Comman All Branches

Bachelor Of Engineering

Question Papers Nov-Dec 2019

Sem–I & II

FE SEM-I ALL BRANCHES CHOICE BASE (Revised 2019) 'C' Scheme

11/12/2019,

(3 Hours) [Total Marks : 80

40

Note:

1) Question No.1 is compulsory
2) Attempt any three out of remaining five questions
3) Figures to the right indicate full marks

Q1.

a) If $\sin(\theta + i\varphi) = tan\alpha + isec\alpha$, then show that $\cos 2\theta \, . cosh2\varphi = 3$ [5]

b) If $u = \log(tanx + tany)$, then show that $sin2x\frac{\partial u}{\partial x} + sin2y\frac{\partial u}{\partial y} = 2$ [5]

c) Express the matrix $A = \begin{bmatrix} 0 & 5 & -3 \\ 1 & 1 & 1 \\ 4 & 5 & 9 \end{bmatrix}$ as the sum of a symmetric and skew symmetric matrix. [5]

d) Expand $\sqrt{1 + sinx}$ in ascending powers of x upto x^4 term. [5]

Q2.

a) Find non-singular matrices P and Q such that PAQ is in normal form where, [6]

$A = \begin{bmatrix} 4 & 3 & 1 & 6 \\ 2 & 4 & 2 & 2 \\ 12 & 14 & 5 & 16 \end{bmatrix}$. Also find the rank of A.

b) If $z = f(x, y)$ and $x = u\,coshv$, $y = u\,sinhv$; prove that [6]

$$\left(\frac{\partial z}{\partial x}\right)^2 - \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial u}\right)^2 - \frac{1}{u^2}\left(\frac{\partial z}{\partial v}\right)^2$$

c) Prove that $Log\left[\frac{(a-b)+i(a+b)}{(a+b)+i(a-b)}\right] = i(2n\pi + tan^{-1}\frac{2ab}{a^2-b^2})$. Hence evaluate $Log\left(\frac{1+5i}{5+i}\right)$ [6]

Q3.

a) If α *and* β are the roots of the equation $z^2 sin^2\theta - z\ sin\ 2\theta + 1 = 0$, then prove that $\alpha^n + \beta^n = 2\cos n\theta\ cosec^n\theta$ and $\alpha^n\beta^n = cosec^{2n}\theta$ [6]

b) Solve the following equations by Gauss–Seidal Method ; [6]

$15x + 2y + z = 18$, $2x + 20y - 3z = 19$, $3x - 6y + 25z = 22$,

Take three iterations.

c) Prove that if z is a homogeneous function of two variables x and y of degree n, then $x^2\frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2\frac{\partial^2 z}{\partial y^2} = n(n-1)z$. Hence find the value of $x^2\frac{\partial^2 z}{\partial x^2} + 2xy\frac{\partial^2 z}{\partial x \partial y} + y^2\frac{\partial^2 z}{\partial y^2}$ at $x = 1, y = 1$ when $z = x^6\ tan^{-1}\left(\frac{x^2+y^2}{x^2+xy}\right) + \frac{x^4+y^4}{x^2y^2}$ [8]

Q4.

a) If $\tan(\alpha + i\beta) = \cos\theta + i\sin\theta$ then prove that $\alpha = \frac{n\pi}{2} + \frac{\pi}{4}$, $\beta = \frac{1}{2}\log\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$ [6]

b) Expand $x^5 + x^3 - x^2 + x - 1$ in powers of $(x-1)$ and hence find the value of [6]

1) $f\left(\frac{9}{10}\right)$

2) $f(1.01)$

c) For what values of λ and μ , the equations, [8]

$x + y + z = 6$; $x + 2y + 3z = 10$; $x + 2y + \lambda z = \mu$

1) have a unique solution

2) have infinite solution

Find the solution in each case for a possible value of μ and λ.

Q5.

a) Find the nth derivative of $y = \frac{1}{x^2 + a^2}$ [6]

b) Discuss the maxima and minima of $x^3 + xy^2 - 12x^2 - 2y^2 + 21x + 16$ [6]

c) Prove that if A and B are two unitary matrices then AB is also unitary. Verify the result when

$A = \frac{1}{\sqrt{3}}\begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$ and $B = \begin{bmatrix} \frac{1+i}{2} & \frac{-1+i}{2} \\ \frac{1+i}{2} & \frac{1-i}{2} \end{bmatrix}$ [8]

Q6.

a) If $x = \cosh\left(\frac{1}{m}\log y\right)$, prove that [6]

$$(x^2 - 1)y_{n+2} + (2n+1)x\,y_{n+1} + (n^2 - m^2)\,y_n = 0$$

b) Find a root of the equation $xe^x = \cos x$ using the Regular Falsi Method correct to three decimal places. [6]

c) 1) Expand $\sin^4\theta \cos^2\theta$ in a series of multiples of θ. [4]

2) If one root of $x^4 - 6x^3 + 18x^2 - 24x + 16 = 0$ is (1+i); find the other roots. [4]

FE SEM I All Branches CHOICE BASED (Rev) 2019 'C' Scheme

13/12/2019

TIME: 2 Hours MARKS: 60

N.B 1) Question no 1 is Compulsory.
2) Attempt any three questions from **Q.2 to Q.6**
3) Assume suitable data wherever required.
4) Figures on the Right indicates marks.

Q.1 Attempt any five questions from the following [15]

(a) Draw (0 0 2), ($\bar{1}$ 0 0), (0 1 1)

(b) Explain any three properties of matter waves.

(c) Differentiate between Direct and Indirect band gap semiconductor.

(d) Explain any three conditions for Sustained Interference.

(e) A source is emitting 150W of red light of wavelength of 600nm. How many photons per second are emerging from the source?

(f) Explain the Meissner effect with application.

(g) Explain Magneto Resistance with application.

Q.2 (a) Show that Non- Existence of electron in the Nucleus, Find the uncertainty in the position of electron . The speed of an electron is measured to be 4.0×10^3 m/s to an accuracy of 0.002% . [8]

(b) Define the Fermi energy level , Show that in intrinsic semiconductor Fermi level is at the centre of Forbidden energy gap. Draw the position of Fermi level in intrinsic, P-type and N-type semiconductor. [7]

Q.3 (a) Explain with diagram Bragg's X Ray Spectrometer . Calculate the interplaner spacing between the family of planes (1 1 1) in crystal of lattice constant $3A^0$. [8]

(b) Prove that the Diameter of the n^{th} dark ring in Newton's ring setup is directly proportional to the square root of the ring number . In Newton's Rings reflected light of wavelength 5×10^{-5} cm. The diameter of the 10^{th} dark ring is 0.5 cm. Calculate radius of curvature R. [7]

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Q.4 (a) Derive one dimensional time independent Schrodinger Equation. [5]

(b) Differentiate between Type I superconductor and Type II superconductor. [5]

