagram of basic voltage regulator using op-amp. Explain its operation for increase in unregulated input voltage and reduction in load voltage (how it is compensated). **16**

OR

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

a) IC 723

b) AD 590

c) LM 336

d) IC 317.

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**S.E. (Instrumentation and Control) (Sem. – II) Examination, 2010**
**NETWORK THEORY**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions***: *1) Answer* ***three*** *questions from Section* ***I*** *and* ***3*** *questions from Section* ***II****.*

*2) Question Nos.* ***11*** *are* ***compulsory****. Out of the remaining attempt* ***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) Find out the various branch currents in the passive elements of the network shown in figure 1(a). **8**

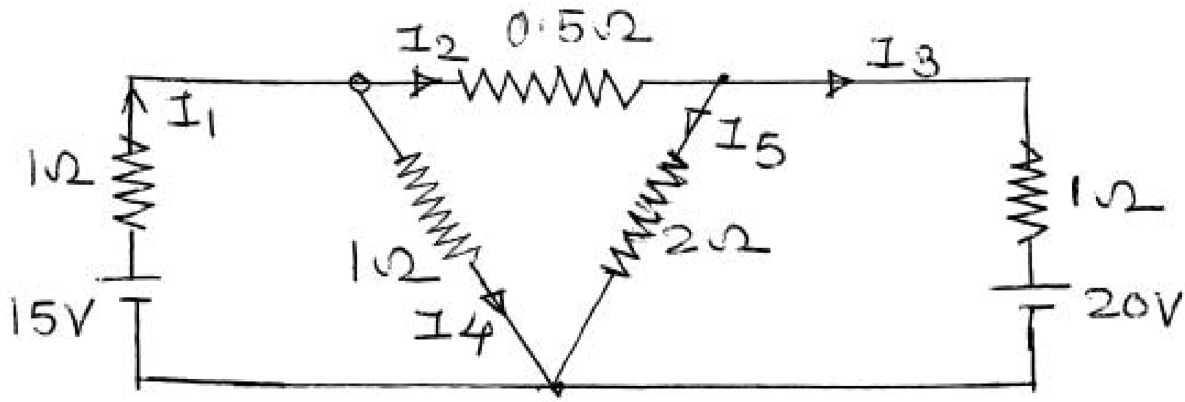


fig. 1 (a)

**P.T.O.**

b) In the circuit shown in figure 1(b) the switch is closed at t = 0. Determine i(t). **8**

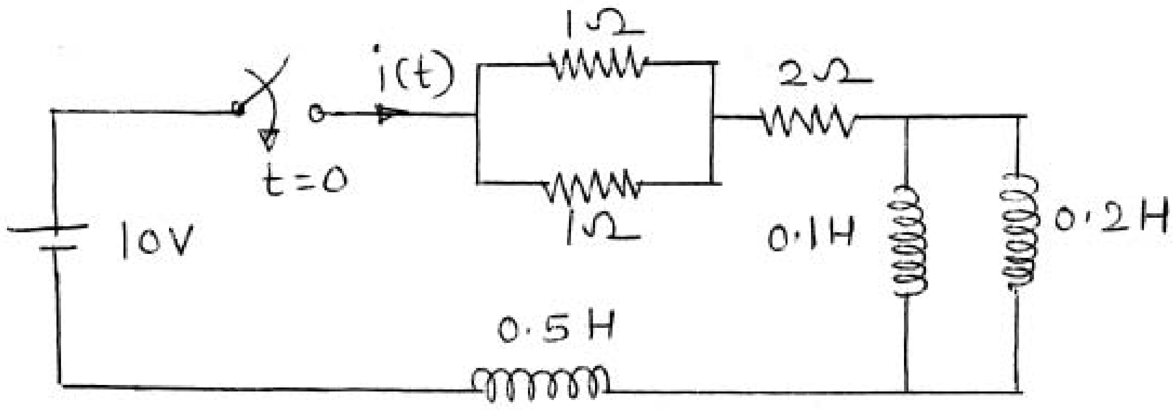


Fig. 1 (b)

OR

2. a) Find the values of $I_1$ and $I_2$ in the circuit shown in fig. (2.a). **8**

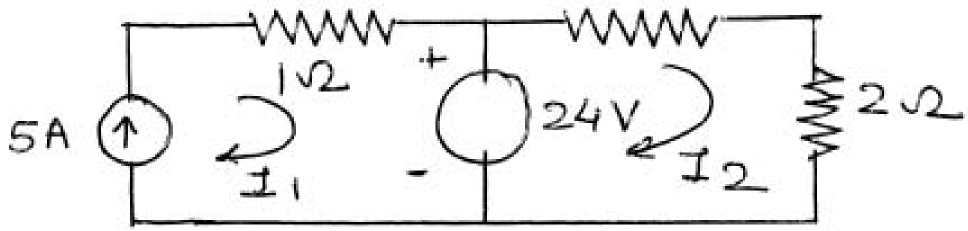


fig. 2 (a)

b) In the circuit shown in figure 2(b) switch k is closed, steady state condition is reached. Now at time t = 0, switch k is opened. Obtain expression for current iL through the inductor. **8**

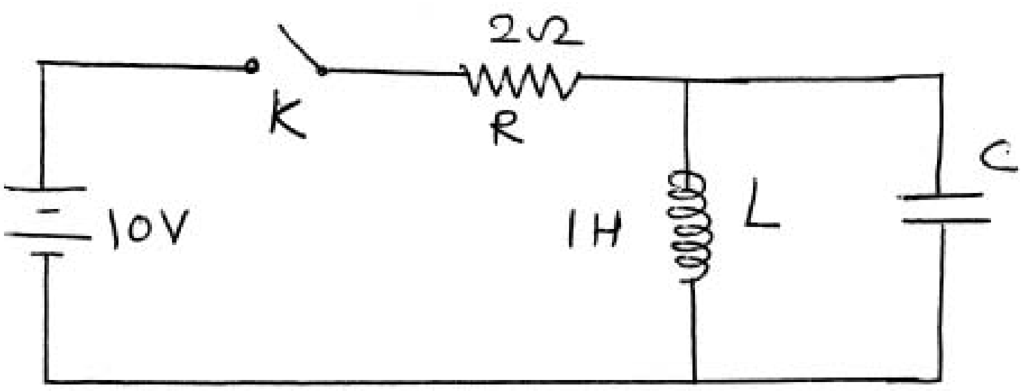


fig. 2 (b)

3. a) Synthesize first Foster form of LC network

$$Z(s) = \frac{(s^2+1)(s^2+9)}{s^2(s^2+4)}.$$ **8**

b) An Impedance function has the pole-zero shown in figure 3(b). Find the impedance function to z (– 4) = 3/8. **8**

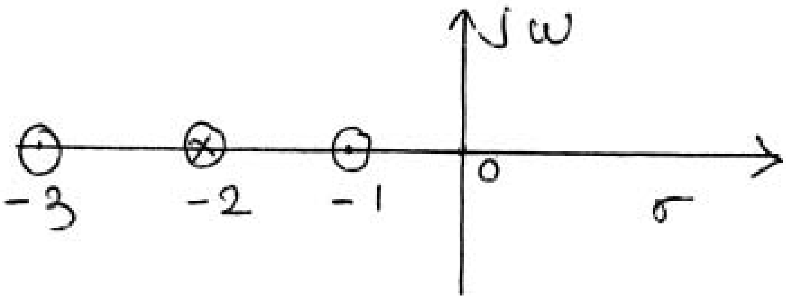


Fig. 3(b)

OR

4. a) Find the second Cauer form of LC network for the impedance function

$$Z(s) = \frac{s^4+10s^2+9}{s^3+4s}.$$ **8**

b) Find the first Cauer form of impedance function

$$Z(s) = \frac{s^2+4s+3}{s^2+2s}.$$ **8**

5. a) State and prove maximum power transfer theorem. Give examples. **10**

b) Using Millman's theorem find the current in the load $Z_L$, shown in Fig. 5(b). **8**

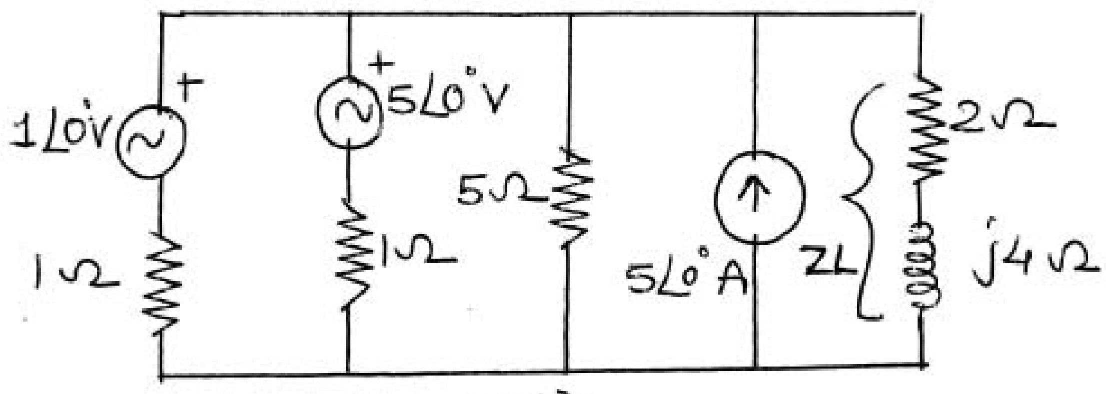


Fig. 5 (b)

OR

6. a) State and prove Tellegan's theorem. Give examples. **10**

b) Find the load impedance for maximum power to the load. Find the amount of maximum power. Shown in Fig. 6(b). **8**

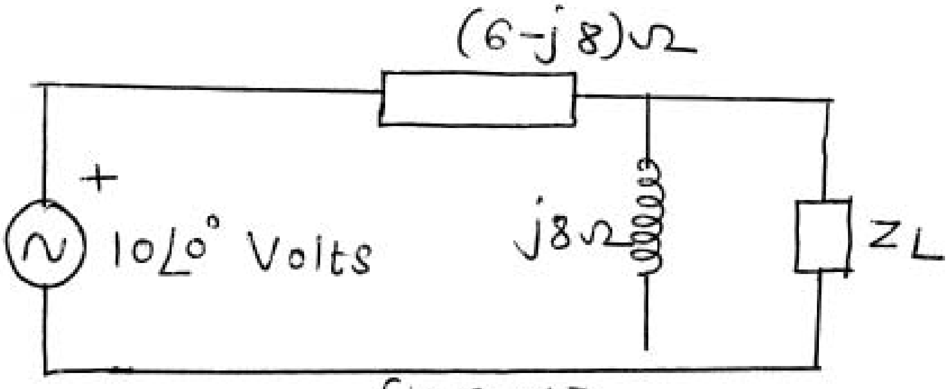


Fig 6 [b]

SECTION – II

7. a) Define transfer function of two port Network with diagram. **8**

b) Find the transfer function of the network as shown in Fig. 7(b). **8**

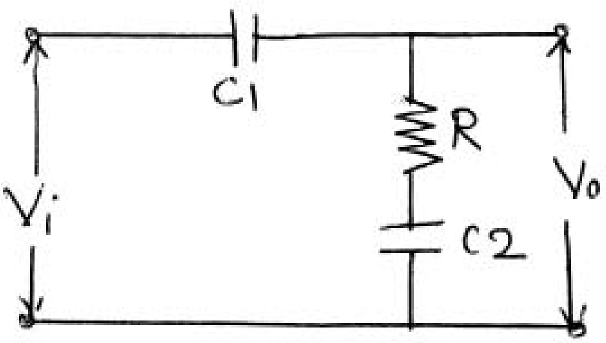


Fig. 7(b)

OR

8. a) Find the pole zero locations of the current transfer ratio $I_2/I_1$ in s-domain for the circuit shown in Figure 8(a). **8**

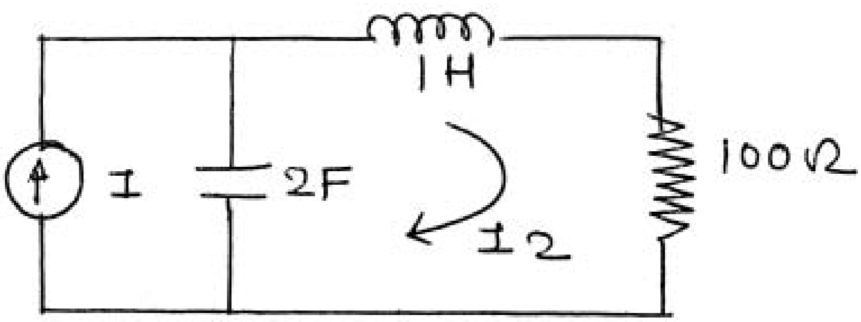


Fig. 8(a)

b) For the circuit shown in Figure 8(b). Determine value for $Z(s) = \frac{V_1}{I_1}, T(s) = \frac{V_2}{V_1}$. **8**

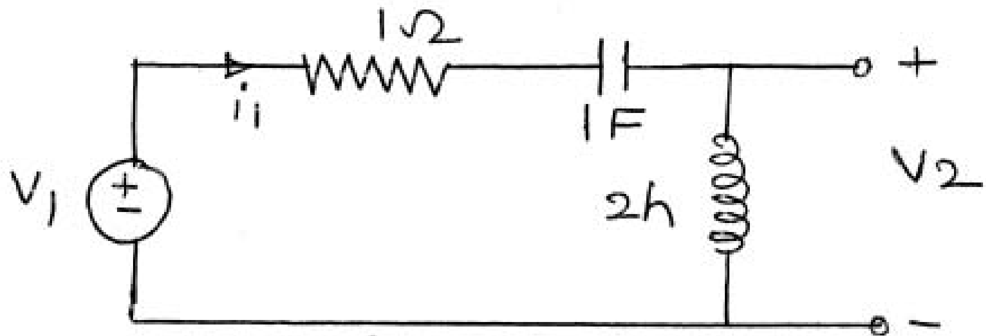


fig. 8(b)

9. a) State conditions for reciprocity and symmetry for Z, Y, H and T parameters. **8**

b) Determine the Z-parameters of the network shown in figure 9(b). **8**

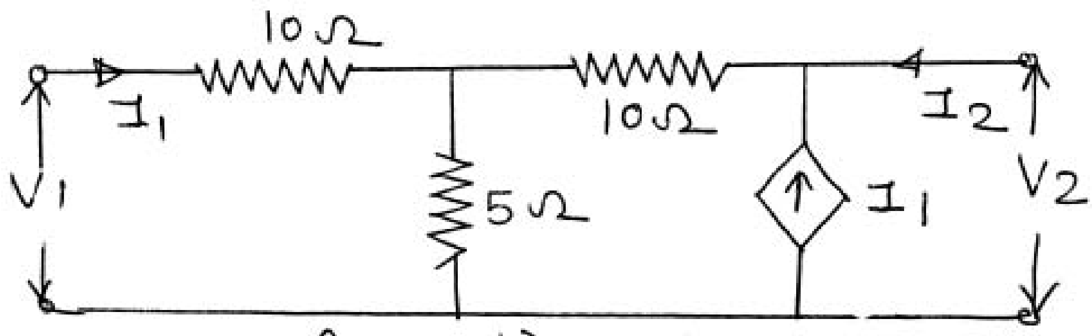


fig. 9(b)

OR

10. a) Find the Relationship between Z and Y parameters. **8**

b) Find Z parameter for the network shown in Figure 10(b). **8**

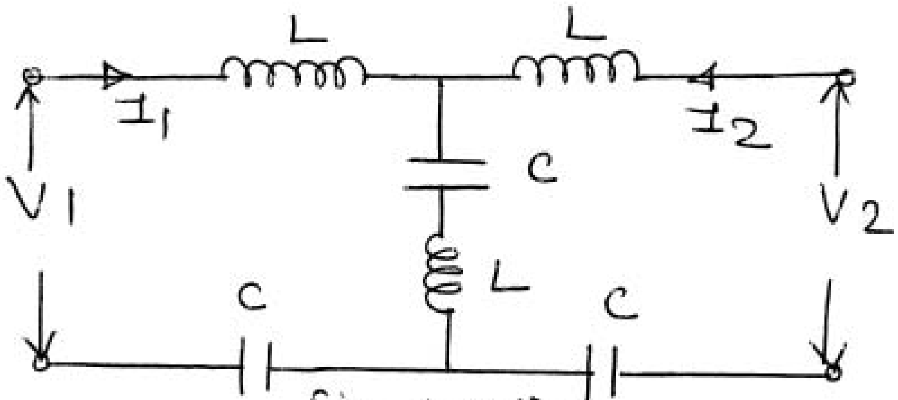


fig. 10(b)

11. a) Design a second order Butterworth low pass filter with cut-off frequency of 10 KHz. Draw the necessary circuit using OP. Amp. **10**

b) Explain Butterworth Approximation to low pass filter. **8**

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**S.E. (Printing Engg. & Commun. Tech.) (Semester – I ) Examination, 2010**
**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.*

SECTION – 1

1. Explain any four factors affecting the readability with diagrams. **16**

OR

Differentiate between Legibility and Readability with minimum eight points. **16**

2. Explain the manufacturing process screen by photographic method. **16**

OR

Explain the manufacturing process of Positive and Negative film output. **16**

3. Explain the method of preparing the screen by Hand duffing method. **18**

OR

Explain the method of preparing the image carrier for the offset lithographic printing process. **18**

SECTION – 2

4. Explain the offset lithographic printing process with suitable diagram. **16**

OR

Explain the letterpress printing process with suitable diagram. **16**

5. Explain the post printing operations in detail. **16**

OR

Explain the various methods of binding of the book. **16**

6. Explain Flexo-Inkjet printing technology in detail. **18**

OR

Explain the Holographic printing technique in detail along with diagram. **18**

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*B/II/10/110*

**S.E. (PTG. Engg. & Communication Tech.) (Semester – I) Examination, 2010**
**PRINTING DIGITAL ELECTRONICS**
**(2003 Course)**

Time : 3 Hours                                                                                    Max. Marks : 100

***Instructions :*** *1) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** from Section – **I**, Q. **7** or Q. **8**, Q. **9** or Q. **10**, Q. **11** or Q. **12** from Section – **II**.*

*2) Answers to the **two** Sections should be written in **separate** books.*

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

*4) **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. Solve the following : **18**

i) What is the maximum number that we can count up to using 10 bits ?

ii) What range of decimal values can be represented by a 4-digit octal number ?

iii) A typical CD ROM can store 650 M byte of digital data. How many bits of data can a CD ROM held ?

iv) Draw the diagram that implements the expression : $X = (A + B)(\overline{B} + C)$.

v) Multiply following binary numbers :

$111.01 \times 101.01$

vi) Perform BCD addition and write answer in BCD : $(147)_{10} + (380)_{10}$.

OR

2. Solve the following : **18**

i) The exact value of an input voltage is critical for a digital circuit.

True or False. **1**

ii) A graph that shows how one or more digital signals change with time is called a

________________. **1**

iii) What are the relative advantages of parallel and serial transmission of binary data ? **2**

iv) Which of the following are analog quantities and which are digital ? **2**

a) Temperature of a room

b) Altitude of air craft.

c) Timer setting on a microwave oven

d) Pressure in a bicycle tyre.

v) Name the five major functional units of a computer. **2**

vi) Using N bits, we can represent decimal numbers ranging from 0 to ________, a total of ____________________ different numbers. **2**

vii) A 3 Mega pixel digital camera stores an 8-bit number for the brightness of each of the primary colors (red, green and blue) found in each picture element (pixel). If every bit is stored (no data compression) how many pictures can be stored on a 128 M byte memory card ?

(Given in a digital system Mega = $2^{20}$). **4**

viii) What is meant by the term edge-triggered ? **2**

ix) Can J-K FF's be used for parallel data transmission ? How ? **2**

3\. a) A logic circuit needs to operate in order to activate a seat belt warning indicator in a car. If the driver is present and the driver is not buckled up and the ignition switch is ON, then turn on the warning light. Describe the circuit using Boolean algebra, schematic diagram with logic symbols, truth tables and timing diagram. **8**

b) In a dial up communication over the internet, two remote computers communicate with each other over telephone lines with the information encoded in ASCII. What actual bit strings would a computer transmit to send the message HELLO, using ASCII with even parity ? **8**

OR

4\. a) Minimize the following equation : **8**

$f(P, Q, R, S) = \sum m(0, 2, 5, 7, 8, 10) + d(4, 6, 11, 12, 13, 14)$. Implement using basic logic gates (AOI logic).

b) Minimize the following equation : **8**

$f(A, B, C, D) = \pi M(4, 5, 12, 13) + d(0, 2, 8, 10)$. Implement the reduced equation using NOR gates only.

5\. a) Design a full adder. **8**

b) Design a one bit comparator. **4**

c) Design a two bit ALU. **4**

OR

6\. a) Perform following BCD addition $(28)_{10} + (11)_{10}$. **4**

b) Perform Excess 3 addition : $(46)_{10} + (11)_{10}$. **4**

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

Multiplexers and demultiplexers. Explain their significance in the field of printing applications.

SECTION – II

7. a) Draw and explain MSJK flip flop in detail. **8**

   b) Design MOD-7 asynchronous counter. **8**

OR

8. a) Draw and explain Johnson's counter. **8**

   b) What is shift registers ? State its application in Printing. Explain various modes of shift register in detail. **8**

9. a) What is DAC ? State and explain different types of DAC's. State its application in Printing. **8**

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

      1) Memories.

      2) ADC's.

OR

10. Write short notes on **(any 2)** : **16**

    1) PLD's.

    2) BCD to seven segment decoder.

    3) Display drivers.

11. a) State and explain various input and output devices with respect to digital computer. **10**

    b) Distinguish between digital camera and digital scanner. **8**

OR

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

    1) Application of printers in printing.

    2) Floppy Disc and CD's.

    3) Modems.

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**[3862] – 377**

**S.E. (Printing Engg. & Commun. Tech.) (Semester – II) Examination, 2010**
**MICROPROCESSOR TECHNIQUES AND PERIPHERAL INTERFACE**
**(2003 Course)**

Time: 3 Hours Max. Marks: 100

***Note :*** *1) Answer Section* ***I*** *is Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.****4****, Q.****5*** *or Q.****6****. Section* ***II*** *Q.7or Q.****8****, Q.* ***9*** *or Q.****10****, Q.* ***11*** *or Q.* ***12****.*

*2) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*

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

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

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

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

SECTION – I

1. a) Draw and explain the block diagram of 8085 in detail. **10**

b) Explain the following pins of 8085 in detail. **8**

TRAP ALE

RST 6.5 INTR

SO, S1 HOLD

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.

**P.T.O.**

3. a) Explain what operation will take place when the following instructions are executed. **8**

MOV A,M

STA 2300

LXI H,2300H

MVI A,23H.

b) Write an assembly language program to add 8 bit number with 8 bit number and store the result in memory. Draw flow chart. **8**

OR

4. a) Draw and explain the timing diagram of MOV A, B. (use graph paper). **8**

b) Write a program to SUBTRACT 8 bit number from 8 bit number (Draw flowchart). **8**

5. a) Draw and explain the flag register of 8085. Explain each flag in detail with example. **8**

b) State and explain addressing modes of 8085. **8**

OR

6. a) What is the difference between JMP and CALL instruction ? Explain in detail with example. **8**

b) Explain the CALL and RETURN instruction in detail. **8**

SECTION – II

7. a) Explain I/O modes of 8255 in detail. **10**

b) Draw and explain block diagram of 8255 in detail. **8**

OR

8. a) Draw Block diagram of 8279. Explain the interfacing with Keyboard. **10**

b) Draw and explain block diagram of 8251 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 8259 in detail. Explain its use in any Printing application. **8**

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

       1) USART 2) RS 485

11. a) Explain stepper motor controller using 8085. **8**

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

       1) Application of Microprocessor in printing technology.

       2) Display controller 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) CD controller.

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**S.E. (Chemical) (Semester – I) (2003 Course) Examination, 2010**
**CHEMISTRY – I**
**Common to Bio-Tech.**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain the following : **6**
   1) Amides are extremely weak basis.
   2) Formic acid stronger than acetic acid.
   3) Aniline is weaker base.

   b) Define carbanion. Explain the formation of carbanion by any two methods and explain structure and stability of carbanion. **6**

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

OR

2. a) What is resonance effect ? What are necessary conditions for resonance ? Explain +R and –R effect with suitable examples. **6**

   b) Define and explain the following terms, **6**
   1) Electrophile
   2) Heterolysis
   3) Carbene.

   c) Write a note on hyper conjugation. **4**

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

1) $CH_3-CH_2-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_3 \xrightarrow{alc.KOH}$

2) Acetal dehyde $\xrightarrow[\text{dil.NaOH}]{\text{warm}}$

3) 

4) Sodium praponoate $\xrightarrow{\text{Electrolysis}}$ **6**

b) Attempt **any two** : **6**

1) Nitration of benzene
2) Kolbe synthesis
3) Fridal Crafts alkylation.

c) Write a short note on Wurtz reaction. **4**

OR

4. a) Explain with mechanism why ethyl iodide gives ethylene by addition of alc.KOH. where as it gives ethyl alcohol by action of aq.KOH. **6**

b) Discuss the effects of following factors on $SN^1$ and $SN^2$ reactions. **6**

1) Nature of Nucleophile
2) Nature of leaving gr.
3) Nature of substrate.

c) Explain Aldol condensation with suitable examples. **4**

5. a) What is confirmational isomerism ? Discuss the confirmations of cyclohexane with the help of energy profile diagram. **7**

b) Predict the products

1) Thiophene + conc. $H_2SO_4 \rightarrow$
2) Pyridine + $C_6H_5L° \rightarrow$
3) Quinoline $\xrightarrow{HNO_3 + H_2SO_4}$ **6**

c) Explain geometrical isomerism with suitable examples. **5**

OR

6. a) 1) Assign R and S configuration to following compounds.

i) $$\begin{array}{c} \text{COOH} \\ | \\ \text{H}-\text{C}-\text{COCH}_3 \\ | \\ \text{OH} \end{array}$$

ii) $$\begin{array}{c} \text{CHO} \\ | \\ \text{HO}-\text{C}-\text{CH}_2\text{OH} \\ | \\ \text{H} \end{array}$$

iii) $$\begin{array}{c} \text{Cl} \\ | \\ \text{H}-\text{C}-\text{COOH} \\ | \\ \text{Br} \end{array}$$ **3**

2) Discuss confirmations of ethane. **4**

b) Explain :

1) Pyrrole is more reactive than furan.
2) Thiophene is more stable than furan and pyrrole.
3) In quinoline electrophilic substitution takes place at 5 and $8^{th}$ position. **6**

c) Give one method of preparation of the following compounds, **5**

1) Indole 2) Quinoline

SECTION – II

7. a) Explain the term viscosity in case of liquids. Give experimental method of determination of viscosity of liquids. **6**

b) Define surface tension and interfacial tension. Explain capillary rise method for determination of surface tension. **6**

c) The diffraction of crystal and barium with x-rays ($\lambda$ = 2.29 A°) gives a first order reflection at 27°.8′ calculate the distance between the different planes. **4**

OR

8. a) What is meant by vapour pressure of liquids ? Explain any one method of determination of vapour pressure of liquids. **6**

b) Derive Braggs equation for the diffraction of x-rays by crystal lattice. How this equation is utilised to determine crystal structure ? **6**

c) Find density of toluene at 25°C if parachor for hydrogen, carbon and double bond are 17.1, 4.8 and 23.2 respectively. Surface tension of toluene is 28.23 dynes $cm^{-1}$. **4**

9. a) Derive the following terms from kinetic gas equation. **6**
1) Boyle's law 2) Charle's law 3) Dalton's law.

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

OR

10. a) Derive the kinetic gas equation. **6**

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

c) For ammonia gas Vander Waals constants a and b are 4.0 lit $mol^{-1}$ and 0.036 lit $mol^{-1}$ respectively. Calculate its critical volume (R = 0.082 lit atm $deg^{-1}$). **4**

11. a) Show that depression in freezing point is a colligative property. Give thermodynamic derivation. **7**

b) What is the osmotic pressure of a solution. How it is determined ? **7**

c) A solution of 0.278 gm of an organic compound in 55.6 gm of acetone 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**

OR

12. a) Show that the elevation in a boiling point is a colligative property. How will you find out molecular weight using elevation in B.P ? **7**

b) Explain abnormal colligative properties of solution. **7**

c) A solution of an organic compound containing 18 gm per litre had an osmotic pressure of 2.46 atm. at 27°C. Calculate the molecular weight of the compound. **4**

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**S.E. (Chemical) (Semester – I) Examination, 2010**
**FLUID FLOW OPERATIONS**
**(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 are the time-dependent fluids ? Classify them with examples. **4**

b) The velocity distribution for flow over a flat plate is given by

$$u = \frac{2}{3}y - y^2$$

Where u is the point velocity in metre per second at a distance y metre above the plate. Determine the velocity gradient and shear stress at y = 0 and y = 15 cm. Assume dynamic viscosity as 8.63 poises. **10**

c) State Newton's law. Give any two examples of non-Newtonian fluids. **2**

2. a) One litre of crude oil weighs 9.6 N. Calculate its Specific weight and density. **4**

b) Draw shear stress-shear rate curve and discuss rheological classification of fluids. **8**

c) Define, kinematic viscosity and vapour pressure. **4**

**P.T.O.**

3\. a) Derive an expression for the pressure difference across two limbs of a differential manometer containing two gauge fluids, mutually immissible. What factors influence the sensitivity ? **8**

b) Define the terms : **8**

i) Steady and unsteady flows

ii) Uniform and non-uniform flows

iii) Rotational and irrotational flows

iv) Laminar and turbulent flows.

4\. a) A U-tube manometer filled with mercury is connected between two points in a pipeline. If the manometer reading is 26 mm of Hg, calculate the pressure difference between the points when (a) water is flowing through the pipe (b) air at atmospheric pressure and 20°C is flowing in the pipe. Density of mercury = 13.6 gm/cc Density of water = 1 gm/cc Molecular weight of air = 28.8. **8**

b) Explain with neat sketches the working of an inclined tube manometer. **8**

5\. a) A water tank has an inflow line 20 cm in diameter and two 10 cm diameter outflow lines. The velocity in the inflow line is 2 m/sec. The mass of water in the tank is not changing with time. What are the volumetric flow rate, mass flow rate, and the velocity in the other outflow line ? **8**

b) A horizontal venturi meter having a throat diameter of 4 cm is set in a 10 cm I.D. pipeline. Water flows through the system and the pressure differential across the venturi meter is measured by means of a simple U-tube manometer filled with mercury. Estimate the flow rate when the manometer reading is 30 cm. Assume $C_v$ = 0.98. **8**

c) Compare the merits and demerits of Orifice meter and Venturi meter in the measurement of flow. **2**

6\. a) A Newtonian fluid having a viscosity of 1.23 poise, and a density of 0.893 gm/cm$^3$, is flowing through a straight, circular pipe having an inside diameter of 5 cm. A pitot tube is installed on the pipeline with its impact tube located at the center of the pipe cross section. At a certain flow rate, the pitot tube indicates a reading of 8 cm of mercury. Determine the volumetric flow rate of the fluid. **8**

b) An orifice meter having an inside diameter of 2.5 cm is located in a 8 cm pipe. Water is flowing through the line and the mercury manometer measures the differential pressure over the instrument. The leads are filled with water. When the manometer reading is 35 cm, what is the flow rate of water per minute ? **8**

c) Write Bernoulli's equation. State its assumptions. **2**

SECTION – II

7. a) For laminar flow of a Newtonian fluid in circular pipe, obtain the following relations from first principles : **12**
   i) Velocity distribution in the radial direction
   ii) Average velocity and maximum velocity
   iii) Pressure drop and average velocity.

b) Define :
   i) Geometric similarity
   ii) Dynamic similarity
   iii) Kinematic similarity. **6**

8. a) Describe in detail the method of dimensional analysis using Buckingham's $\pi$ theorem. **8**

b) Water is flowing through a pipe of diameter 250 mm with a velocity of 3 m/sec. Find the head loss due to friction for a length of 5.5 m, if the coefficient of friction f is given by

$$f = \left[0.03 + \frac{0.08}{Re^{0.3}}\right]$$

where kinematic viscosity = 0.01 strokes. **8**

c) Show that the Reynolds number is dimensionless. **2**

9. a) Define Displacement thickness. Derive an expression for the Displacement thickness. **8**

b) A thin plate is moving in still atmospheric air at a velocity of 5m/sec. The length of the plate is 0.6 m and width 0.5m. Calculate : **8**

i) The thickness of the boundary layer at the end of the plate and

ii) Drag force on one side of the plate. Take density of air as 1.24 kg/m3 and kinematic viscosity 0.15 strokes.

10. a) Draw a neat sketch and explain the development of boundary layer over a flat plate. **4**

b) A plate of 600 mm length and 400 mm wide is immersed in a fluid of specific gravity 0.9 and kinematic viscosity $10^{-4}$ $m^2$/sec. The fluid is moving with a velocity of 6 m/sec. **12**

Determine : i) boundary layer thickness

ii) shear stress at the end of the plate and

iii) drag force on one side of the plate.

11. a) What do you understand by the terms : Major energy losses and Minor energy losses ? **4**

b) With a neat sketch explain the working of a centrifugal pump. **8**

c) Water flows through a 0.203 m diameter pipe, with an average velocity of 3.6 m/sec. There is a sudden enlargement to 0.406 m diameter pipe. What is the power loss due to the sudden enlargement ? **4**

12. a) Water is pumped from a reservoir to a height of 1000 m from the reservoir level, through a pipe of 15 cm I.D. at an average velocity of 4 m/s. The pipe is 2000 m long and the overall efficiency of pump is 70%, what is the energy required for pumping ?