(c) Find Resistance of an intrinsic Ge rod of dimensions (1cm long , 1mm wide and 1mm thick) at 300K . For Ge $n_i = 2.5 \times 10^{19}/m^3$, $\mu_n = 0.39 m^2/v\text{-}s$, $\mu_p = 0.19 m^2/v\text{-}s$ [5]

Q.5 (a) Derive the condition for maxima and minima due to interference of light reflected from thin film of uniform thickness. [5]

(b) Explain Hall Effect . Derive the equation for Hall Voltage. [5]

(c) Calculate the lowest three energy states of an electron confined in potential well of width $10A^0$. [5]

Q.6 (a) Explain multiferroics and its different types. [5]

(b) A soap film 4×10^{-5} cm thick is viewed at angle of 35^0 to normal. Calculate Wavelength of light in the visible spectrum which will be absent from the Reflected light ($\mu = 1.33$) [5]

(c) The Coefficient (Rh) of semiconductor is $3.22 \times 10^{-4} m^3 c^{-1}$. Its resistivity is 9×10^{-3} Ω m . Calculate the mobility and concentration of carriers. [5]

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16/12/2019.

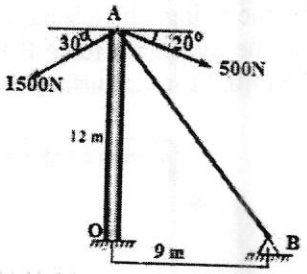
F.E Sem-I (All branches) Choice based (Rev-2019 C-S

(3 Hours) [Total Marks: 80]

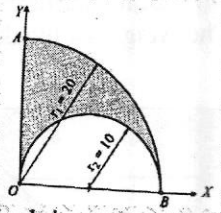
N.B.: (1) Question **No. 1** is compulsory.
(2) Attempt any **THREE** questions from the remaining **FIVE** questions.
(3) Assume suitable data if necessary and mention the same clearly.
(4) Take g=9.81 m/s^2

Q.1 Answer any **FIVE** questions

a. The top end of a pole is connected by three cables having tension 500 N, 1500 N and a guy wire 'AB' as shown in figure below. Determine tension in cable 'AB' if the resultant of the concurrent force is vertical. [4]



b. Locate the centroid of the shaded area obtained by cutting a semicircle of diameter 20 mm from the quadrant of a circle of radius 20 mm as shown in Figure below. [4]



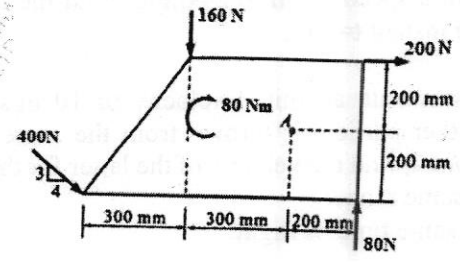
c. A body weighing 1000 N is lying on a horizontal plane. Determine the necessary force to move the body along the plane if the force is applied at an angle of 45 degrees to the horizontal with a coefficient of friction 0.24 [4]

d. The motion of a particle is defined by the relation $x= t^3- 3t^2+2\ t+5$ where x is the position expressed in meters and time in seconds. Determine (i) velocity and acceleration after 5 seconds (ii) maximum or minimum velocity and corresponding displacement. [4]

e. A steel ball of mass 8 kg is dropped onto a spring of stiffness 600 N/m and attains a maximum velocity of 2.5 m/s. Find (i) the height from it is dropped and (ii) the maximum deflection of spring. [4]

f. A ladder AB of length l=4.8 m rests on a horizontal floor at A and leans against a vertical wall at B. If the lower end A is pulled away from the wall with a constant velocity 3 m/s, what is the angular velocity of the ladder at the instant when A is 2.4 m from the wall. [4]

Q.2 a. Find the resultant of the force system acting on the plate as shown in Fig, where does this resultant act with respect to point A? [8]



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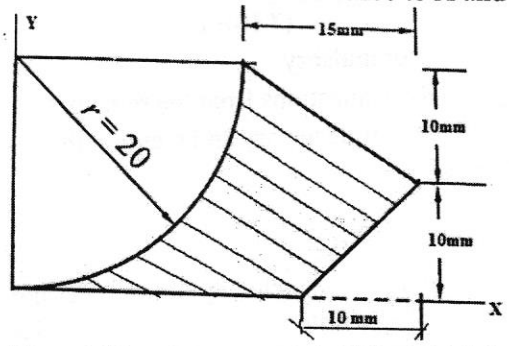
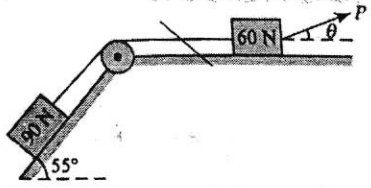
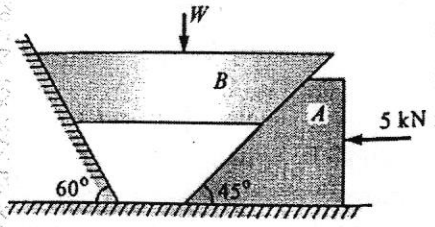
b. Find the centroid of the shaded area with reference to X and Y Axes. [6]



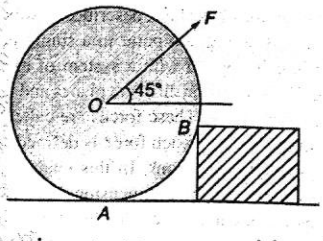
c. Two bodies A and B weighing 90N and 60N respectively placed on an inclined plane are connected by the string which is parallel to the plane as shown in Fig. Find the inclination of the minimum force P for the motion to impend in the direction of "P". Take μ=0.2 for the surface of contact. [6]



Q.3 a. A horizontal force of 5KN is acting on the wedgw as shown in the figure. The coefficient of friction at all rubbing surfaces is 0.25. Find the load "W" which can be held in position. The weight of block "B" may be neglected. [8]



b. A road roller of radius 36cm and weight 6000N, which is of cylindrical shape, is pulled by a force F, acting at an angle of 45^0 as shown in the figure below. It has to cross an obstacle of height 6cm. Calculate the force "F" required to just cross over the obstacle. [6]

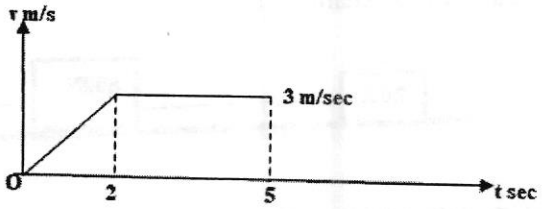


c. At the instant t=0, a locomotive start to move with uniformly accelerated speed along a circular curve of radius r=600 m and acquires, at the end of the first 60 seconds of motion, a speed equal to 24kmph. Find the tangential and normal acceleration at the instant t=30 s. [6]

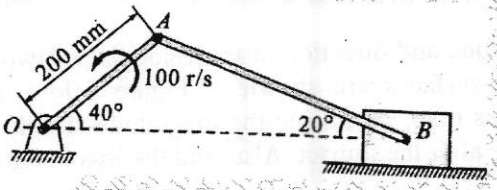
Q.4 a. A particle is thrown with an initial velocity of 10 m/s at a 45^0 angle with horizontal. If another particle is thrown from the same position at an angle $60^0$with the horizontal, find the velocity of the latter for the following situation: [8]
(i) Both have the same range.
(ii) Both have the same time of flight.