Take friction factor $f = 0.046\ Re^{-0.2}$. **8**

b) Draw the operating characteristic curves for a centrifugal pump. **4**

c) What is cavitation and priming in centrifugal pump ? **4**

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**S.E. (Chemical) (Semester – I) Examination, 2010**
**CHEMICAL ENGINEERING MATERIALS**
**(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**.*

SECTION – I

1. a) Explain the following terms : **10**
   i) Stress-strain curve
   ii) Classification of Engineering Materials
   iii) Shear stress
   iv) Shear strain
   v) Factor of safety.

   b) Define the following terms : **6**
   i) Poission's ratio
   ii) Necking.

OR

2. Attempt the following (**any four**) : **16**
   i) Breaking stress
   ii) Proportional stress
   iii) Proof stress
   iv) Ductility
   v) Stiffness
   vi) Hardness
   vii) Malleability.

**P.T.O.**

3. a) What are the different Hardness Tests ? Explain any one in detail. **12**

   b) Explain the methods for increasing fatigue life. **4**

OR

4. a) Explain various types of Impact Test. **10**

   b) Write a short note on Rockwell Hardness Test. **6**

5. Draw and explain Fe-$Fe_3C$ equilibrium diagram. Explain the various phases observed and reactions involved in Fe-$Fe_3C$ equilibrium diagram. **18**

OR

6. a) Explain the following terms : **12**

   i) Insulations

   ii) Refractories

   iii) Types of steel.

   b) Discuss various methods of welding. **6**

SECTION – II

7. a) Give and explain any four types of corrosion. **12**

   b) Write short note on 'Dry Corrosion'. **4**

OR

8. a) What is an oxide film ? Explain its formation and growth mechanism. **8**

   b) Give the methods of prevention of corrosion. **8**

9. a) Describe the elastic and plastic deformation of polymers. **6**

   b) Write short note on the following (**any two**) : **10**

   i) Corrosion resistance of plastic

   ii) Stress relaxation

   iii) Applications of polymers.

   iv) Wear/Abrasion Test.

OR

10. a) Explain polymerization and describe addition and condensation polymerization. **8**

b) Write short notes on :

i) Vulcanisation of rubber

ii) Nylon-6. **8**

11. a) Explain in detail processing of ceramics. **10**

b) Explain in brief applications of ceramics in chemical engineering. **8**

OR

12. a) What are the different types of glass ? Explain the characteristics of one in detail. **6**

b) Write short notes on (**any three**) : **12**

i) Refractories

ii) Clays

iii) Cement

iv) Properties of silicon nitrate

v) Borosilicate

vi) Glass and its types.

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**S.E. (Chemical) (Semester – II) Examination, 2010**
**CHEMICAL ENGINEERING THEMODYNAMICS – I**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*
*2)* ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
*3)* ***Black*** *figures to the* ***right*** *indicate* ***full*** *marks.*
*4) 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) Explain the phase rule and discuss the degree of freedom for any system. **8**

b) A horizontal piston/cylinder arrangement is placed in a constant temperature bath. The piston slides in the cylinder with negligible friction, and an external force holds it in place against an initial gas pressure of 14 bar. The initial gas volume is $V_1^t = 0.03\ m^3$, where superscript denotes a total rather than a molar volume. The external force on the piston is reduced gradually, allowing the gas to expand until its volume doubles. Experiment shows that under these conditions the volume of the gas is related to its pressure in such a way that the product $PV^t$ is constant. Calculate the work done by the gas in moving the external force. How much work would be done if the external force were suddenly reduced to half its initial value instead of being gradually reduced ? **8**

OR

2. a) Write a note on Intensive and Extensive properties. **4**

b) Explain term internal energy. **4**

c) Calculate $\Delta U$ and $\Delta H$ for 1 kg of water when it is vapourized at the constant temp. of 100°C and the constant pressure of 101.33 KPa. The specific volumes of liquid and vapour water at these conditions are 0.00104 and 1.673 $m^3kg^{-1}$. For this change, heat in the amount of 2,256.9 KJ is added to the water. **8**

3. a) Derive the eq$^{ns}$ $PV^r$ = constant. **8**

b) Air is compressed from an initial condition of 1 bar and 25°C to a final state of 5 bar and 25°C by two different mechanically reversible processes :

i) Heating at constant volume followed by cooling at constant pressure.

ii) Isothermal compression.

At these conditions, air may be considered an ideal gas with the constant heat capacities, $C_v = \left(\frac{5}{2}\right)R$ and $C_p = \frac{7}{2}R$.

Calculate the work required, heat transferred and the changes in internal energy and enthalpy of the air for each process. **8**

OR

4. a) Discuss the applications of virial equations. **8**

b) Reported values for the virial coefficients of isopropanol vapour at 200°C are

$B = -388\ cm^3\ mol^{-1}$

Calculate V and Z for isopropanol vapour at 200°C and 10 bar by :

i) The ideal-gas equation

ii) Virial equation. **8**

5. a) Derive $\Delta H^0 = \Delta H_0^0 + R_0^0 \int_{T_0}^{T} \frac{\Delta Cp^0}{R} . dT$. **12**

b) Calculate the standard heat at 25°C for the following reaction :

$$4HCl(g) + O_2(g) \rightarrow 2H_2O(g) + 2Cl_2(g)$$

Std. heat of formation at 298 k are $HCl(g) = -92307$ J

$H_2O(g) = -241818$ J. **6**

OR

6. a) Discuss sensible heat effects. **6**

b) Write a note on std. heat of formation. **4**

c) Calculate the standard heat of the methanol synthesis reaction at 800°C : **8**

$$CO_{(g)} + 2H_{2(g)} \rightarrow CH_3OH_{(g)}$$

Data : $\Delta H^0_{298} = \Delta H^0_0 = -90135\ J$

| **Component** | A | $B \times 10^3$ | $C \times 10^6$ | $D \times 10^{-5}$ |
|---|---|---|---|---|
| $\mathbf{CH_3OH}$ | 2.211 | 12.216 | –3.450 | 0.000 |
| **CO** | 3.376 | 0.557 | 0.000 | –0.031 |
| $\mathbf{H_2}$ | 3.249 | 0.422 | 0.000 | 0.083 |

SECTION – II

7. a) Derive $\eta = 1 - \frac{T_c}{T_H}$ for an ideal gas. **9**

b) A central power plant, rated at 800,000 kW, generates steam at 585 K and discards heat to a river at 295 K. If the thermal efficiency of the plant is 70% of the maximum possible value, how much heat is discarded to the river at rated power ? **9**

OR

8. a) Derive $\frac{DS}{R} = \int_{T_0}^{T} \frac{C_p^{ig}}{R} \frac{dT}{T} - \ln \frac{P}{P_0}$. **9**

b) Derive mathematical statement of the second law of Thermodynamics. **9**

9. a) Derive dH = $C_p dT + \left[V - T\left(\frac{\partial V}{\partial T}\right)_p\right].dp$. **8**

b) Discuss Residual properties. **8**

OR

10. a) Derive $C_p - C_v = \beta TV\left(\frac{\partial P}{\partial T}\right)_V$. **8**

b) Derive $ds = C_p \frac{dT}{T} - \beta V dp$ **8**

11. a) Discuss the Carnot Refrigerator. **8**

b) A house has a winter heating requirement of 30 kJ $S^{-1}$ and a summer cooling requirement of 60 kJ $S^{-1}$. Consider a heat pump installation to maintain the house temp. at 20°C in winter and 25°C in summer. This requires circulation of the refrigerant through interior exchanger coils at 30°C in winter and 5°C in summer. Underground coils provide the heat source in winter and the heat sink in summer. For a year-round ground temp. of 15°C. the heat transfer characteristics of the coils necessitate refrigerant temperatures of 10°C in winter and 25°C in summer. What are the minimum power requirements for winter heating and summer cooling ? **8**

OR

12. a) Explain Liquefaction processes. **8**

b) Explain Adsorption Refrigeration system **8**

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**S.E. (Chemical) (Semester – II) Examination, 2010**
**MECHANICAL OPERATIONS**
**(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) **Use** of logarithmic tables, slide rule, Mollier charts, electronic pocket claculator and steam tables is **allowed**.*
*5) Assume suitable data, if necessary.*

SECTION – I

1. a) What will be the power required to crush 150 tons/hr of limestone of 80% of the feed passes through 2 inch screen and 80% of the product passes through 1/8 inch screen ? **8**

b) Define size reduction and explain different ways to reduce the size of the Particles. **6**

c) Distinguish between Ideal Screen and Actual Screen. **4**

OR

2. a) Explain open circuit and close circuit grinding with its flow sheet. **6**

b) Short note on Work Index. **6**

c) Define size reduction and explain different ways to reduce the size of the particles. **6**

3. a) State advantages and limitation of Belt conveyor. **6**

b) Describe with a sketch the working of closed loop pneumatic conveying system with its flow sheet. **8**

c) Why it is necessary to clean the belt ? **2**

OR

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

   a) Pneumatic Conveyor

   b) Screw Conveyor

   c) Belt Conveyor

   d) Chain and flight conveyor.

5. a) Describe the types of mixers for pastes and plastic mass. **8**

   b) Explain in brief power consumption of impellers. **8**

OR

6. a) State different operations which need mixing and explain agitation equipment in detail. **8**

   b) With the help of neat sketch distinguish between axial flow and radial flow Impellers. **8**

SECTION – II

7. a) What are the various factors which affect the rate of filtration ? Derive an expression to calculate the rate of filtration. **10**

   b) Describe with a neat sketch the working of plate and frame filter press. **6**

OR

8. a) State factors to be considered while selecting filtration equipment and enlist characteristics of filter media. **8**

   b) Compare Rotary drum filter and pressure filter press. **4**

   c) Explain the operating cycle of centrifuge filter. **4**

9. a) Describe with neat sketches the aggregate and particulate fluidization. Give typical examples of both. **8**

   b) Describe with neat sketch the sedimentation operation. Also sketch typical commercial equipment. **8**

OR

10. a) Define Fluidization. State the applications of fluidization technique. **8**

b) Distinguish between free settling and Hindered settling. **4**

c) Explain spouted Bed. **4**

11. a) Explain capacity and effectiveness of screen. **4**

b) Explain Jigging separation technique with neat diagram. **6**

c) Describe with neat sketch, working and applications of bag filters. **8**

OR

12. a) Explain froth floatation with neat diagram. **6**

b) Write short notes on (**any 3**) : **12**

i) Mineral Jig

ii) Gravity settling tank

iii) Magnetic separator

iv) Fabric Filters.

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**S.E. (Polymer/Petroleum/Petrochemical) (Semester – I) Examination, 2010**
**(2003 Course)**
**ENGINEERING CHEMISTRY – I**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. a) Explain : **6**
   i) Cations can be aromatic.
   ii) Alkyl halides are involved in generation of carbanions.
   b) Explain phenomenon of inductive effect with suitable example. **6**
   c) Formic acid is stronger than acetic acid. **4**

OR

2 a) Define and give two examples of (i) electrophile (ii) Nucleophile (iii) free radical. **6**
   b) Explain the phenomenon of tautomerism in acetyl acetone and ethyl acetoacetate. **6**
   c) Aniline is much weaker base than aliphatic acid. **4**

3. a) Explain mechanism, stereochemistry, reactivity and energy profile diagram of $S_N1$. **6**

b) Write mechanism of Aldol condensation and Claison ester condensation. **6**

c) Explain synthesis of 2- methyl 2- butanol and 2, 2, dimethyl propanoic acid by using Grignard reagent. **4**

OR

4. a) Explain the following terms in electrophilic substitution of monosubstituted benzene with suitable example. **6**

i) Ortho para directing groups.

ii) Activating and deactivating groups.

b) Predict the products **(any 3)** : **6**

i) Sodium propionate $\xrightarrow{\text{electrolysis}}$

ii) Acetone oxime $\xrightarrow{H^+}$

iii) n- propyl bromide $\xrightarrow{\text{Na, ether, heat}}$

iv) Tert. Butyl alcohol $\xrightarrow{20\% H_2SO_4 \text{ heat}}$ .

c) Explain chlorination of methane to methyl chloride. **4**

5. a) Draw major conformation on n-butane. Why anti conformation is stable of all ? **6**

b) Draw two chair conformations of methyl cyclohexane. Which is more stable ? Why ? **6**

c) Explain Skraup synthesis of quinoline ? **6**

OR

6. a) Explain diastereo isomerism w.r.t. 2, 3 dichloropentane. **6**

b) Predict products **(any 2)** : **6**

i) Quinoline $\xrightarrow{HNO_3}$

ii) Pyridine $\xrightarrow{\text{catalytich ydrogenati on}}$

iii) Furan + Methyl lithium $\rightarrow$

c) Give one method of preparation of furan and pyrrole. **6**

SECTION – II

7. a) Derive Bragg's equation. Explain powder diffraction method for measurement of diffraction angle. **6**

b) Define atomic and molar heat of solids. Explain melting of crystalline and amorphous solids with help of graphs. **6**

c) Find the inter planar distance in a crystal in which series of planes produce a first order reflection a copper target X-ray tube with wavelength of 1.539°A at an angle of 22.5°. **4**

OR

8. a) Derive Poisulie's equation. **6**

b) What do you understand by surface tension of a liquid ? How it is measured experimentally ? **6**

c) The coefficient of viscosity for ethanol is 1.2 at 20°C and 0.592 at 60°C. Calculate the coefficient of viscosity for ethanol at 50°C. **4**

9. a) Derive Van Der Waal's equation. **6**

b) Give postulates of kinetic theory of gases. **6**

c) Calculate the average velocity of Neon at 27°C. Given R = 8.314 J/mol K. and Atomic weight of Neon = 20. **4**

OR

10. a) Write a short note on inter molecular forces of attraction. **6**

    b) Explain Andrew's experiment for carbon dioxide. **6**

    c) Calculate the critical constants for ethylene using Van Der Wall's constants. Given a = 4.39 atmosphere litre$^2$/mole and b = 0.05136 liter/mole. **4**

11. a) Draw and explain experimental set up for measuring depression in freezing point of a solution of non volatile solute. **7**

    b) Explain Arrhenius theory for electrolytic dissociation. **7**

    c) Calculate the Osmotic Pressure of an aqueous solution of Glucose ($C_6H_{12}O6$) containing 40 grams of glucose in 500 ml. of solution. R = 0.0821 liter atmosphere /mole. Temperature = 300 K. **4**

OR

12. a) What is Osmosis ? Give experimental method for measurement of osmotic pressure. **7**

    b) i) Show that the relative lowering of vapour pressure of a solution of nonvolatile solute is equal to the mole fraction of the solute.

    ii) What is an ideal solution ? What conditions it must satisfy ? State Rault's law and obtain an expression for total vapour pressure exerted by a binary liquid mixture. **7**

    c) Calculate the B.P. of 3% (weight by weight percent) glucose solution in water. Given : M.W. of glucose = 180 and $K_b$ for 1000 gram water = 0.52. **4**

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**S.E. (Petro/Petrochem./Poly) (Semester – I) Examination, 2010**
**(2003 Course) (Old Course)**
**ENGINEERING MATERIALS SCIENCE AND TECHNOLOGY**

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) Use of scientific electronic calculator is **allowed**.*
*v) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Explain major classes of materials. **8**

   b) Explain code of ethics designed by IEEE. **8**

OR

2. i) What are volume defects ? Explain any one volume defect in details. **8**

   ii) Explain the role of materials in technologically advanced societies. **8**

3. a) Draw the microstructures of following and explain their properties and applications. **8**

      i) Dead mild steel.

      ii) Cartridge brass.

   b) Explain all the steps involved in specimen preparation for micro-observation. **8**

OR

4. a) Draw and explain the micro structures of following : **8**

      i) Fatigue fracture.

      ii) Creep fracture.

   b) Write a note on shear strength of deformable single crystal. **8**

**P.T.O.**

5. a) What are non destructive tests ? Explain ultrasonic test. **6**

   b) What factors influence the mobility of electrical charge carriers ? **6**

   c) Explain the mechanism of polarization in a dielectric material. **6**

OR

6. i) Polythylene has a polarization of $5.75\times10^{-8}$ c/m$^2$ in a field of 5000 V/m. Calculate the dielectric constant of this polymer. **6**

   (Take permittivity of a vacuum as $8.85\times10^{-12}$ F/m)

   ii) What is refraction of a light ? Explain the formula of refractive index. **6**

   iii) Explain in brief diamagnetism and paramagnetism. **6**

SECTION – II

7. Write notes (on **any two**) : **16**

   i) Role of interfaces in composites

   ii) Ceramic-matrix composites

   iii) Fracture behavior of composites.