TURN OVER

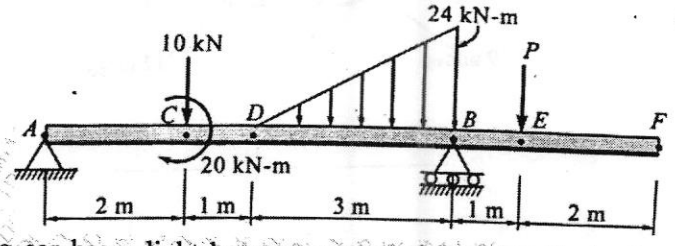
b. The motion of a particle is represented by the velocity-time diagram as shown in the graph shown below. Draw acceleration-time and displacement – time graphs. [6]



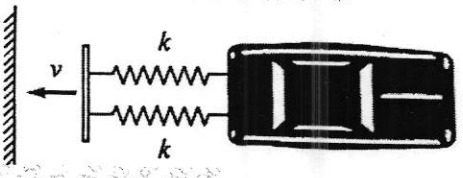
c. In the reciprocating engine mechanism shown in Fig. the crank OA of length 200mm rotates at 100rad/sec. determine the angular velocity of the connecting rod AB and the velocity of the piston at B. [6]



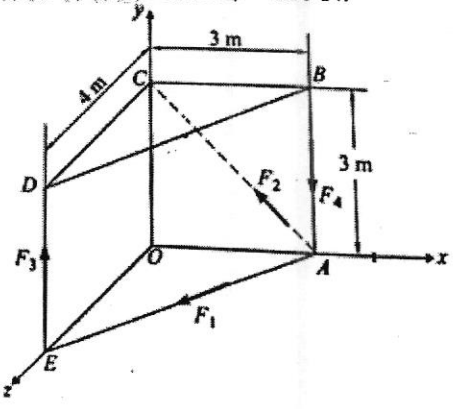
Q.5 a. Find the support reaction at A and force P if reaction at B is 60 kN for the beam loaded as shown in Figure below. [8]



b. A 1200Kg car has a light bumper supported horizontally by two springs of stiffness 15kN/m. Determine the initial speed of impact with the fixed wall that causes 0.2 m compression. Neglect friction. [6]



c. Determine the resultant force of the force system shown in figure where F_1=150N, F_2 = 120 N, F_3 = 200 N and F_4 = 220 N. [6]



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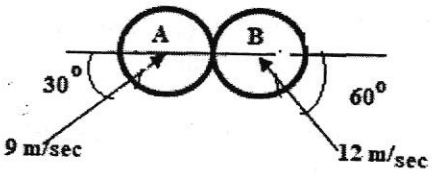
Q.6 a. Two bodies A and B are connected by a thread and move along a rough horizontal plane (μ=0.3) under the action of 400 N force applied to the body as shown in Fig.12. Determine the acceleration of the two bodies and the tension in the thread using D'Alembert's principle. [8]

b. Train A starts with a uniform acceleration of 0.5 m/s^2 and attains a speed of 90 km/hr which subsequently remains constant. One minute after it starts, another train B starts on a parallel track with a uniform acceleration of 0.9 m/s^2 and attains a speed of 120 km/hr. How much time does train B take to overtake train A. [6]

c. The magnitude and direction of the velocities of two identical spheres having frictionless surfaces are shown in Figure below. Assuming coefficient of restitution as 0.90, determine the magnitude and direction of the velocity of each sphere after the impact. Also find the loss in Kinetic energy. [6]



FE / Sem-I / All Branches / choice base (REV 2019 'C' scheme ' 18/12/2019

3hrs 80marks

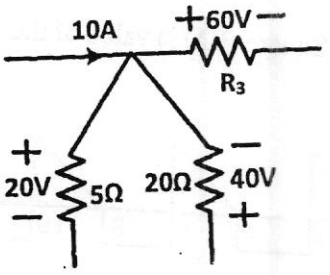
N. B:(1) Question No.1 is compulsory.

(2) Answer any THREE from the remaining five questions.

(3) Assume suitable data if required and state the assumption.

Q1. Answer any five.

(i) Find value of R_3 in the figure given below by applying Kirchhoff's laws. 4



(ii) Briefly describe the operation of any one type of stepper motor. 4

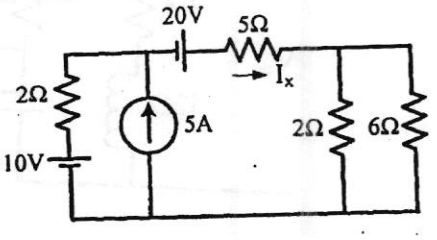
(iii) Two pure circuits elements in a series connection have the following current and applied voltage: $v(t) = 150 \sin (500t+10°)$ V, $i(t) = 13.42 \sin (500t-53.4°)$ A. Find the supply frequency (in Hz) and the value of circuit elements. 4

(iv) A three-phase, three-wire, 100V system supplies a balanced delta-connected load with per phase impedance of $20\angle 45°$ ohms. Determine the line current drawn and active power taken by the load. 4

(v) Draw the phasor diagram of a single phase non ideal transformer feeding a resistive load. 4

vi) Single phase induction motor is not self-starting. State True or False and Justify your answer. 4

Q2. **(A)** Find the current through 5Ω (I_x) using Superposition theorem **without using source transformation.** 10



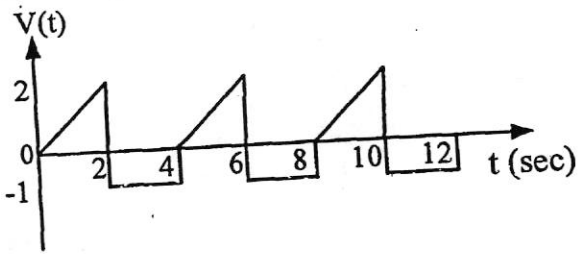
(B) State and prove Maximum Power Transfer theorem. 05

(C) Plot the variation of current, impedance, resistance, inductive reactance and capacitive reactance when supply frequency is varied in R-L-C series circuit. 05

Q3. (A) The Open Circuit (OC) and Short Circuit (SC) tests on a 5 KVA, 200/400 V, 50 Hz, single phase transformer gave the following results. **OC:** 200 V, 1 A, 100 W (lv side), **SC:** 15 V, 10 A, 85 W (hv side). Draw the equivalent circuit referred to primary and put all values. 10

(B) Derive the EMF equation of a dc motor. 05

(C) Find the Root Mean Square (RMS) value of the following waveform. 05

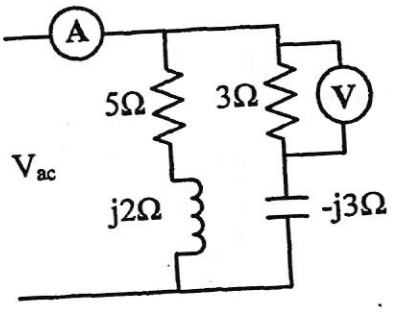


Q4. (A) With neat circuit diagram and phasor diagram, prove that by two watt meter method active power and reactive power of a three phase load can be measured. 10

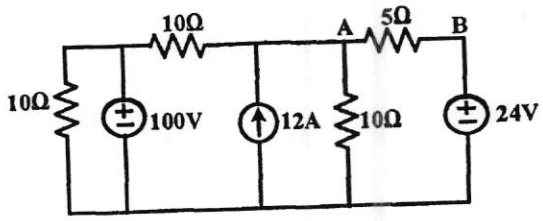
(B) A sinusoidal voltage v(t)=200sinωt is applied to a series *R-L-C* circuit with R = 20 Ω, L=100 mH, and C =10 μF. Find (i) the resonant frequency, (ii) RMS value of current at resonance (iii) Quality factor of the circuit, (iv) voltage across the inductor at resonant frequency and (v) phasor diagram at resonance. 10

Q5. (A) Derive the transformation formula to convert a delta network of resistors to an equivalent star network and star network of resistors to an equivalent delta network. 10

(B) In the parallel circuit, voltmeter across 3 Ω resistor reads 45 V. What is the indication on the ammeter? Also find the input power factor. 10



Q6. **(A)** Find current through 5Ω from A to B using Thevenin's theorem. 10



(B) A 20 KVA Transformer has iron loss of 450W and full load copper loss of 900W. Assume power factor of load as 0.8 lagging. Find full load and half load efficiency of the transformer. 05

(C) Briefly explain the principle of operation of three phase Induction motor. What are the types of three phase Induction motor? 05

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FE/ sem-I / Rev- 2019 - C-scheme

20/12/201

Time: 2 Hrs **Marks: 60**

NB:
1) Question No.1 is Compulsory
2) Attempt any **Three questions** from the remaining **Five questions**
3) Figures to the right indicate full marks
4) Atomic weight: Ca = 40, Mg = 24, N = 14, Cl = 35.5, C = 12, H = 1, O = 16, Na = 23.

Q.1) Attempt any **five** of the following: **(15)**

a)What are the characteristics of aromatic compounds?

b) What happens when temporary hard water is boiled? Explain giving examples

c)Distinguish between thermoplastic and thermosetting resins.

d) Give difference between bonding and antibonding orbitals.

e)What is the temporary and permanent hardness of water sample having the following impurities in ppm: $Ca(HCO_3)_2$= 32.4, $CaSO_4$= 13.5, $Mg(HCO_3)_2$= 29.2.

f) Discuss the reduced phase rule.

g) What is a real gas?

Q2) a) Explain the application of phase rule to one component system with an appropriate graph, areas and the triple point. **(6)**

b) What is compounding of plastics? Discuss the below mentioned constituents with appropriate examples: **(5)**

i) Fillers ii) Pasticizers

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

i) BOD ii) COD

Q3) a) Draw the Molecular Orbital diagram of Be_2. Give its electronic configuration .Explain why it does not exist . **(6)**

b) (1) Identify the most important intermolecular interaction in each of the following: (i) CCl_4 (ii) HF **(2)**

(2) Explain the correction for volume term in the ideal gas equation. **(3)**

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c) A polymer consists of 9 polymer chains as given below: **(4)**

No. of polymer(N1) :	1	3	2	1	2
Mol. Wt. of each polymer:	200	100	300	500	400

Calculate the number – average molecular weight of the polymer

Q4) a) Discuss the following with examples: **(6)**
i) Phase ii) Components iii) degree of freedom

b) Give the KeKule structure for benzene. Discuss the problems with the structure. (any **two**) **(5)**

C) Write notes on: supercritical fluids and critical temperature **(4)**

Q5) a) Give the preparation, properties and uses of: **(6)**
i) Kevlar ii) PMMA

b)What are atomic orbitals? Explain the *s*-orbitals and *p*-orbitals. **(5)**

c) 1gm of $CaCO_3$ was dissolved in 1 litre of distilled water. 50ml of solution required 45ml EDTA for titration. 50ml of hard water required 25 ml of EDTA for titration. The water sample after boiling and filtering consumed 15ml of EDTA for titration. Calculate the total and permanent hardness of the sample. **(4)**

Q6) Explain the ion-exchange method for softening of water giving the following details: **(6)**
Diagram, process and Reactions

b) Calculate the number of phases in the following examples: **(1)**
i) Rhombic Sulphur ⟶ Monoclinic sulphur

ii) An alloy of tin and lead contains 73% tin. Find the mass of eutectic in 1kg of solid alloy, if the eutectic contains 64% of tin. **(4)**

C) i) Give the Molecular Orbital diagram of nitric oxide (NO) molecule. **(2)**
ii) Discuss: Glass transition temperature **(2)**

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R-2016

FE(I)(Choice based) 15/11/2019

(Time: 3 hours) **Total Marks: 80**

N.B. (1) Question no. 1 is Compulsory
(2) Solve any three from the remaining.

Q.1) a) Prove that $\left(1+i\sqrt{3}\right)^8+\left(1-i\sqrt{3}\right)^8=-2^8$ (3)

b) If $A=\frac{1}{3}\begin{pmatrix}1 & 2 & a\\ 2 & 1 & b\\ 2 & -2 & c\end{pmatrix}$ is orthogonal find a,b,c. (3)

c) $z^3+xy-y^2z=6$ find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ where z is an implicit function of x and y. (3)

d) If $u=e^x cosy, v=e^x siny$ find $\frac{\partial(u,v)}{\partial(x,y)}$. (3)

e) Find the n^{th} derivative of $y=\frac{x^2+4x+1}{x^3+2x^2-x-2}$ (4)

f) Find a,b if $\lim_{x->0}\frac{asinhx+bsinhx}{x^3}=\frac{5}{3}$ by L'Hospitals Rule. (4)

Q.2) a) Find the roots common to $x^4+1=0$ and $x^6-i=0$ (6)

b) If $y=sin^{-1}x$ Prove That
$(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-n^2y_n=0$ also find $y_9(0)$ (6)

c) Discuss the maxima and minima of
$f(x,y)=x^3+3xy^2-15x^2-15y^2+72x$ (8)
Hence find maximum and minimum value of $f(x,y)$.