OR

8. a) Estimate the elastic modulus of a uniaxial epoxy-glass fiber composite in the longitudinal and transverse directions. **8**

   Given following data : $E_m$ = 3.0 GPa

   $E_f$ = 70 GPa and $V_f$ = 0.6

   b) Explain the characteristics of matrix material and fiber materials of a composite. **8**

9. a) Explain different mechanisms of electrochemical corrosion. **8**

   b) During corrosion tests a current density of 0.9 A/m$^2$ was measured for a steel sample immersed in sea water. Calculate the weight loss per second and the thickness loss per year for this steel. Given : Atomic weight of iron = 55.85 g/mol Faraday's constant = 96500 C /mol

   Density of iron = $7.87\times10^6$ g/m$^3$. **8**

OR

10. Write short notes with diagrams (**any two**) : **16**

i) Sensitization of stainless steel.

ii) Improved designs of components to minimize corrosion problems.

iii) Alteration of bond structures of elastomers by exposure to U.V. light.

11. a) Explain with diagram Czochralski (CZ) method for growth and processing of single crystal. **6**

b) What are the steps in sintering process ? What are its advantages ? **6**

c) Explain with diagrams the stages of forming a cup from a circular blank in a deep drawing process. **6**

OR

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

i) Metal casting

ii) Open die forging operation

iii) Photolithography Process

iv) Manufacturing of glass tubing or rods.

v) Blow molding process for hollow containers.

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**S.E. (Polymer/Petroleum/Petrochemical) (Semester – I) Examination, 2010**

# 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 **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 electronic pocket calculator is **allowed**.*

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

SECTION – I

1. a) What are the four elastic constants for an elastic material ? Define each one of them. Write the basic relations between them. **12**

1. b) A hollow cast iron column has an internal diameter of 200 mm. What should be its minimum external diameter so that it may carry a load of 1600 KN without the stress exceeding 90 $N/mm^2$ ? **6**

OR

2. a) A tension bar, 4 m long is made up of two parts, 2.5 m of its length has a cross sectional area of 1250 $mm^2$ while the remaining 1.5 m has a cross sectional area of 2500 $mm^2$. An axial load of 80 KN is gradually applied. Find the total strain energy produced in the bar and compare this value with that obtained in a uniform bar of the same length and having the same volume under the same load. E = 200 GPa. **12**

2. b) Derive the expression for extension of a bar of uniform cross section under its own weight. **6**

3. a) Write the torsion formula for a circular prismatic shaft subjected to a torque. Explain each term. What are the assumptions made in deriving this formula ? **8**

3. b) At a point in a strained material, the state of stress is as shown in fig. Q. 3 (b). Find :

   i) Principal stresses

   ii) Maximum shear stress

   iii) Shear stress which acting alone will produce the same principal tensile stress. **8**

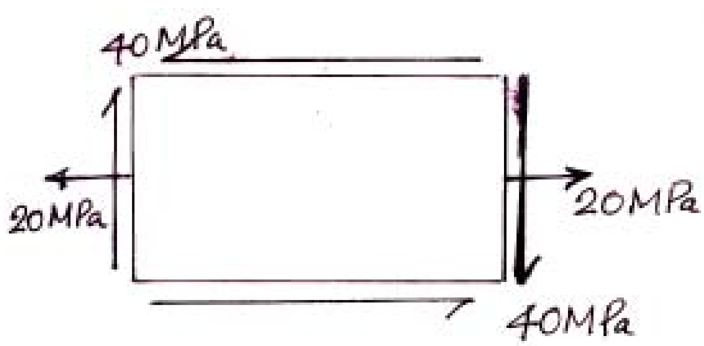


fig. Q. 3(b)

OR

4. a) Compare the weights of equal lengths of hollow and solid steel shafts to transmit a given torque for the same maximum shear stress. Take inside diameter as 0.6 times the outside diameter for the hollow shaft. **8**

4. b) The principal stresses in the wall of a container arc 20 MPa(T) and 40 MPa(T). Determine the normal, shear and resultant stresses in magnitude and direction on a plane inclined at 30° with the 40 MPa stress. **8**

5. a) Derive the expressions for hoop stress and longitudinal stresses developed in a thin shell subjected to an internal pressure p. Write the assumptions made in deriving the same. **8**

5. b) A pipe of 200 mm internal diameter and 100 mm thickness contains a fluid at a pressure of 6 N/mm$^2$. Find the maximum and minimum hoop stresses across the section. **8**

OR

6. a) A thin spherical shell of 450 mm diameter is subjected to an internal pressure of 12 MPa. The change in diameter was observed to be 0.15 mm. Find the percentage change in volume of shell. **8**

6. b) Calculate the thickness of metal required for a cast iron cylindrical shell of internal diameter 100 mm to withstand an internal pressure of 50 MPa, if the permissible tensile stress in cylindrical wall is 100 MPa. **8**

SECTION – II

7. a) Draw shear force diagram and BMD for the beam shown in fig. Q. 7 (a) showing all important values. Locate the points of contraflexure (if any). What are the values of maximum BM ? **12**

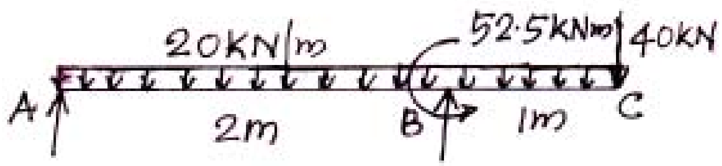


fig. Q. 7(a)

b) A timber beam of depth 300 mm and symmetrical section is simply supported over a span of 10 m. What udl per metre (including self weight) can it carry if the maximum permissible stress is 7.5 N/mm$^2$. MI of the section of the beam is $4.5 \times 10^8$ mm$^4$. **6**

OR

8. a) Explain the following terms with suitable examples :

i) Section modulus

ii) Pure bending. **6**

8. b) A beam is supported and loaded as in fig. Q. 8(b) (i) and its cross section is shown in fig. Q. 8 (b) (ii). Find the maximum compressive stress developed in the beam due to bending. **12**

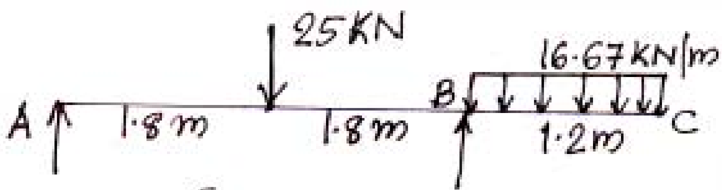


fig. Q. 8(b)(i)

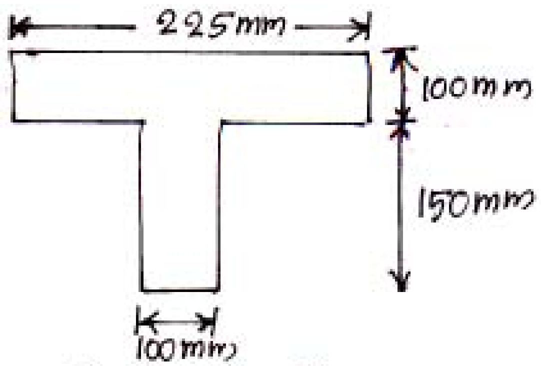


fig. Q.8(b)(ii)

9. a) Derive the expression for shear stress distribution over a rectangular section subjected to a shear force F. Hence sketch the distribution of shear stress over the cross section. **8**

b) What is the effective length of columns. Tabulate the effective length of columns with standard end conditions. **8**

OR

10. a) The cross section of a beam is a T section 120 mm×200 mm×12 mm with the 120 mm side horizontal. Sketch the shear stress distribution and hence find the maximum shear stress. SF on the section = 200 KN (Ref. fig. Q.10 (a). **8**

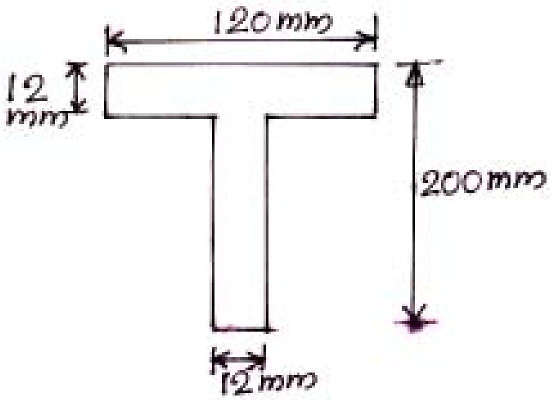


fig. Q.10(a)

10. b) A hollow cast iron column with fixed ends, supports an axial load of 800 KN. If the column is 3m long and has an external diameter of 200 mm, find the thickness of metal required. Use Rankine's formula taking a constant of $\frac{1}{1600}$ (which includes end effects) and assume a working stress of 90 N/mm$^2$. **8**

11. a) A load of 100 KN is carried by a bracket riveted to a flange plate of a stanchion as in fig Q. 11 (a). Each rivet is of 24 mm diameter. Calculate the max. shear stress developed. **8**

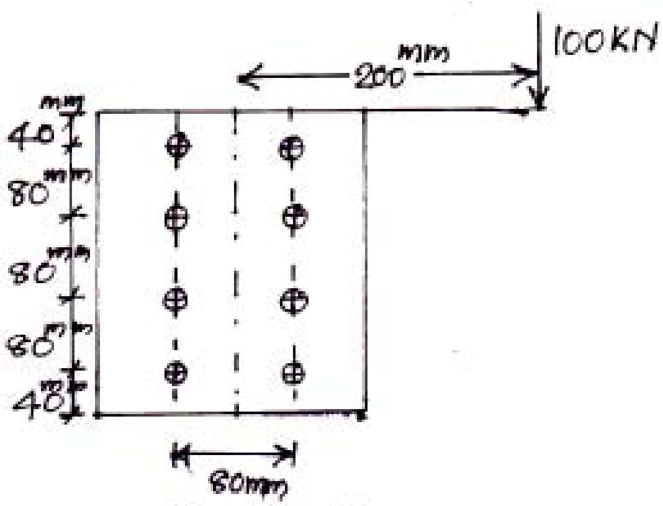


fig. Q. 11(a)

11. b) From basic principles derive an expression for slope and deflection at any section of a cantilever beam carrying a udl throughout its span. Hence derive the expression for slope and deflection at the free end. **8**

OR

12. a) With the help of proper sketches, derive the expression for the extreme fibre stresses for a short member subjected to a compressive eccentric loading (eccentricity is about one axis only). What is the core or kernel of a section ? **8**

12. b) A beam of uniform cross section and span 6 m is simply supported at its ends and carries two point loads 48 KN and 40 KN at 1 m and 3 m from left support. Find the deflection under each load in terms of EI. **8**

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*B/II/10/125*

**[3862] – 395**

**S.E. (Polymer /Petroleum/Petrochemical) (Semester – II) Examination, 2010**
**ENGINEERING CHEMISTRY – II**
**(2003 Course)**

Time: 3 Hours Max. Marks: 100

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

SECTION – I

1. a) Define enzymes. Explain four factors affecting enzyme activity. **6**

b) Give two reactions characteristic of amino group and carbonyl group of amino acid. **6**

c) Explain cyclic structure of D-Fructose. **4**

OR

2. a) Explain classification of carbohydrates. **6**

b) Explain tertiary structure of protein. **6**

c) Draw the structure of following carbohydrates- **4**
i) Amylose ii) Maltose

3. a) Give two methods to convert ketones into alkanes. **6**

b) Give two oxidative methods for synthesis of carboxylic acid. **6**

c) Write short note on ‘Gabriel synthesis of amines’. **4**

OR

**P.T.O.**

4. a) Explain the following methods for the synthesis of ketones. **6**

   i) Oxidation of secondary alcohols

   ii) Friedel-Craft acylation

   iii) From organolithium compounds.

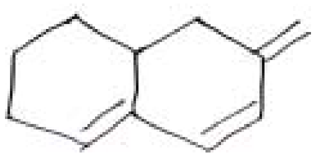
   b) Explain synthesis of esters from **6**

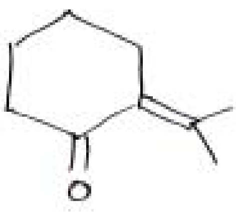
   i) Acids ii) Acid anhydride

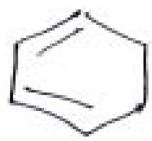
   iii) Diazomethane

   c) Explain preparation of esters by transesterification reaction. **4**

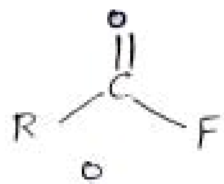
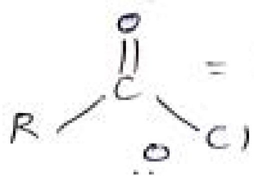
5. a) Calculate $\lambda_{max}$ by using Woodward-Fieser rule **6**

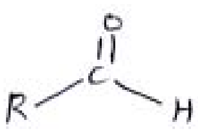
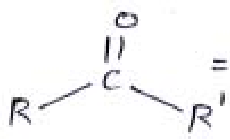
i) 

ii) 

iii) 

   b) Explain the following I.R. frequencies of carbonyl group. **6**

i)  $= 1870\ cm^{-1}$ and  $= 1800\ cm^{-1}$

ii)  $= 1735\ cm^{-1}$ and  $= 1720\ cm^{-1}$

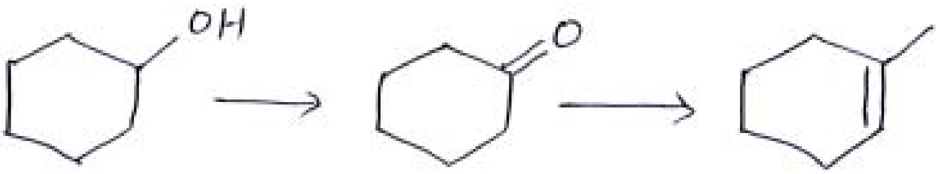
   c) How will you get cis and trans alkenes starting from alkynes ? **6**

OR

6. a) How will you distinguish between alcohols by oxidation ? **6**

b) The molecular formula of an organic compound is $C_3H_5N$. It absorbs at $\lambda_{max} = 2200\,cm^{-1}$ in IR spectroscopy. Suggest the probable structure. **6**

c) How will you follow the following sequence of reaction by IR spectroscopy ? **6**



SECTION – II

Atomic numbers : Ti = 22, V=23, Cr= 24, Mn = 25, Fe = 26, Co=27, Ni = 28, Cu = 29.