Q.3) a) Find the values of k for which the equations (6)
$x+y+z=1, x+2y+3z=k, x+5y+9z=k^2$ have a solution, solve them for these values of k.

b) If $x=\sqrt{vw}, y=\sqrt{wu}, z=\sqrt{uv}$, Prove that (6)
$x\frac{\partial\emptyset}{\partial x}+y\frac{\partial\emptyset}{\partial y}+z\frac{\partial\emptyset}{\partial z}=u\frac{\partial\emptyset}{\partial u}+v\frac{\partial\emptyset}{\partial v}+w\frac{\partial\emptyset}{\partial w}$
where $\emptyset$ is the function of x,y,z.

c) If $tan(\alpha+i\beta)=cos\theta+isin\theta$ Prove that (8)
$\alpha=\left(\frac{n\pi}{2}+\frac{\pi}{4}\right)$ & $\beta=\frac{1}{2}logtan\left(\frac{\pi}{4}+\frac{\theta}{2}\right)$.

Q.4) a) If $z=e^{x/y}+log(x^3+y^3-x^2y-xy^2)$, Find the value of (6)
$x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}+x^2\frac{\partial^2 z}{\partial x^2}+2xy\frac{\partial^2 z}{\partial x\partial y}+y^2\frac{\partial^2 z}{\partial y^2}$.

b) Using encoding matrix $\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$ encode and decode the message (6)
NOW*STUDY

C) Solve the following equations by Gauss Jacobi's Iteration method (8)
$15x+2y+z=18, 2x+20y-3z=19, 3x-6y+25z=22$

Q.5) a) Prove that the general value of $(1 + itan\alpha)^{-i}$ is (6)

$$e^{2m\pi+\alpha}[cos(logcos\alpha) + isin(logcos\alpha)]$$

b) State and Prove Eulers Theorem for function of Three Variables. (6)

c) Expand $x^5 - x^4 + x^3 - x^2 + x - 1$ in powers of $(x - 1)$ and hence find $f\left(\frac{11}{10}\right), f(0.99)$. (8)

Q.6) a) Prove that:

$$sinh^7 x = \frac{1}{64}(sinh7x - 7sinh5x + 21sinh3x - 35sinhx)$$ (6)

b) Find nonsingular matrices P and Q such that PAQ is in Normal form.

also find Rank of A , where A= $\begin{bmatrix} 2 & 1 & 4 \\ 3 & 2 & 2 \\ 7 & 4 & 10 \\ 1 & 0 & 6 \end{bmatrix}$. (6)

c) Using Newton Raphson Method find an iterative formula for $\sqrt[5]{N}$ where N is positive number, Hence find $\sqrt[5]{35}$. (8)

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$13 + 4 + 4 + 9 + 4 + 11 + 23 + 20$

$= 88$

$33 + 34 + 20 = 88$

CBCS CBCS

morning

FE (CI) (Choice base) 19/11/2019

(3 Hours) Marks :80

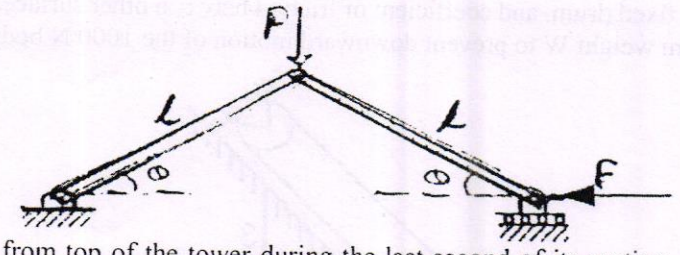
N.B. 1. Question No.1 is compulsory.
2. Answer any three questions from remaining questions.
3. Assume suitable data if required.
4. Figure to the right indicates full marks.
5. Take g= 9.81 m/s^2.

Q.1 Attempt any four. 20

a) A force of a100 N act at a point P (-2, 3, 5)m has it line of action passing through Q (10,3, 4)m. Calculate the moment of force about origin.

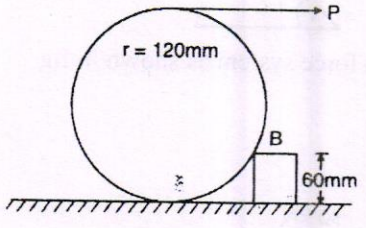
b) A vertical lift of total mass 750 kg acquires an upward velocity of 3 m/s over a distance of 4m moving with constant acceleration starting from rest. Calculate the tension in cable.

c) For the mechanism shown express the relation between forces F and P in terms of θ, by principle of virtual work.



d) A stone is released from top of the tower during the last second of its motion, it covers 1/4th of the height of the tower. Find the height of the tower.

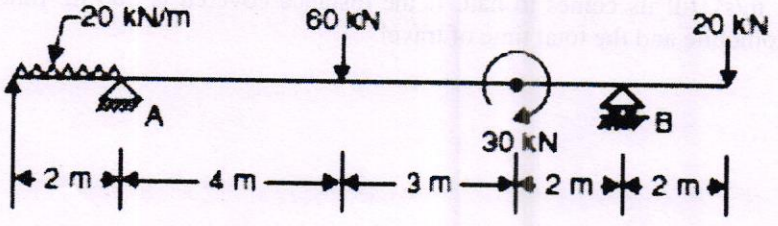
e) A roller of weight 500 N has a radius of 120 mm and is pulled over a step at height 60 mm by a horizontal force P. Find magnitude of P to just start the roller over the step.



f) Classify types of motion for rigid body with suitable examples.

Q.2 a) State the laws of dry friction. 4

b) Find support reaction of the beam as shown in fig. 8



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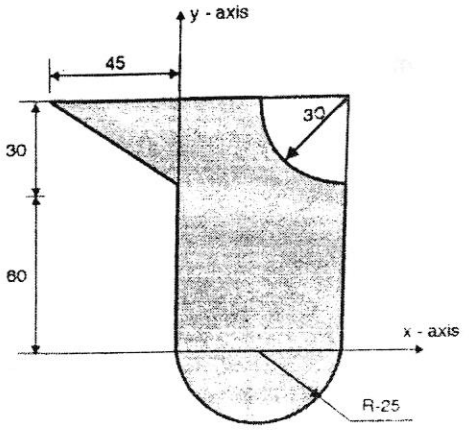
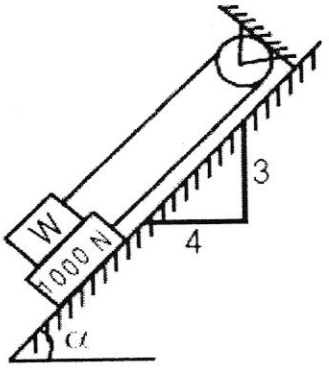
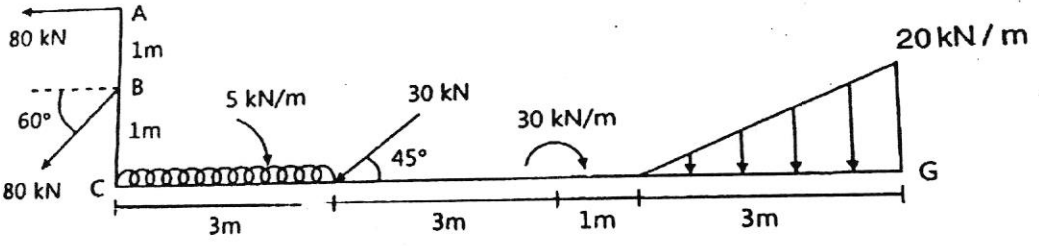
c) Find the coordinates of the centroid of the shaded area with respect to the axes shown in Fig. 8



Q.3 a) In Fig. The frictionless fixed drum, and coefficient of friction between other surfaces of contact is 0.3. Determine the minimum weight W to prevent downward motion of the 1000 N body. 8



b) Determine the resultant of the given force system as shown in fig. 6



c) An automobile starts from rest and travels on a straight path at 2 m/s^2 for some time. After which it deaccelerates at 1 m/s^2, till its comes to halt. If the distance covered is 300 m, find the maximum velocity of the automobile and the total time of travel. 6

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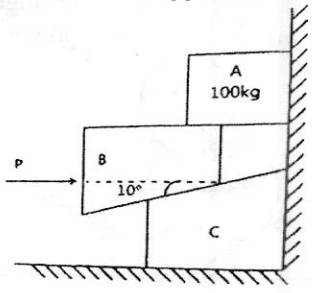
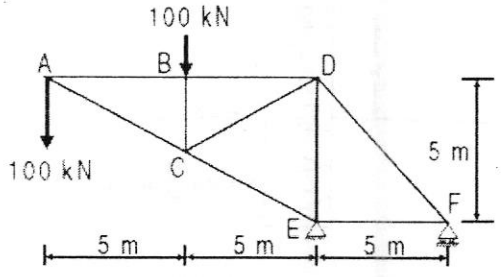
Q.4 a) Two 10^0 wedges of negligible weight are used to just move the block of mass 100 kg. If $\mu = 0.25$ at all surfaces of contact. Find the force P that should be applied on the wedge. **8**



b) State and derive Work Energy principle. **4**

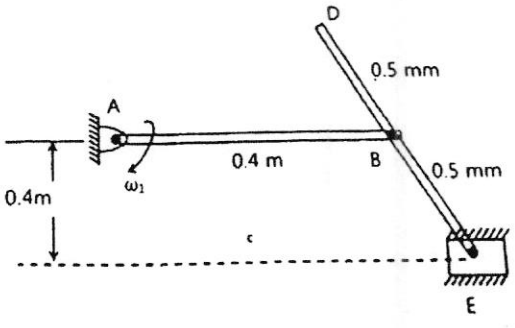
c) Find the initial velocity and corresponding angle of projection of a projectile such that when projected from the ground it just clears a wall 4.5 m high at a horizontal distance of 6 m and finally lands on the ground at a distance of 35 m beyond the wall. **8**

Q.5 a) Referring to the truss shown in figure, find: **8**
(a) Support Reactions.
(c) Forces in members BD, CD and CE by method of sections.
(d) Forces in other members by method of joints.



b) Two balls of the masses 10 kg and 20 kg are moving along a straight line towards each other at velocities of 4 m/s and 1 m/s respectively. If e=0.6, determine the velocities of the balls just after collision. **6**

c) For the position shown, the angular velocity of bar AB is 2.8 r/s clockwise if AB is a horizontal. Determine the velocities of slider E and point D. **6**



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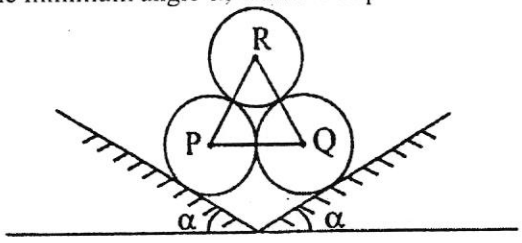
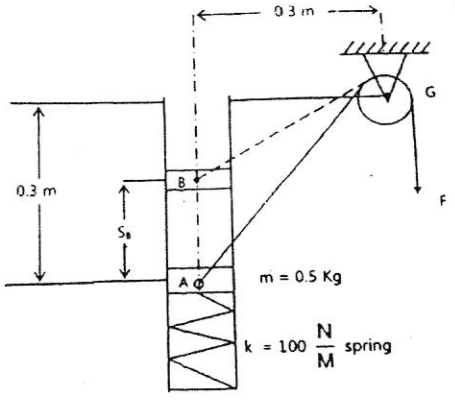
Q.6 a) Three identical spheres P, Q and R each of weight W are arranged on smooth inclined surface are shown in Fig. Determine the minimum angle α, which will prevent the arrangement from collapsing. **8**



b) The block of amass 0.5 kg moves within the smooth vertical slot. If its start from rest, when the attached spring is in the upstretched position at A. determine constant vertical force F which must be applied to the cord, so that block attains a speed of 2.5 m/s when it reaches B. i.e., S_B = 0.15 m, neglect the mass of the cord, pulley and friction between cord and pulley. **6**



c) A car is moving on a curve of radius 300 m at a speed of 90 kmph. The brakes are suddenly applied, causing speed to decrease at a constant rate of 1.3 m/s^2. Determine the total acceleration immediately after brakes have been applied. **6**

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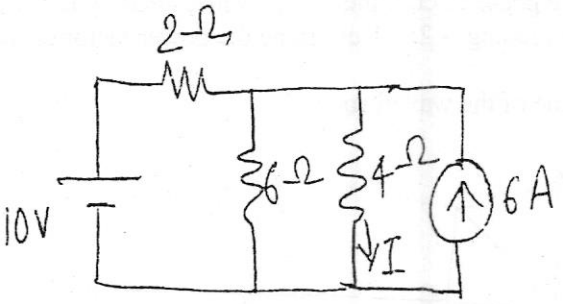
FE (All) Sem - I Choice Based

2/11/19

N. B. 1) Question No. **1** is **compulsory**.
2) Answer any **3** questions from the remaining **5** questions.
3) Assume suitable data wherever necessary.

Q1 Solve the following

(a) Using source transformation, find I in the circuit shown. **20**



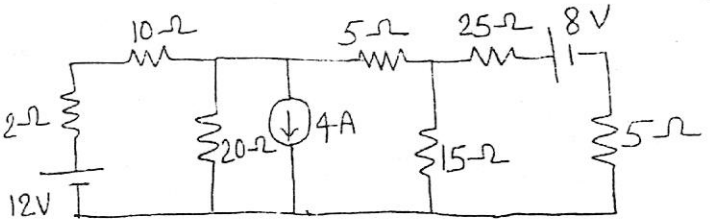
(b) Derive emf equation for single phase transformer.
(c) Show that the sum of three phase emf's is zero in a three phase ac circuit.
(d) Compare series and parallel resonant circuit.