7. a) What are quantum numbers ? Give their significance. Give electronic configuration of Copper and Chromium atom. **6**

b) With the help of molecular orbital diagram explain magnetic properties of Nitrogen molecule calculate its bond order. **6**

c) Explain bonding in $NH_3$ and ethylene on the basis of VBT theory. **4**

OR

8. a) Explain in brief molecular orbital theory. **6**

b) With the help of molecular orbital diagram explain magnetic properties of $O_2$ molecule and calculate its bond order. **6**

c) Explain bonding in $CO_2$ on the basis of VBT theory. **4**

9. a) Calculate the magnetic moment for $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$ using CFT. **6**

b) $[Ni(CO)_4]$ is tetrahedral but $[Ni(CN)_4]^{2-}$ is square planer and diamagnetic explain using VBT. **6**

c) Calculate effective atomic number for $[Cu(NH_3)_4]^{2+}$ and $Fe(CN)_6^{4-}$ **4**

OR

10. a) Explain variable oxidation states shown by first transition series. **6**

b) Explain colour and catalytic properties shown by transition metal complexes. **6**

c) Define and explain ligand and complex ion. **4**

11. a) Draw and explain the titration curve for a redox titration. Discuss the various steps involved. **7**

b) What is an indicator ? Give various theories of indicators. **7**

c) Calculate the pH of buffer formed by mixing 20 ml. of 0.2M NaOH and 30 ml. of 0.2M acetic acid solution $K_a = 1.8 \times 10^{-5}$ for acetic acid. **4**

OR

12. a) Explain complexometric titration with suitable example. **7**

b) What is meant by iodometry ? Explain, how the percentage of copper in brass can be measured by iodometry. **7**

c) Find the amount of HCl and $H_3PO_4$ present in the 25 ml. mixture. The first end point was obtained for 20 ml. of 0.1N NaOH and second end point was obtained for additional 11 ml. of the same base. **4**

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**S.E. (Petroleum/Petro-chemical/Polymer) (Semester – II) Examination, 2010**
**SOLIDS HANDLING OPERATIONS**
**(2003 Course)**

Time : 3 Hours

Max. Marks : 100

***Instructions**: i) Answer **three** questions from **each** Section.*
*ii) Answer to the **two** Section should be written in **separate** answer books.*
*iii) Neat diagram must be drawn **wherever** necessary.*
*iv) Use of logarithmic table, slide rule, Mollier charts, electronic pocket calculator and steam table is **allowed**.*
*v) Assume suitable data if **necessary**.*

SECTION – I

1. A) Derive "Janssen equation' regarding stress in Hopper and Silos. **6**

B) Define mesh ? What is screen ? How screens are classified ? Discuss different standards used for screens. **6**

C) List the different type of conveyors and explain chain conveyor with neat sketch. **6**

OR

2. A) A sample of uniterm particle shape and size with diameter of particle (Dp). Prove that number of particle in mixture is given on

$$N_w = \frac{1}{a.\rho_p} \sum_{i=1}^{n} \frac{xi}{\overline{DP}_i^3} = \frac{1}{a\rho_P \overline{D}_v} 3$$

Where : $N_w$ : – No. of particle in mixture

a : – Volume shape factor

$D_P$ : – Dia of particle

$x_i$ : – Mass fraction **8**

B) Define “mixing”. List the mechanism of solid mixing. Discuss theory of solid mixing in brief. **6**

C) Calculate the sphericity of cylinder of diameter 2cm and height 6cm. **4**

3. A) What is grantysetler ? Name any two type of gravity settler. Explain hydraulic fig. with neat sketch. **8**

B) Explain principle and working of magnetic separator. **4**

C) Discuss electrostatic separator in brief. **4**

OR

4. A) State principle and explain electrofloation method with neat sketch. **8**

B) What are centrifugal settler ? Differentiate between gravity settler. List any two centrifugal separator. **6**

C) List any two method of gas cleaning. **2**

5. A) A material is crushed in a jaw crusher and the average size of particle reduced from 5 cm to 1 cm with consumption of energy $1.32 \times 10^4$ J/kg. What will be the consumption of energy to crush the same material of an average size 7.5 cm to 2.5 cm assuming ?

a) Rittinger’s law

b) Kick’s law **8**

B) The power required to crush 100 to n/hr of material is 179.8 Kw, if 80% of feed passes through 51 mm screen and 80% of product passes through a 3.2 mm screen. What is the work index of the material ? What will be power required for same feed at 100 ton/hr to be crushed to a product such that 80% is passes through a 1.6 mm screen ? **8**

OR

6. A) A pair of rolls is to take a feed equivalent to spheres of 3 cm in diameter and crush them to spheres having 1 cm diameter. If coefficient of friction is 0.29. What would be diameter of roll ? **6**

B) A crusher crushes rock having a volume surface mean dia of 0.2 m and discharges product of volume surface mean diameter of 0.04m. To crush 3.5 kg/sec 7 kw of power is required using Rittinger law. Calculate Rittinger con stante. **4**

C) Explain with neat sketch principle and working of Black Jaw crusher. **6**

SECTION – II

7\. A) Derive the expression for drag force acting on spherical particle for different regime or region of Renoylds number. **12**

B) Discuss concept of terminal falling velocity. **4**

OR

8\. A) Discuss the sedimentation process with neat sketch. **8**

B) What is flocculation ? Discuss the flocculation method. **6**

C) State principle of thickener. **2**

9\. A) Discuss the effect of fluidisation velocity or fluid velocity on pressure gradient in fluidisation process. **8**

B) A bed consist of particle of density 2000 $kg/m^3$. If the height of bed is 1.5m and porosity is 0.4. Calculate the pressure drop required to fluidisation. **4**

C) A one meter high bed made up of 2mm particle is to be fluidised by an oil (density = 900 $kg/m^n$ viscosity = 0.01 pa.s). If at the point of incipient fluidisation, the bed voidage is 39% and the pressure drop across the bed is 10 Kpa. Estimate density of particle. **4**

OR

10\. A) Derive expression for minimum fluidisation velocity. **8**

B) State various application of fluidisation and explain fluidised bed combustion process. **8**

11\. A) Derive relationship between thickness of cake and volume of filtrate. **6**

B) Discuss principle and working of Rotary drum filter. **8**

C) Discuss in brief cross filtration. **4**

OR

12\. A) Explain with neat sketch ultrafiltration process. **8**

B) What is pervaperation method of separation ? With neat sketch explain pervaperation process. **6**

C) Write short note on delayed cake filtration. **4**

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# S.E. (Petroleum/Petrochemical/Polymer) (Sem. – II) Examination, 2010
# 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 in detail three modes of heat transfer with one example each. **12**

b) Explain with one example the term "Thermal Resistance". **4**

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 **8**

i) Heat flow across the plane wall;

ii) Temperature gradient in flow direction.

b) Explain with the importance the following terms : **8**

Temperature Gradient, Heat Flux, Thermal Conductivity, Thermal Diffusivity.

3. 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 area 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) Derive the necessary expression for the heat conduction through a composite hollow cylinder with neat diagram. **8**

OR

4. a) A reactor's wall, 320 mm of thick, is made up of an inner layer of Fire Brick ($k_{\text{Fire Brick}}$ = 0.84 w/m°C) covered with a layer of insulation ($k_{\text{Insulation Layer}}$ = 0.16 w/m°C). the reactor operates at a temperature of 1325°C and the ambient temperature is at 25°C. Determine the thickness of fire brick and Insulation layer which gives minimum heat loss and calculate the heat loss per unit area presuming that the Insulation layer has a maximum temperature of 1200°C. **10**

b) Derive the necessary expression for the Critical thickness of insulation for cylinder with neat diagram. **8**

5. a) Write a note on overall heat Transfer Coefficient. **8**

b) Write a note on heat transfer by Forced Convection. **8**

OR

6. a) Explain the following Dimensionless Numbers with their importance : **8**

i) Reynolds Number

ii) Prandtl Number

iii) Rayleigh Number

iv) Stanton Number.

b) When 0.5 kg of water per minute is passed through a tube of 20 mm diameter, it is found to be heated from 20°C to 50°C. the heating is accomplished by condensing steam on the surface of the tube and the subsequently surface temperature of the tube is maintained at 85°C. Determine the length of tube required for fully developed flow. **8**

Properties of Water at 60°C are as below :

$\rho$ = 983.2 kg/m$^3$, Cp =4.178 KJ/Kg °k

k = 0.659 w/m °C, kinematic viscosity $\upsilon = 0.478 \times 10^{-6}$ m$^2$/sec.

Average Nusselt Number is given by :

$(N_{Nu})_{Avg} = 3.65$

## SECTION – II

7. a) Discuss Absorptivity, Reflectivity, Transmissivity terms of radiation with neat diagram. **8**

   b) Discuss in detail Stefan-Boltzmann law and Planck's law. **10**

OR

8. a) Show that the total emissive power of a surface equal to $\Pi$ times its Intensity of radiation. **10**

   b) Discuss in detail Black Body concept. **8**

9. a) Discuss in detail Parallel, Counter flow and Cross flow heat exchangers with neat diagrams. **12**

   b) Define the term "Logarithmic Mean Temperature Difference". **4**

OR

10. a) Discuss Heat exchanger analysis based on LMTD and derive the term LMTD for parallel type flow heat exchangers. **12**

    b) Discuss any four parameters which affect Fouling. **4**

11. a) Write a note on Short tube evaporator and Long tube vertical evaporator. **12**

    b) Discuss the following terms : **4**

       i) Evaporator Capacity

       ii) Evaporator Economy

OR

12. a) Define Evaporation with its the importance and state the classification of evaporators. **10**

    b) Discuss the terms : Boiling Point elevation, Material and enthalpy balances for single effect evaporator. **6**

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**[3862] – 399**

**S.E. (Polymer/Petro/Petrochemical) (Semester – II) Examination, 2010**
**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. Explain the following : **16**
   i) Utility and its types
   ii) Human Wants
   iii) Wealth
   iv) Value of Price

OR

   a) Explain the importance of Engineering Economics. **8**
   b) Explain the Law of Demand. **8**

2. a) Explain the functions of Money. **8**
   b) Explain the various factors of Production. **8**

OR

   a) Discuss the role of Government in development of macro economy of India. **8**
   b) Explain the merits and demerits of Specialization. **8**

**P.T.O.**

3. Write Short Notes on : **18**

   i) Types of Markets

   ii) Vision of India 2010

   iii) Industrial Policy of India.

OR

Describe the economic policies implemented in India after Independence to achieve Economic Growth. **18**

SECTION – II

4. a) Discuss the features of Modern Family System. **8**

   b) India is land of Unity in Cultural Diversity. Comment. **8**

OR

Discuss the impact of Globalization on Socio Economic sectors in India. **16**

5. a) Explain the function of Religion. **8**

   b) Explain the importance of Census. **8**

OR

   a) All the Religions promote Universal Brotherhood and Love. Discuss. **8**

   b) Explain the concept of Sustainable Development. **8**

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

   i) Values and Professional Ethics

   ii) Crimes and Punishments

   iii) Social Reformers.

OR

   i) Secularism

   ii) Indian Philosophy

   iii) Ecological Crisis.

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# S.E. (Computer Engg.) (Semester – I) Examination, 2010
# DISCRETE STRUCTURES (Common to I.T.)
# (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) Black figures to the* ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) Prove by induction that the sum of the cubes of three consecutive integers is divisible by g. **8**

b) In the survey of 100 new cars, it is found that 60 had air conditioner (AC), 48 had power staring (PS), 44 had power-windows (PW), 36 had AC + PW, 20 had PS + AC, 16 had PW+PS, 12 had all three features. Find the number of cars that had. **8**

i) Only power window

ii) PS and PW but not AC

iii) AC and PS but not PW

Draw Venn diagram.

OR

2. a) Show the following using Venn diagram **5**

i) $A \cup (\overline{B} \cup C) = (A \cup \overline{B}) \cap (A \cap C)$

ii) $(A - B) - C = A - (B \cup C)$

P.T.O.

b) Obtain the conjuctive normal form of each of the following : **6**

i) $P \wedge (P \rightarrow Q)$

ii) $\sim(P \vee Q) \leftrightarrow (P \wedge Q)$

iii) $Q \vee (P \wedge \sim Q) \vee (\sim P \wedge \sim Q)$.

c) Let P denote the statement ‘The material is interesting’.

‘q denote the statement ‘The exercises are challenging’ and r denote the statement’, ‘The course is enjoyable’ write the following statements in symbolic form. **5**

i) The material is interesting and exercises are challenging.

ii) The material is interesting means the exercises are challenging and conversely.

iii) Either the material is interesting or the exercises are not challenging but not both.

iv) If the material is not interesting and exercises are not challenging, then the course is not enjoyable.

v) The material is uninteresting, the exercises are not challenging and the course is not enjoyable.

3. a) i) In how many ways can the letter in the word MISSISSIPI be arranged ? **4**

ii) In how many ways can three examinations be scheduled within a five day period so that no two examinations are scheduled on the same day ?

iii) Compute number of permutations of the set given

{1, 2, 3, 4, 5}.

iv) Suppose that repetitions are not permitted. How many four digit numbers can be formed from the six digits 1, 2, 3, 5, 7, 8 ?

b) Suppose that 3 balls are selected at random from an user containing 7 red balls and 5 black balls. Compute the probability that **6**

i) All three balls are red

ii) At least two balls are black

iii) At most two balls are black

iv) At least one ball is red.

c) Define the terms with examples **6**

i) Rule of sum and Rule of product

ii) Discrete probability and conditional probability

iii) Binominal distribution.

OR

4. a) A man has 7 relatives, 4 of them are ladies and 3 are gentleman, his wife has 7 relatives, 3 of them are ladies and 4 are gentlemen. In how many ways, can they invite a dinner party of 3 ladies and 3 gentlemen so that there are 3 of man's relatives and 3 of wife's relatives ? **6**

b) Two cards are drawn at random from a deck of 52 cards. Find the probability p that **6**

i) Both are diamonds

ii) One is diamond and one is heart.

c) A student has to answer 10 out of 13 questions in an examination : **4**

i) How many choices he has ?

ii) How many choices he has if has to answer the first two questions ?

iii) How many choices he has if he must answer at least three out of first five ?

iv) How many choices he has if he must answer exactly three out of first five ?

5. a) Find the transitive clouser of R by Warshall's Algorithm where A = {1, 2, 3, 4, 5} and R = {(1, 1), (1, 2), (1, 3), (1, 4), (3, 1), (3, 2), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5)}.

Find the transitive closure for R using Warshall's Algorithm. **6**

b) Three functions F, G, H are defined from $R \rightarrow R$ as follows :

i) $f(x) = 2x^3 + 5$

ii) $g(x) = \cos(x)$

iii) $h(x) = x^3 - 1$.

Find $h_0$ (gof) and (hog) of

Are they equal ? **4**

c) Find the numeric function for **4**

$$A(z) = \frac{2}{1-4z^2}$$

d) Define the following terms with examples **4**

i) Antisymmetric relation

ii) Transitive relation

iii) Irreflexive relation.

OR

6\. a) Let A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 18, 24} be ordered by the relation x divides y, show that the relation is partial ordering and draw the Hasse diagram. **5**

b) Write short note on : chains and antichains. **4**

c) What is recurrence relation ? Solve the following recurrence relation. **5**

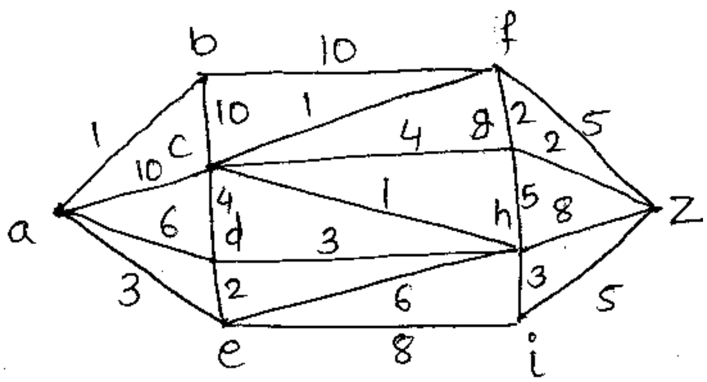
i) $a_r - 7\,a_{r-1} + 10\,a_{r-2} = 0$ given that $a_0 = 0$ and $a_1 = 3$.

ii) $a_r - 4\,a_{r-1} + 4\,a_{r-2} = 0$ given that $a_0 = 1$ and $a_1 = 6$.

d) Let X = {1, 2, .... 7} and R = {(x, y) / x–y, is divisible by 3}. Show that R is equivalence relation. Draw graph of R. **4**

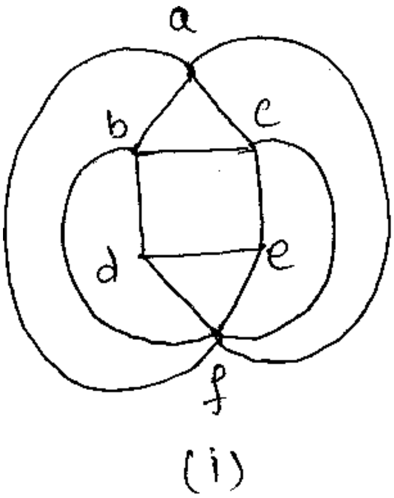
## SECTION – II

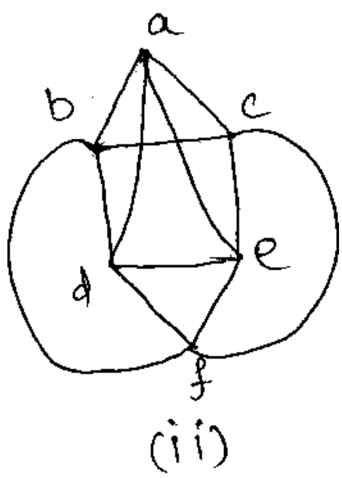
7\. a) Determine a shortest path between a and z in the graph, where the numbers associated with the edges are the distances between vertices. **8**



b) Define weighted graph, subgraph and factors of graph with a suitable example. **6**

c) For the following graphs determine whether the graph has an Euler's circuit and Euler's path.




**4**

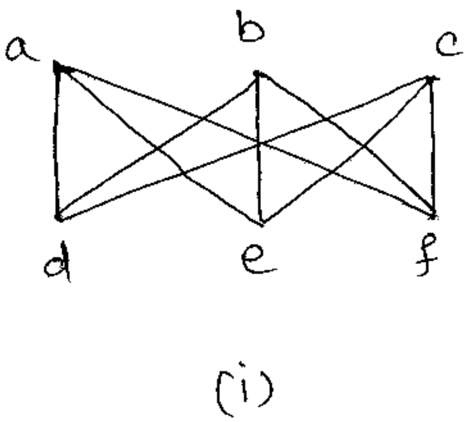
OR

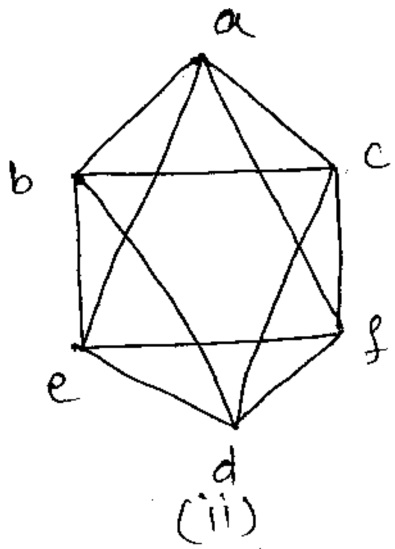
8\. a) Show that the graph G and G* are isomorphic G = (V, E) and G* = (V*, E*) given by,

G = ({a, b, c, d}, {(a, b), (a, d), (b, d), (c, d), (c, b), (d, c)}).

G* = ({1, 2, 3, 4}, {(1, 2), (2, 3), (3, 1), (3, 4), (4, 3), (4, 2)}). **6**

b) Which of the following graphs represent bipartite graph and planar graph ? If planar graph redraw the same.



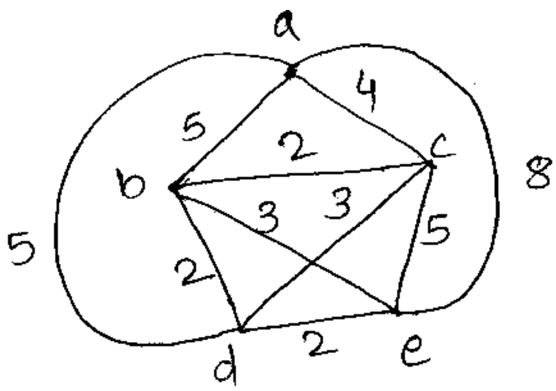

**6**

c) For the following figure solve the following options :

i) Use nearest neighbourhood method to find out Hamiltonian circuit for the graph starting at vertex 'a'.

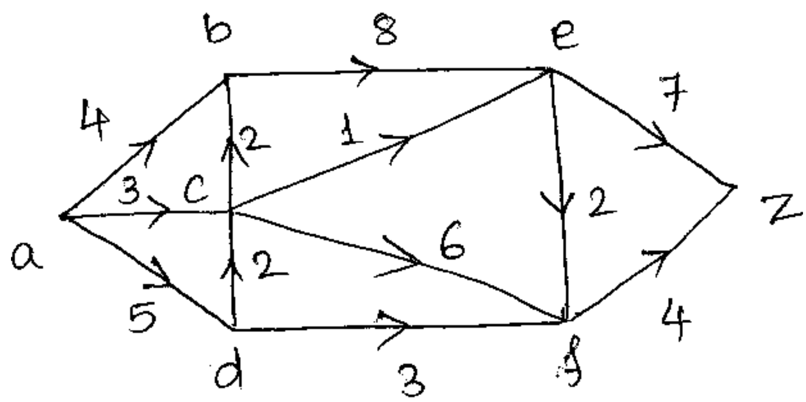
ii) Repeat the part (i) starting at vertex 'd' instead.

iii) Determine the minimum Hamiltonian ckt for the graph in the following figure.




**6**

9. a) Use labelling procedure to find a maximum flow in the transport network shown in the diagram. Determine corresponding minimum cut.



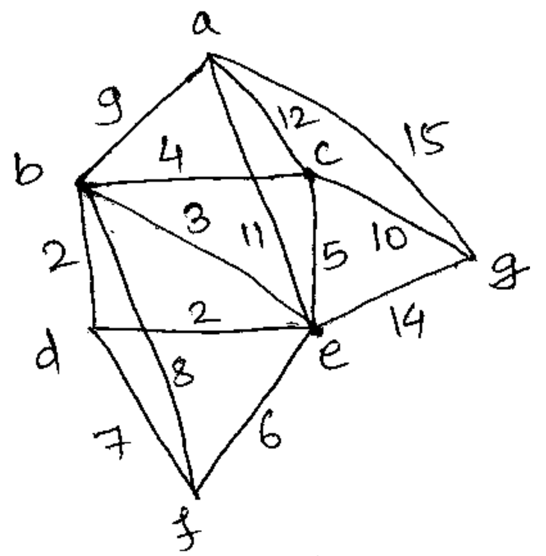

**6**

b) For the given set of weights construct optimal binary tree and find optimal binary prefix code : 5, 7, 8, 15, 35, 40.
For each weight give corresponding code word. **6**

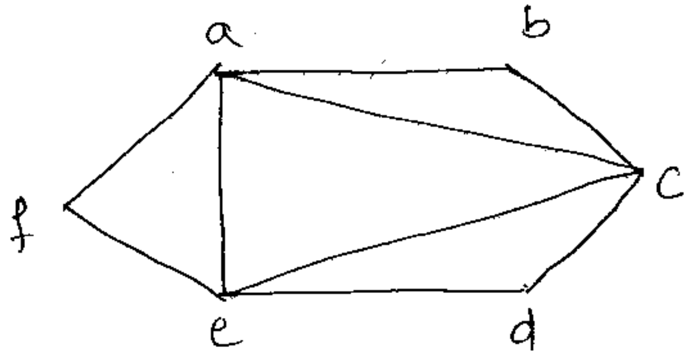
c) Explain Fundamental circuits and fundamental cut sets. **4**

OR

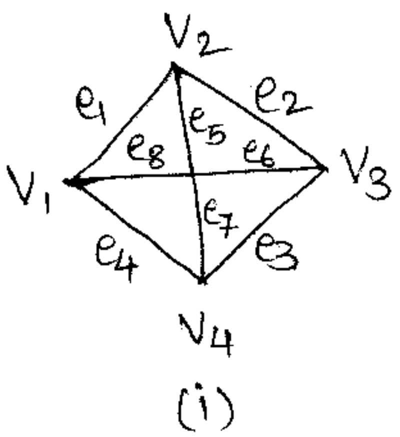
10. a) Determine minimum spanning tree for the following graph using Kruskal's Algorithm. **6**

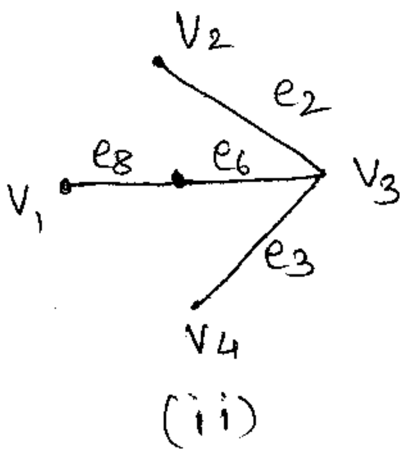



b) What do you understand by factors of a graph ? Find all possible k-factors of the following graph. **4**




c) Find the fundamental system of circuits and the fundamental system of cut-sets for the following graph : i) With respect to the spanning tree given in (ii). **6**



11. a) Define Group. Show that <z, $*$) is a group, where z is set of all integers that are divisible by 2 and * is a binary operation giving multiplication of 2 integers. **6**

b) What is monoid ? Show that the Algebraic system (A, +) is a monoid, where A is a set of integers and + is a binary operation giving addition of two integers. **6**

c) Define :

i) Ring Homomorphism

ii) Ring Isomorphism. **4**

OR

12. a) Define the following terms with examples

i) Ring

ii) Field

iii) Integral domain. **6**

b) Let G = {EVEN, ODD} and binary operation $\oplus$ is defined as :

| $\oplus$ | EVEN | ODD |
|---|---|---|
| EVEN | EVEN | ODD |
| ODD | ODD | EVEN |

Show that (G, $\oplus$) is a group. **6**

c) Define Abelian group. Show that ($Z_6$, +) is Abelian group. **4**

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[3862] – 403

**S.E. (Computer Engineering) (Semester – I) Examination, 2010**
**DIGITAL ELECTRONICS AND LOGIC DESIGN**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *1) Answer* ***1*** *or* ***2****,* ***3*** *or* ***4****,* ***5*** *or* ***6*** *questions from Section* ***I*** *and* ***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.*

SECTION – I

1. a) Perform the following Hexadecimal substraction and show your answer in hexadecimal only. **8**
   i) $(245)_{Hex} – (199)_{Hex}$
   ii) $(A27)_{Hex} – (72\ A)_{Hex}$
   b) Explain in detail 4-bit Binary code to Grey code conversion using k-map and MSI circuit. **10**

OR

2. a) For a maximum 4-bit decimal number, obtain max. equivalent octal and hex number. **6**
   b) Explain the error correcting and detecting codes with suitable examples. **6**
   c) Explain various Boolean algebra rules with suitable example. **6**

3. a) Draw and explain 3-input TTL NAND gate circuit, also write various i/p, o/p state table. **10**
   b) Explain various characteristics of TTL logic families. **6**

OR

4. a) Give the classification of logic families and also explain characteristics of digital IC’s. **8**
   b) Explain NOR Gate using CMOS logic. **8**

**P.T.O.**

5. a) Draw and explain Binary to 7-segment driver IC 7447. Differentiate with IC 7448. **8**

   b) What is priority encoder ? Design a priority encoder using NAND gate. **8**

OR

6. a) Explain the working of BCD adder using IC 7483. **8**

   b) Design and explain 16:1 mux using 4:1 mux IC. **8**

SECTION – II

7. a) Explain the Design of 4-bit synchronous counter using J-K flip flop. Also draw timing diagram. **12**

   b) Explain lock-out condition. Briefly explain its avoidance method. **6**

OR

8. a) Explain types of shift registers. Draw and explain working of any two. **8**

   b) Explain Ring Counter (4-bit) in detail. Differentiate with JOHNSON ring counter. **10**

9. a) Explain execution in VHDL. **4**

   b) Explain design steps of RTL. **4**

   c) What is ASM chart ? Explain the MUX controller method with suitable example. **8**

OR

10. a) Write entity-architecture declaration for 2-i/p x-NOR and NAND gate. Assume A and B as inputs and C as output of logic gates. **8**

    b) Draw ASM chart for 4-bit grey code sequence. **8**

11. a) What is PLD ? Explain in brief GAL, PAL and PLA. **8**

    b) Explain in detail PLA design. **8**

OR

12. Explain in detail CPLD architecture. Describe how to program CPLD. List available tools to design CPLD, and various design steps involved in it. **16**

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# [3862] – 404

**S.E. Semester – I Examination, 2010**
**Computer Engineering**
**DATA STRUCTURES AND ALGORITHMS**
**(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) **Assume** suitable data, if **necessary**.*

SECTION – I

1. a) Define the following terms and explain with **one** example of **each**. **10**

   1) Data
   2) Data Object
   3) Data type
   4) Abstract Data Type
   5) Data Structure.

   b) Write pseudo ‘C’ code to merge two sorted arrays A[1 : n] and B[1 : m] into C[1 : n + m] such that resulting array C is also sorted. **6**

OR

2. a) What are the different algorithm design tools used ? Explain the use of these tools for selection sort. **8**

   b) Explain in brief with one example **each** of the following : **8**

   i) Primitive/Non-primitive data structures
   ii) Linear/Non-linear data structures
   iii) Static/Dynamic data structures

**P.T.O.**

iv) Persistence/Ephemeral data structures.

3. a) Explain how two dimensional array A[1 : m, 1 : n] is represented in computer memory using Row Major representation and obtain a formula for computing the address of any element A[i, j], where $1 \leq i \leq m$ and $1 \leq j \leq n$. **8**

b) Define data structures required to represent the following polynomial,

i) Using two dimensional array and

ii) Using structure to represent any term of the polynomial.

Polynomial $p(x, y) = 3x^8 + 8x^2y + 2xy^2 + 4y^3 + 10$

Compute the storage (bytes) required for both of these representations used to store the above polynomial in computer memory, assuming 2 bytes are required to store an integer. **10**

OR

4. a) Write pseudo 'C' code to compute the transpose of a given sparse matrix using fast transpose method and obtain time and space complexity of your algorithm. **10**

b) What are the advantages and disadvantages of using arrays ? Explain. **4**

c) Explain the necessity of computing transpose in case of sparse representation of sparse matrices. **4**

5. a) Write pseudo 'C' code to check for well-formed parenthesis for a given arithmetic expression using stack. **6**

b) Write an algorithm to covert given infix expression to its postfix form using stack. **6**

c) Write short note on Multi-stack. **4**

OR

6. a) What is parsing ? Explain the use of stack in parsing of an arithmetic expression. **6**

b) Write pseudo 'C' code to evaluate a given postfix expression using stack. **6**

c) Evaluate following postfix expression using stack. Assume that given expression contains only single digit operands. Show the contents of stack for every step. **4**

Postfix Expression : 42/4+5*2

SECTION – II

7. a) Define Queue. Explain Queue simulation as an application of data structure Queue. **6**

   b) What are the problems faced while implementing Linear Queue ? Explain how these problems can be resolved ? **6**

   c) Write an ADT for circular Queue. **4**

OR

8. a) Explain how multiple queue can be implemented using single array ? Explain any one real world application of Multi-queue. **6**

   b) Explain job scheduling based on priority of a job as an application of priority Queue. **6**

   c) Write short note on Double Ended Queue. **4**

9. a) Write pseudo ‘C’ code for insertion sort for non-increasing sort order. What are the Worst and Best cases for it ? Obtain time and space complexities for each case. **8**

   b) Sort the following numbers stored in an array in non-decreasing order using Quick Sort. Show the contents of array and partitions at the end of each iteration. **6**

   80, –20, 45, –6, 11, 79, 41, 92

   c) What do you mean by sort stability ? What precaution you will take to make the insertion sort stable ? **4**

OR

10. a) Write pseudo ‘C’ code to implement Binary Search using recursion. Specify the Worst and Best cases for it, and obtain time and space complexities for each case. **8**

   b) Write pseudo ‘C’ code to sort an array of size ‘n’ in non-increasing order using Shell Sort. Assume that array contains integer numbers. What is it’s time complexity ? **6**

c) What is the need of sorting in computer applications ? **4**

11. a) "Frequency Count is the only important factor while analyzing an algorithm for its efficiency" Justify. **6**

b) Explain how Dynamic Programming approach differs from Divide and Conquer and Greedy approaches. **6**

c) Give all possible solutions using Backtracking for 4-queen problem. **4**

OR

12. a) Explain O, $\Omega$ and $\theta$ notations used in analysis of algorithms. **6**

b) State 'Tower of Hanoi' problem and write pseudo 'C' code to solve it. **6**

c) State the characteristics of "Greedy Strategy". **4**

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[3862] – 405

**S.E. (Computer Engg.) (Semester – I) Examination, 2010**
**FINANCIAL AND INDUSTRIAL MANAGEMENT**
**(2003 Course)**

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　Max. Marks : 100

*N.B. :* 1) ***Answer three*** *questions from Section –* ***I*** *and* ***three*** *questions from Section – II.*
2) *Answer to the* ***two*** *Sections should be written in* ***separate*** *books.*
3) ***Neat*** *diagrams must be drawn* ***wherever*** *necessary.*
4) ***Black*** *figures to the* ***right*** *indicate* ***full*** *marks.*

SECTION – I

1. a) Explain the following Principles of Management. **9**

   i) Division of Labour.

   ii) Remuneration.

   iii) Unity of Direction.

   b) What is MBO ? Explain in brief. **7**

OR

   a) Explain the different functions of Management. **7**

   b) Discuss the contribution of F.W. Taylor to the thought of Scientific Management. **9**

2. a) Explain the importance of Engineering Economics in brief. **8**

   b) Explain in brief : **8**

   i) Copyrights. ii) Patents.

OR

a) Define the following : **8**

i) Human Wants

ii) Wealth

iii) Utility

iv) Value and Price.

b) Explain in brief. **8**

i) Conditions of Valid Contract.

ii) SEBI.

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

i) Co-operatives.

ii) Line and Staff Structures.

iii) Partnership.

OR

Explain the following :

a) Joint Stock Company. **12**

b) Project structure. **6**

SECTION – II

4. a) Explain the types and sources or Recruitment. **8**

b) Define Communication and discuss the barriers of Communication. **8**

OR

a) Explain Maslow's Theory of Motivation. **8**

b) Explain the need and different methods of Training. **8**

5. Explain the following in brief.

a) Shares and Debentures. **6**

b) Capital Market and Money Market. **5**

c) Fixed Capital and Working Capital. **5**

OR

a) Define Cost. Explain the various Elements of Cost. **8**

b) Explain the importance of Budget. **8**

6. a) Explain the following Ratios. **10**

i) Current Ration.

ii) Inventory Turnover Ration.

b) Discuss the process of Credit Rating for Software Companies. **8**

OR

Write short notes on : **18**

a) Depreciation.

b) Payback method.

c) Accounting Rate of Return.

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**S.E. (Computer Engg.) (Semester – II) Examination, 2010**
**COMPUTER GRAPHICS**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions** : 1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Black** figures to the **right** indicate **full** marks.*
*3) Assume **suitable** data, **if necessary**.*

SECTION – I

1. a) Explain Bresenham's line drawing algorithm. Using Bresenham's algorithm draw line from (1, 1) to (5, 3). **8**

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

      a) Digitizer.

      b) Touch Panels.

      c) Joystick.