Q2 (a)Coil A takes 2A at power factor of 0.8 lagging with an applied voltage of 10 V, second coil B takes 2 A with power factor of 0.7 lagging with applied voltage of 5V. What voltage will be required to produce a total current of 2 A with coil A and B in series. Find power factor in this case. **10**

(b) Draw no load phasor diagram of transformer and explain it. **6**

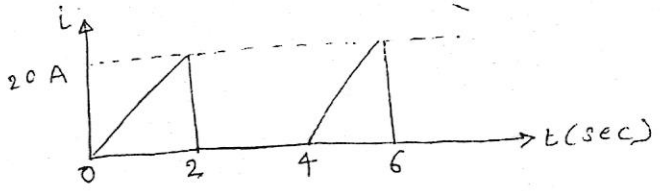
(c) Explain working principle of DC motor and DC generator. **4**

Q3 (a) Using Thevenin's Theorem, obtain the power drawn by 20Ω resistor in the network shown below. **10**



(b) In a balanced three phase circuit, the power is measured by two wattmeters, the ratio of wattmeter reading is 2:1. Determine the power factor of the system. 4

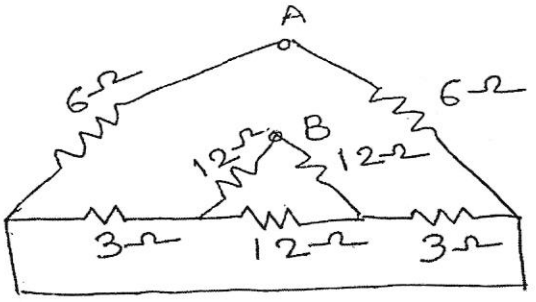
(c) Find the RMS value of the waveform. 6



Q4 (a) A parallel circuit consists of 2.5μF capacitor and a coil whose resistance and inductance are 15 Ω and 260 mH respectively. Determine resonant frequency,Q factor of the circuit at resonance and dynamic impedance of the circuit. 7

(b) A balanced delta connected load has impedance of (14.151-j200) Ω in each branch. Determine branch current, line current, total power taken if balanced three phase 400V, 50 Hz supply is used. How much power is absorbed in each branch of delta? 6

(c) Find the equivalent resistance between A&B. 7



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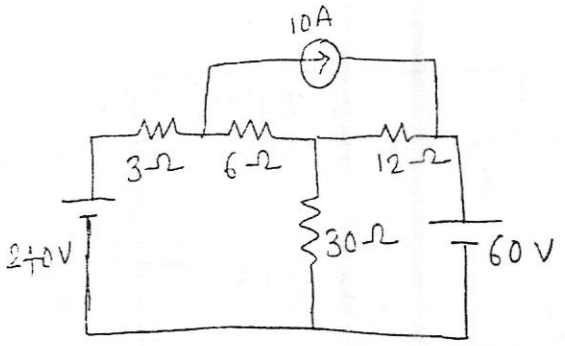
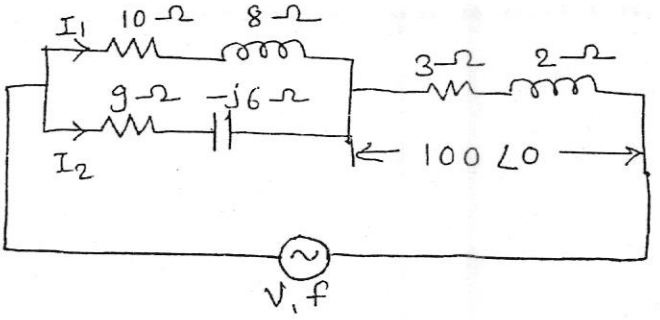
Q5 (a) Find the current through 6Ω resistance using Nodal analysis. 7



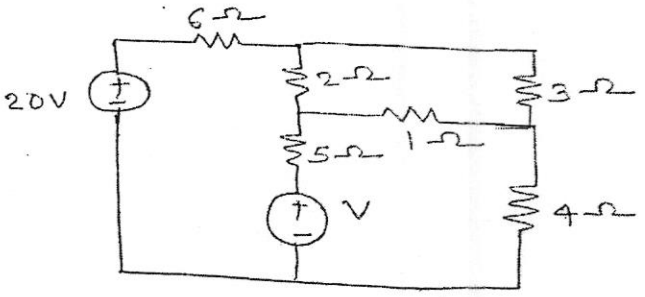
(b) Find I_1 & I_2. 7



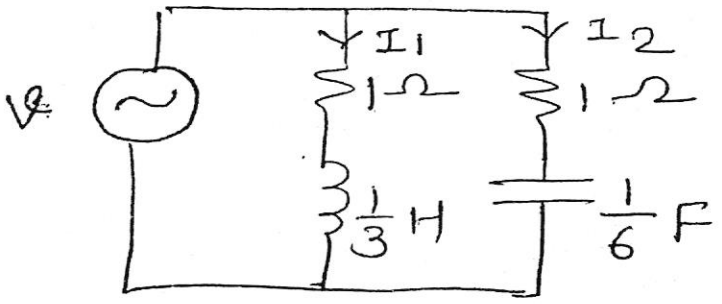
(c) A single phase 440/220V, 10 KVA, 50 Hz transformer has resistance of 0.2Ω and reactance of 0.6 Ω on high voltage side. The corresponding values of low voltage side are 0.04 Ω and 0.014 Ω. Calculate the regulation on full load for 0.8 lagging power factor. 6

Q6 (a) Determine the relationship between phase and line voltage and current for star connected balanced load across a three phase balanced system. 6

(b) By mesh analysis, find V. 8



c) If v= 100 sin3t, determine branch current I_1& I_2 with their phase angle and total current supplied by the source and its phase angle. 6



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25/11/19.

Paper / Subject Code: 58604 / Applied Chemistry - I.

F.E (Sem I) / All Branches / Choice Base /

(2 Hours) Total Marks: 60

NB: 1. Question No.1 is compulsory.
2. Answer any three questions from remaining five.
3. All questions carry equal marks.
4. Atomic Weight: H=1,C=12,O=16,Ca=40,Na=23,Mg=24,Si=28,S=32,Cl=35.5,N=14,Al=27,K=39

1. Solve any five.

(a) Write the applications of CNT's. 3

(b) Distinguish between thermoplastic and thermosetting polymer. 3

(c) Define viscosity and viscosity index.Discuss its significance. 3

(d) What are conducting polymers?Explain with suitable examples. 3

(e) Explain Gibb's phase rule.Define the terms involved in it. 3

(f) Define BOD and COD. 3

(g) Calculate Temporary and permanent hardness : 3

$Mg(HCO_3)_2$ = 73.8 mg/l, $Ca(HCO_3)_2$ =162. 8 mg/l, $MgCl_2$ = 95.8 mg/l
$CaSO_4$ =136 mg/l

2. (a) 1g of $CaCO_3$ was dissolved in 1 litre of distilled water. 50ml of this solution required 45ml of EDTA solution. 50 ml of hard water required 25 ml of EDTA. The same sample of water after boiling consumed 15 ml of EDTA. Calculate each type of hardness. 6

(b) i) Write the role of plasticizers and stabilizers in the compounding of polymers. 3
ii) What are Semi-solid lubricants? Under which conditions they are used. 2