OR

2. a) Explain what is stroke method and bitmap method. **6**

   b) Using DDA algorithm find out which pixels would be turn on for the line with end points [–1, –2] to [4, 8]. **8**

   c) Define pixel, vector. **2**

3. a) Explain the concept of polygon fill and explain various polygon filling algorithms. **8**

   b) Explain w.r.t. 2 D transformation : **8**

      i) Scaling ii) Rotation

      iii) Translation.

OR

P.T.O.

4 a) What are the different types of polygon ? How to find whether given point is inside the polygon or not. **8**

b) Perform the 45° rotation of triangle A (0, 0), B (1, 1), C (5, 2) :

i) about the origin

ii) about P (–1, –1). **8**

5. a) What is animation and explain with suitable example how concept of segmentation is used for animation. **8**

b) With the help of suitable example, explain Cohen-Sutherland outcode algorithm. **10**

OR

6. a) Explain the segment table in detail and suggest the data structure used for segment table. **8**

b) Describe Sutherland-Hodgeman polygon clipping algorithm with the example. Suggest its limitations. **10**

SECTION – II

7. a) Explain :

i) Parallel projection.

ii) Perspective projection. **10**

b) Explain various steps to perform rotation about X-axis, Y-axis and Z-axis in 3 D. **8**

OR

8. a) Obtain the 3-D transformation matrices for :

i) Scaling

ii) Translation

iii) Rotation about an arbitrary axis. **8**

b) What is the necessity of 3-D clipping ? Explain any one 3-D clipping algorithm. **10**

9. a) Explain binary space partition algorithm for hidden surfaces. **8**

   b) Explain phong shading and Gourand shading. **8**

OR

10 a) Explain Warnock's algorithm for hidden line removal. **8**

   b) Why are hidden surfaces algorithms needed ? How does z-buffer algorithm determine which surfaces are hidden. **8**

11. a) Explain the curve generation methods with example. **8**

    b) What are fractals ? Explain how fractal surface is generated. **8**

OR

12. a) What is fractal dimension ? Explain koch curve in detail, giving fractal dimension. **8**

    b) Compare Bezier and B-spline curves. **8**

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**S.E. (Computer Engineering) (Semester – II) (2003 Course) Examination, 2010**
**COMPUTER ORGANISATION**
**(Common to I.T.)**

Time : 3 Hours Max. Marks : 100

***N.B. :*** *1) Answer Q.* ***1*** *or Q.* ***2****, Q.* ***3*** *or Q.* ***4****, Q.* ***5*** *or Q.* ***6*** *from Section –* ***I*** *and Q.* ***7*** *or Q.* ***8****, Q.* ***9*** *or Q.* ***10****, Q.* ***11*** *or Q.* ***12*** *from Section –* ***II****.*

*2) Answers to the* ***two*** *Sections should be written in* ***separate*** *answer sheets.*

*3)* ***Neat*** *diagrams should be drawn* ***wherever*** *necessary.*

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

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

*6) Assume suitable data* ***if*** *necessary.*

SECTION – I

1. a) Draw and explain the Von Neumann architecture. **8**
   b) Represent (178.1875) in single and double precision floating point format. **8**

OR

2. a) Draw the flow chart of floating point addition. **4**
   b) Explain IEEE floating point number format. **4**
   c) Using Booths algorithm multiply the following : **8**
   Multiplicand = +15
   Multiplier = – 6

3. a) What are the advantages of Hardwired control over micro programmed control in the control unit design of CPU ? **8**
   b) Explain the design of multiplier control unit using Delay element method. **8**

OR

4. a) Write a control sequence for the execution of the following instruction : **8**
   SUB R1, (R2) +
   b) Draw a neat diagram of single bus organization of a CPU showing ALU, all types of registers and the data paths among them. **8**

5. a) Explain the instruction pipelining and instruction cycle. **9**

   b) Explain the design of ALU using combinational circuits. **9**

OR

6. a) What is addressing mode ? Explain the following addressing modes with suitable examples : **9**

      i) Immediate addressing
      ii) Base register addressing
      iii) Index addressing
      iv) Register addressing.

   b) Explain Data Hazards in instruction pipelining. **9**

SECTION – II

7. a) Draw and explain following mapping techniques of Cache : **8**

      i) Direct Mapping
      ii) Associative Mapping.

   b) i) What are the different replacement algorithms ? Explain LRU algorithm in detail. **10**

OR

8. a) Explain briefly : **6**

      i) CDROM
      ii) Optical Memory.

   b) Explain the following memory systems : **12**

      i) SRAM
      ii) DRAM
      iii) SDRAM
      iv) RDRAM

9. a) Compare programmed I/O and Interrupt Driven I/O. **6**

b) What is an interrupt ? How does CPU recognize an Interrupt ? What is the difference between subroutine and Interrupt service routine ? **6**

c) Explain working of Laser Printer. **4**

OR

10. a) Explain the encoding method used by the USB. Also give any four USB commands. **8**

b) Draw and explain typical DMA block diagram and explain cycle stealing operation. **8**

11. a) Explain how I/O processor communicates with the main processor. **8**

b) Write a short note on Superscalar Architecture. **8**

OR

12. a) What is bus arbitration ? Explain and compare Daisy Chaining and Polling methods of Bus Arbitration. **8**

b) Compare RISC Vs. CISC. **4**

c) Explain the working of IEEE 488 bus. **4**

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**[3862] – 411**

**S.E. (Information Technology) (Sem. – I) Examination, 2010**
**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 Decimal numbers to its equivalent Binary numbers. (Show step by step process) **6**

   i) 23.05 ii) 0.7572 iii) 85

   b) Perform the following hexadecimal subtraction using 2's compliment method. **6**

   i) 78 H – 61 H ii) 25 H – 75 H iii) 38 H – 29 H

   c) What is Gray code ? State specific properties and applications of this code. **6**

OR

2. a) Convert the following binary numbers into octal and then decimal. **6**

   i) 1101100.101010 ii) 01010011.010101

   iii) 10110011

   b) Perform the following additions with base 8, 16 and 2 : **6**

   i) $(2374)_8 + (6276)_8$ ii) $(3FC5)_{16} + (7FAE)_{16}$

   iii) $(101101)_2 + (011001)_2$

   c) What are the Error detecting codes ? Explain in detail. **6**

P.T.O.

3. a) What do you mean by Tri-state ? Draw and explain the circuit diagram of tri-state TTL NAND GATE. **10**

b) Compare TTL and CMOS families based on the following characteristics. **6**

i) Noise Margin ii) Propagation Delay time

iii) Fan-out

OR

4. a) What is the drawback of WIRED_OR TTL GATE ? With the help of suitable circuit diagram explain how it can be removed using TRI_STATE GATE. **10**

b) What is the difference between low Power TTL and Schotty TTL ? **6**

5. a) Design and draw a full adder using 8 : 1 mutiplexer. Compare the IC package count with the NAND-NAND realization. **8**

b) Reduce the following function using K-map technique. Also implement using basic logic gates :

i) $Y = \Sigma m$ (1, 3, 7, 11, 15) + d (0, 2, 5, 8, 14) **4**

ii) $Y = \pi M$ (0, 1, 3, 7, 9, 10, 1, 13, 14, 15) **4**

OR

6. a) List Rules for BCD addition and design single digit BCD adder using 7483 and some logic gates. **8**

b) Implement 32 : 1 multiplexer using 16 : 1 and 2 : 1 multiplexers. **4**

c) Draw and explain the logic configuration of PLA. **4**

SECTION – II

7. a) What is Race-around condition ? How is it removed in basic JK flip-flop circuit ? **8**

b) What is switch contact bounce ? How will you remove contact bouncing in a key-board ? **6**

c) What do mean by synchronous and asynchronous sequential circuits ? State merits and demerits of both the circuits. **4**

OR

8. a) Draw and explain Ring Counter using 4-bit shift register. Also draw the waveforms. **8**

   b) Design the circuit to generate the following sequence. How will you ensure that circuit will not have lockout condition ? **10**

   1 – 5 – 7 – 12 – 15

9. a) Explain with the help of suitable block diagram the logic of 4 bit successive approximation analog to digital converter. **8**

   b) Compare 4-bit R-2R ladder DAC with 4-bit weighted resister DAC. Also draw circuit diagram for both the types of DACs. **8**

OR

10. 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) What are the various specification one needs to observe while deciding an ADC for a specific application ? Explain. **8**

11. a) Explain the block diagram of 8255 PPI. How is it interfaced with 8085 microprocessor ? What is BSR mode ? **8**

    b) Compare : **8**

       i) Memory mapped I/O and I/O mapped I/O

       ii) Mode 1 and Mode 2 of 8255.

OR

12. a) What are various addressing modes of 8085 microprocessor ? Explain with suitable example of instructions. **8**

    b) Draw and explain the block diagram of 8085 microprocessor. **8**

## S.E.(I.T.) (Semester – I)Examination, 2010
## MANAGEMENT AND FINANCE
## (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) Define Management. Describe various functions of management. Explain the role of managers in a changing business environment. **12**

 b) "Management is an art, science as well as a profession". Explain. **6**

OR

2. a) Critically evaluate the contribution of F.W. Taylor to the management science. **10**

 b) State and explain Henry Fayol's 14 principles of management.Are they relevant in present business context ? Justify. **8**

3. a) What is human wants ? Explain various characteristics of human wants. **8**

 b) Define demand. Explain law of demand. Under what conditions demand curve slopes backward ? **8**

OR

4. Explain the following : **16**

 i) Patent and copy right and its certification procedure.

 ii) Contract Act.

5. a) Explain the concept of ERP and E-commerce and its application in business. **8**

 b) State and explain the structure, merits and demerits of functional organisation. **8**

OR

6. Describe various forms of business organisation. Explain the formation, functions, merits and demerits of Joint Stock Company. **16**

SECTION – II

7. a) Define quality circle. Explain the importance and functioning of quality circle in industry. **9**

   b) State and explain Maslow's theory of motivation. **9**

OR

8. a) Define man power planning. Explain the techniques and objectives of man power planning. **9**

   b) What do you mean by capital structure ? Explain various types of capital and its importance. **9**

9. Explain the following : **16**

   i) Capital Budgeting

   ii) Money and Capital Market.

OR

10. Define Break-Even Analysis. What are its assumptions ? Construct CVP graph and explain its importance to industry. **16**

11. a) What is credit rating ? Explain the process of credit rating for software companies. **8**

    b) State and explain various types of overheads with example. **8**

OR

12. a) Define depreciation. Explain various methods of depreciation. **10**

    b) Explain the following Ratios with their importance : **6**

       i) Debt-equity ratio

       ii) Current ratio.

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**[3862] – 414**

**S.E. (Information Technology) (Semester – I) Examination, 2010**
**PROGRAMMING PARADIGMS AND METHODOLOGY**
**(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** indicate **full** marks.*
*v) Assume suitable data if **necessary**.*

SECTION – I

1. a) Discuss the various programming language translation issues in detail ? **10**
   b) Explain the different aspects of the cost of a programming language. **8**

OR

2. a) What are the characteristics of high level language ? Explain each in brief. **10**
   b) Explain the following : **8**
      i) Tokens (lexical issue)
      ii) Syntax and semantics
      iii) Grammar.

3. a) List out the basic building blocks of a programming language. Explain any four in detail. **10**
   b) Write a short note on static and dynamic type checking. **6**

OR

4. a) What are pointers and references ? Explain the differences between them. What do you think are the issues that are to be deal with when dealing with pointers ? **8**
   b) Explain the following control flow statements with any programming language code : **8**
      i) Sequence statement
      ii) Loop structure
      iii) Branching statement
      iv) Iterative statement.

**P.T.O.**

5. a) What are the general characteristics of subprogram ? What is the recursion in the subprogram ? How activation record work in this case ? **10**

b) Explain the following parameter passing methods with simple program fragment (**any 3**) : **6**

i) Call by value
ii) Call by reference
iii) Call by name
iv) Call by value result.

OR

6. a) State and explain the different static scope rules ? **6**

b) Define the term referencing environment. Explain local, non local, global and predefined referencing enjoinments with suitable examples. **10**

SECTION – II

7. a) Explain the distinction between Procedure-Oriented Programming language and Object-Oriented Programming Language. **8**

b) What is meant by constructor and destructor ? What are the different types of constructors ? For what purpose will constructor and destructor use in program ? **10**

OR

8. a) Discuss the inheritance and operator overloading in C++ with suitable example. **10**

b) Explain with respect to C++ :

i) Objects and classes
ii) Polymorphism
iii) Encapsulation
iv) Data/Information hiding. **8**

9. a) Explain the importance of LISP ? **6**

b) Explain the following preliminary used by PROLOG with suitable example :

i) Facts
ii) Existential Query
iii) Clauses
iv) Deductions
v) Cuts. **10**

OR

10. a) Write short note on :

i) Process
ii) Semaphores
iii) Dead lock. **12**

b) Explain in brief concurrent programming ? **4**

11. a) Compare different corresponding control structure available in C++ and PROLOG. Explain with suitable example. **10**

    b) Write all the data type supported by LISP. **6**

OR

12. a) Explain the following terms in C++ :

    i) Friend function

    ii) This pointer

    iii) Virtual function

    iv) Copy constructor. **8**

    b) How is the file handling in C++ different than file handling in C ? **8**

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*B/II/10/555*

**[3862] – 415**

# S.E. (Infor. Tech.) (Semester – II) Examination, 2010
# 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**

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[3862] – 416

**S.E. (I.T.) (Semester – II) (2003 Course) Examination, 2010**
**DATA STRUCTURES AND FILES**

Time : 3 Hours | Max. Marks : 100

***Instructions** :1) Answers to the **two** Sections should be written in **separate** books.*
*2) **Neat** diagrams must be drawn **wherever** necessary.*
*3) Black figures to the **right** indicate **full** marks.*
*4) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Write an pseudo code to find fast transpose of a sparse matrix. Analyse time complexity of the algorithm. **6**

b) Write a 'C' program to add two binary nos. using DLL. **6**

c) Define frequency count. Find the frequency count of the following piece of code : **6**

```
 x = 5; y = 5;
for (i = 2; i< = x; i + +)
  for (j = y; j> = 0; j – –)
   {If (i = = j) print ("xxx");
    else break;
    }
```

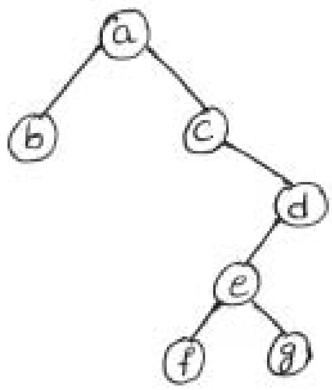
OR

2. a) Explain the representation of a sparse matrix with an example and state its advantages. **6**

b) Write a 'C' program to reverse a SLL. **6**

c) Write a non-recursive 'C' program to implement quick sort on a list of n nos. **6**

3. a) Describe the sequential and linked representation of binary trees and show the same for the given tree. **8**




b) Write a 'C' program to create a threaded binary tree and perform traversals. **8**

OR

4. a) Draw the BST for the given set of data values, JAN, FEB, MAR, APR, MAY, JUN, JULY, AUG, SEP, OCT, NOV, DEC.

Write a C fn. to delete a node from a BST. **8**

b) Write a note on threaded binary trees. **8**

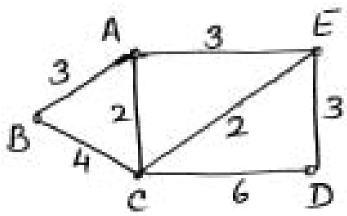
5. a) Define a graph. Define the following terms with eg. with respect to graphs : **8**

i) Cyclic graph

ii) Connected graph

iii) Strongly connected graph.

b) Write a pseudocode to find MST for a graph using Prim's algorithm. Find MST using Prim's for the given graph. **8**

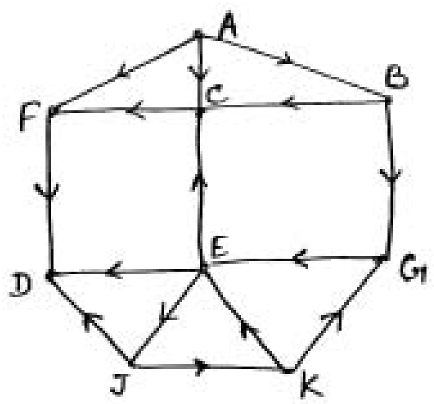



OR

6. a) Explain the node structure used to represent a GLL. Represent the given polynomial using a GLL. **8**

$x^9y^3z^2 + 2x^7y^3z^2 + 3x^7y^2z^2 + x^3y^4z + 6x^2y^4z + 2yz.$

b) Write a pseudo-code to find DFS traversal for a graph. Find DFS traversal for the given graph. **8**




SECTION – II

7. a) Write a note on OBST. **4**

b) Perform heapsort on the following set of data : **10**

44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66.

c) Compare static and dynamic trees. **4**

OR

8. a) Explain the different rotations used in AVL trees with eg. **8**

b) Create a Huffman's tree for the given set of data values and find the code of each. **10**

| A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|
| 22 | 5 | 11 | 19 | 2 | 11 | 25 | 5 |

9. a) Write a pseudo-code for merge-sort and explain the algorithmic strategy used for the same. Perform merge-sort for the given data :

40, 60, 70, 50, 20, 10, 30. **8**

b) Distinguish between greedy and dynamic programming strategy. Give examples for both. **8**

OR

10. Write notes on : **16**

a) Randomized algorithm.

b) 8-Queens problem.

c) Towers of Hanoi algorithm.

11. a) Write an algorithm for hashing using linear probing with replacement strategy. Perform linear probing without and with replacement for the given set of values : 0, 1, 4, 71, 64, 89, 11, 33, 45, 58.

Hash table size : 10 and H(x) = x mod 10. **8**

b) Explain the different file opening modes w.r.t. binary and text files. **8**

OR

12. a) Write an algorithm for hashing using chaining with replacement strategy. Perform chaining without and with replacement for the given set of values : 0, 1, 4, 71, 64, 89, 11, 33, 45, 58.

Hash table size : 10, H(x) = x mod 10. **8**

b) Compare sequential, index-sequential and direct access files. **8**

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**S.E. (Bio-Tech.) (B.Tech.) (Semester – I) Examination, 2010**
**APPLIED CHEMISTRY (Common to Chemical)**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

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

SECTION – I

1. i) What is aromaticity ? Explain the aromaticity of the following compounds : **6**
   a) Iropylium cation
   b) Thiophene
   c) Cyclopentadienyl anion.

   ii) Explain the following with examples : **6**
   a) Inductive effect
   b) Tautomerism.

   iii) Give reasons : **4**
   a) N, N-dimethyl aniline is a weaker base than N, N– dimethyl o-toluidine.
   b) Guanidine is a strong base.

OR

2. i) Draw resonating structures of following compounds : **6**

   a) p-nitrophenol

   b) Benzaldehyde

   c) Anthracene.

   ii) What is mesomeric effect ? Explain with the help of examples the resonance effect on pKa values of acids. **6**

   iii) What are free radicals ? Draw the orbital picture and show the relative order of stability of free radicals. **4**

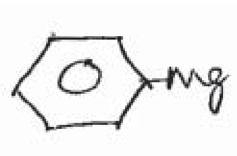
3. i) Explain $SN_2$ mechanism using suitable example. **4**

   ii) Give mechanism of Friedel Crafts acylation. What are its limitations ? **6**

   iii) Predict the product :

   a) $CH_2 = CH_2 + H_2O \xrightarrow{H_2SO_4}$

   b) $CH_3\,CH_2 - \underset{\substack{|\\ Br}}{\overset{\substack{CH_3\\ |}}{C}} - CH_3 \xrightarrow[C_2H_5OH]{NaOC_2H_5}$

   c)  Br + $CH_3CHO \xrightarrow{H_2O}$

   d) t-butyl alcohol $\xrightarrow[90^\circ C]{20\%H_2SO_4}$

   e) Sodium ethanoate $\xrightarrow{\text{electrolysis}}$

   f) Acetaldehyde $\xrightarrow[\text{dil NaOH}]{\text{warm}}$ **6**

OR

4. i) Give the mechanism of H-Br addition on propene, in presence of peroxide. **4**

ii) Identify A & B :

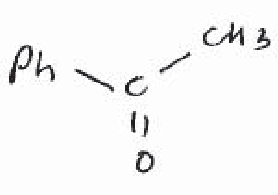
a) $CH_3\,CH_2\,\underset{\underset{Cl}{|}}{CH}\,CH_3 \xrightarrow[KOH]{alc} A$

b) Ethyl acetate $\xrightarrow[\text{ethoxide}]{\text{Sodium}}$ B

c) $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2 \xrightarrow{HCl} A$

d) Phenol $\xrightarrow[\text{sunlight}]{\text{conc } HNO_3}$ A + B

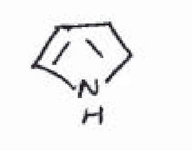
e) $2\,CH_3-\overset{\overset{CH_3}{|}}{C}=CH_2 \xrightarrow[80^\circ C]{H_2So_4} A+B$

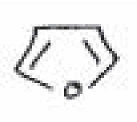
f)  $\xrightarrow{NH_2OH}$ A $\xrightarrow{H^+}$ B. **6**

iii) Give mechanism for formation of ethylacetoacetate. **6**

5. i) Draw the conformation of n-butane and discuss the energy profile diagram. **6**

ii) Predict the product

a)  $+\ CH_3\,COO^-\,NO_2^+ \xrightarrow{5^\circ C}$

b)  $+\ 2H_2 \xrightarrow[\Delta,\ 50^\circ C]{Ni}$

c) $2\,CH \equiv CH \xrightarrow[\text{tube}]{\text{Red hot}}$

d)  $+\ Br_2 \xrightarrow{\text{dioxane}}$ . **6**

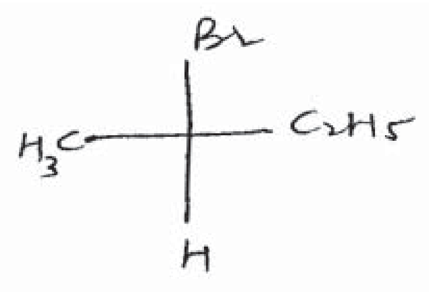
iii) Describe the Fischer's Indole synthesis. **6**

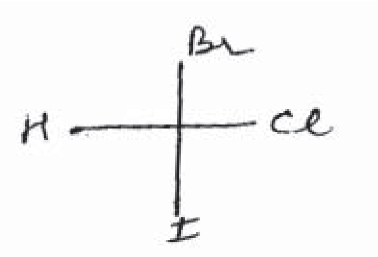
OR

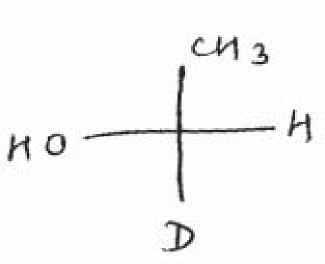
6. i) Explain why electrophilic substitution takes place at position 5 – and 8 – in quinoline. **6**

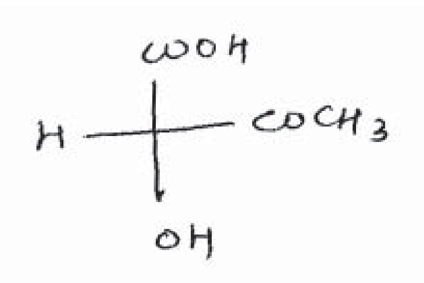
ii) What is conformation ? Draw the important conformations of ethane. Explain why staggered conformation is more stable than eclipsed conformation. **6**

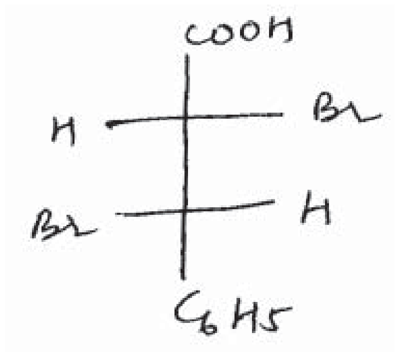
iii) Assign R and S configuration to each of the following compounds :

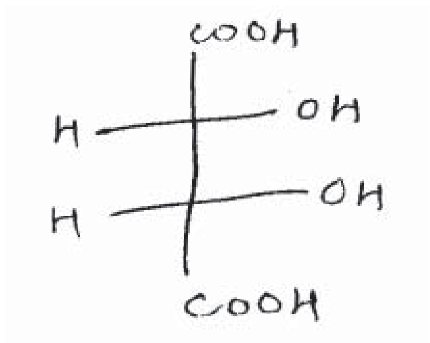
a) 

b) 

c) 

d) 

e) 


f) 


**6**

## SECTION – II

7. a) Derive the Bragg's equation for the measurement of diffraction angle. **6**

   b) Define – Angle of contact and explain the capillary rise method to determine the surface tension of the liquid. **6**

   c) The time required to flow through Ostwald's viscometer is 2 min. for water and for same volume of organic liquid having density of 0.982 g/cc is 3.5 min. Find the viscosity of the liquid relative to that of water.
   $(\eta_w = 1.002 \text{ centipoise})$. **4**

OR

8. a) Define viscosity and explain the method for determining the viscosity of the liquid by using Ostwald's viscometer. **6**

   b) Write a note on : **6**

      1) Troutan's Rule.

      2) Parachor.

   c) In measuring surface tension of a liquid, by the drop weight method, 20 drops of the liquid falling from the tip whose diameter is 0.7 cm were found to weigh 0.887 g. If $\phi = 0.6$, under these conditions, what is the surface tension of the liquid ? **4**

9. a) Derive the Kinetic Gas Equation. **6**

   b) Define : **6**

      1) Mean free path.

      2) Collision diameter.

      3) Collision frequency.

      4) Critical temperature.

      5) Specific heat at constant volume ($C_V$).

      6) Specific heat at constant pressure ($C_P$).

   c) Calculate the critical constants $P_C$ and $T_C$ of $C_2H_2$ gas using van der Waal's constants.

      [$a = 5.380\ dm^6/mol^2$, $b = 0.06316\ dm^3/mol$.]

      [Value of R is 0.08206 atm litre $mol^{-1}\ k^{-1}$]. **4**

OR

10. a) State ideal gas equation and explain the corrections to this equation with respect to : **6**

      1) Pressure

      2) Volume

      suggested by van der Waal and write the corrected equation.

b) Define : **6**

1) Average velocity
2) Root mean square velocity
3) The most probable velocity
4) Boyle's Law
5) Charle's Law
6) Grahm's Law of Diffusion.

c) Calculate the mean free path of $O_2$ molecules at 28°C and a pressure of 1.333 atm. Given that the collision diameter is $352 \times 10^{-2}$ m. **4**

11. a) Explain the Landberger's method of determining the molecular weight of a solute. **7**

b) Give the thermodynamic derivation of boiling point and show that it is a colligative property. [Elevation in B.P.]. **7**

c) 5% solution of $Ca(NO_3)_2$ in water boils at 100.175°C. Molar elevation constant for 1000 g of water is 0.520. Calculate van't Hoff's factor i. **4**

OR

12. a) Explain the term osmosis and osmotic pressure. Describe the Barkeley and Hartley's method for the determination of osmotic pressure of the solution. **7**

b) Explain abnormal colligative properties of solution and explain the term colligative property. **7**

c) Find the freezing point depression constant for water, if heat of vapourization is 534 J/g.

$\left[\text{Given } :-n_1 = \dfrac{1000}{18}\right].$ **4**

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**[3862] – 423**

**S.E. (Biotech.) (B.Tech.) (Semester – I) Examination, 2010**
**FLUID FLOW OPERATIONS AND SOLID HANDLING**
**(Course 2003)**

Time : 3 Hours Max. Marks : 100

***Notes :*** 1) *Figures to the **right** indicate **full** marks.*
2) ***Use** of programmable calculator is **not allowed**.*
3) *Draw a **neat** sketch **wherever** necessary.*
4) *Make necessary assumptions **wherever** required.*
5) *Answer **any three** questions from Section **I** and **any three** questions from Section **II**.*

SECTION – I

1. a) Explain Rheological classification of Non-Newtonian fluid. **6**

   b) Explain effect of temperature and pressure on viscosities of fluids. **4**

   c) Derive Euler's equation of motion. **6**

OR

2. a) A flat plate of area $0.7*10^5$ sq.mm. is pulled with speed of 0.75 m/s relative to another plate located at distance of 0.3 mm from it. Find the force and power required to maintain this speed if fluid separating the plate is having viscosity of 0.75 poise. **8**

   b) Explain the formation of hydrodynamic boundary layer. **8**

3. a) An oil of specific gravity 0.85 is contained in vessel. At a point the height of oil is 35 m. Find the corresponding height of water at that point. **9**

   b) Water is flowing through a pipe of 10 cm dia. under pressure of 55 $N/cm^2$ and mean velocity of 3 m/s. Calculate the total energy per unit weight of water at a cross section which is 7 m about the baseline. **9**

OR

4. a) State the necessity of diverging cone, converging cone in construction of venturimeter. **4**

   b) A pitot tube placed in the centre of a 400 mm pipe has one orifice pointing upstream and other perpendicular to it. The mean velocity is 20% of central velocity. Calculate the discharge through the pipe if pressure drop is 80 mm of water. Take $C_v$ = 0.98. **8**

   c) Explain constructional features of orificemeter. **6**

5. a) Explain construction and working of Hammer mill. **8**

b) State the factors affecting the size of product in case of size reduction equipments. **2**

c) Calculate the operating speed of the ball mill if diameter of ball mill is 750 mm and that of ball is 55 mm provided the operating speed is 60% less than critical speed. **6**

OR

6. a) Describe the effect of mesh size on capacity of screen. **6**

b) Explain working of gyratory screens. **6**

c) A pair of rolls is to take a feed equivalent to sphere 70 mm in diameter and crush them to sphere having diameter 55 mm. If the coefficient of friction is 0.23. Calculate the diameter of rolls. **4**

SECTION – II

7. a) Obtain relation between power required for mixing and Reynold's no. **8**

b) Explain the necessity of baffles in agitated vessels. **4**

c) Describe working of twin blade conical mixer. **6**

OR

8. a) Explain mixing flow pattern in baffled and unbaffled tanks. **10**

b) A disk turbine with four blades is installed centrally in a vertical baffled tank 3 m in diameter. The turbine is 1.2 m in diameter the tank is filled with a fluid having viscosity 15 cP and density of 1600 kg/$m^3$. The turbine impeller runs at 120 rpm. Calculate the power required. Take $K_T = N_P = 1.27$. **6**

c) Define froude number and power number. **2**

9. a) Derive Navier Stoeks equation for a fluid of constant density and viscosity. **10**

b) Define Hindered settling. Describe the relation between terminal velocity and settling velocity with necessary curve. **6**

OR

10. a) State Darcy's law and derive Kozeny Carman equation. **12**

b) Explain relation between Reynold's number and drag coefficient for spheres when the particle is moving at its terminal velocity with respect to fluid. **4**

11. a) Explain the application of fluidization in fluidized bed reactors. **6**

    b) Write short note on : **10**

    i) Particulate fluidisation

    ii) Bubbling fluidization

    iii) Axial slugging and flat slugging.

OR

12. a) Explain the construction and working of continuous rotary vacuum filter. **8**

    b) Explain mechanism of filtration. Differentiate between compressible and incompressible filter cake. **8**

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*B/II/10/110*

**[3862] – 430**

**S.E. Biotechnology (B.Tech.) (Semester – II) Examination, 2010**
**MOLECULAR BIOLOGY AND GENETIC ENGINEERING**
**(2003 Course)**

Time : 3 Hours Max. Marks : 100

***Instructions :*** *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.*

SECTION – 1

1. Describe in detail biosynthetic and degradation pathways of purines and pyrimidines. Draw structures wherever necessary. **16**

OR

2. Answer the following : (**8** Marks **each**) **16**
   a) What are salvage pathways ? Elucidate with example.
   b) What are inborn errors of metabolism ? Give an example of a disorder.

3. With the help of a neat diagram, show and explain the specific pairing of purines and pyrimidines. Highlight the spatiotemporal reasons for the formation of these bonds in the specific manner. **18**

OR

4. Write short notes on (**6** Marks **each**) : **18**
   a) Nucleosome
   b) Hyperchromacity
   c) Mitochondrial DNA.

**P.T.O.**

5. List various enzymes involved in replication of both prokaryotes and eukaryotes. Discuss in detail functions of various enzymes involved in replication of eukaryotes. **16**

OR

6. Write short notes on (**4** Marks **each**) : **16**

   A) Rolling circle model of DNA replication

   B) DNA gyrase

   C) Messelson Stahl experiment

   D) DNA Polymerase.

SECTION – 2

7. Discuss in detail splicing of mRNA. List the enzymes involved. **16**

OR

8. Write notes on : (**8** Marks **each**)

   a) Post transcriptional modifications of all types.

   b) Reverse transcriptase with an example.

9. Discuss the process of transcription in detail. **16**

OR

10. Write short notes on : (**8** Marks **each**)

    a) Various types of mutations, with one example each.

    b) Hormone responsive elements.

11. Discuss in detail initiation of translation in prokaryotes. How is it different from the one in eukaryotes ? **18**

OR

12. Write notes on : (**6** Marks **each**)

    a) Heat shock proteins

    b) Mode of action of Puromycin

    c) tRNA synthetase.

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