(c) What are CNT's? Explain chemical vapour deposition method of preparation of CNT's. 4

3.(a) What is fabrication of plastic ? Explain transfer moulding process with the help of neat labelled diagram. 6

(b) i) Discuss the advantages and limitations of phase rule. 3
ii) What are fullerenes? Write important applications of fullerenes. 2

(c) The hardness of 50,000 litres of water sample was removed by zeolite softener. The softness required 200 litres of NaCl solution containing 50gm/l. NaCl for regeneration. Calculate the hardness of water sample. 4

4. (a) Draw the diagram for demineralization process and write suitable reactions involved in the process. What are the advantages and disadvantages of the method. 6

(b) i) 5 gms of an oil was saponified with 50 ml of 0.5 N alcoholic KOH. After refluxing for 2 hrs,the mixture was titrated by 15 ml of 0.5 N HCl.Find the saponification value of oil. 3

ii) What are the advantages of RCC over concrete? 2

(c) Natural rubber requires vulcanization. Give reasons. With appropriate reactions explain how the drawbacks are overcome? 4

5. (a) Write preparation ,properties and uses of following polymers: 6

i) PMMA ii) Silicone rubber

(b) i) Define Chemical Oxygen Demand (COD). 25 ml of sewage water required 8.3 ml of 0.001M $K_2Cr_2O_7$ for its complete oxidation. Calculate COD of this water sample. 3

ii) Mention the role of additives used in blended oils. 2

(c) Draw and explain the phase diagram of Pb- Ag system. 4

6. (a) What are lubricants? Define Lubrication. Explain Hydrodynamic lubrication mechanism with neat diagram. 6

(b) i) What is the Triple Point? At what conditions triple point exists in water system? 3

ii) Write a short note on reverse osmosis. 2

(c) Explain wet process of preparing the Portland cement. 4

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FE / All branches / Sem – I
choice based

27-11-2019

(2 Hours) [Total Marks:60]

N.B.: (1) Question. **1** is **compulsory.**
(2) Attempt any **three** questions from the remaining questions N0.**2** to **6.**
(3) **Assume** suitable **data** wherever required.
(4) **Figures** to the **right** indicate **marks.**

1. Attempt any **five** questions from the following- 15
   (a) Calculate atomic packing fraction of HCP unit cell.
   (b) Express de-Broglie wavelength in various forms.
   (c) Draw the energy band diagram for p-n junction diode in forward and reverse bias condition.
   (d) Define: persistent current, critical temperature, critical magnetic field.
   (e) What is reverberation time? Explain its formula.
   (f) With the help of diagram state direct and inverse piezoelectric effect.
   (g) The resistivity of intrinsic material at room temperature is 2×10^{-4} Ohm-cm. If the mobility of electron is 6 m^2 /V-sec and mobility of hole is 0.2 m^2 /V-sec. Calculate its intrinsic carrier density.

2 (a) Arrive at the statement that electron can not survive inside the nucleus. 8
An electron has a speed of 300m/s with uncertainty of 0.01% . Find the accuracy in its position.
(b) A sample of semiconductor is placed in uniform magnetic induction *B* with sample current *I* and thickness *w* then obtain the expression for (a) Hall voltage and (b) Hall coefficient. 7

3 (a) With neat diagram of unit cell explain the structure of diamond crystal. 8
(b) Explain variation of Fermi level with temperature in n-type semiconductor. 7
What is the probability of an electron being thermally excited to the conduction band in Si at 30^0C. The band gap energy is 1.12eV (k=1.38×10^{-23} J/K)

4 (a) Distinguish between Type I and Type II superconductors. 5
(b) A class room has dimension of (20x15x10) m^3 ; the reverberation time is 3 sec. 5
Calculate the total absorption of its surfaces and average coefficient of absorption
(c) How ultrasonic waves are produced using quartz crystal in an oscillator? 5

5 (a) Show that for an intrinsic semiconductor, the Fermi level lies half way between conduction and valence band. 5
(b) State and explain principle of SQUID and explain its working to determine the strength of magnetic field. 5
(c) The lowest energy of an electron trapped in a one dimensional box is 3.2×10^{-18} J. Calculate the width of the box. Also calculate the next two energies in eV the particle can have? 5

6 (a) Define ligancy and critical radius ratio. Calculate critical radius ratio for ligancy 6. 5
(b) Obtain one dimensional time dependent Schrodinger equation 5
(c) Explain photovoltaic effect and write a note on solar cell. 5

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$34 + 20 = 54$

28/11/2019

F.E (All) / choice based / sem I -

Time: 2 Hours **Marks: 60**

N.B.:

(1) Q.1 is compulsory. Attempt any three questions from Q.2 to Q.6.

(2) Draw neat diagrams wherever necessary.

(3) Figures to the right indicate full marks.

Q.1	Attempt **any five** from the following:-	**15M**
a	Define ecosystem. List out any four factors which disturb the energy balance in the ecosystem.	
b	What is conventional source of energy? Mention any four drawbacks of conventional sources of energy.	
c	What is photochemical smog? Give any four sources and any four bad effects of photochemical smog.	
d	State any four sources responsible for water pollution of Ganga river. Mention any two ways for elimination of water pollution of Ganga river.	
e	State any six functions of central pollution control board.	
f	What is soil pollution? State any four side effects of pollution.	
g	Mention any three social and economical aspects of sustainable development.	
Q.2	Attempt the following:-	**15M**
(a)	What is industrial waste water? Mention any three sources and three bad effects of industrial waste water. Mention any two ways for removal of industrial waste water pollution.	5M
(b)	Give the principle, construction, working and schematic diagram of steam turbine power plant. Mention any two advantages and disadvantages of steam turbine power plant.	6M
(c)	What is the importance of environmental education? How does Biomass and energy flow are related in ecological pyramid?	4M
Q.3	Attempt the following:-	**15M**
(a)	Explain the case study of Fukushima disaster (March, 2011).	5M
(b)	What is environmental degradation? Mention the causes (any four) and bad effects (any four) of depletion of natural water resources.	5M

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F.E. (All) / Choice based / Sem-I

29/11/2019

(c) What is green building? Explain the concepts and give any four objectives of Green building. 5M

Q.4 Attempt the following:- **15M**

(a) Give the schematic diagram of venturi scrubber used for purification of air pollutants. Give the principle, construction, any two advantages and disadvantages of venturi scrubber. 6M

(b) What is indoor air pollution? Mention any four sources and four bad effects of indoor air pollution. 5M

(c) Write a short note on case study on Narmada Bachao Andolan. 4M

Q.5 Attempt the following:- **15M**

(a) Explain the concept of flat plate collector with the help of its principle, construction, working, advantages (any two) and disadvantages (any two). 6M

(b) Define noise pollution. Mention any three sources and three adverse effects of noise pollution. 4M

(c) What do you mean by Solid waste? What are the different sources (any four) responsible for the solid waste? Explain composting in brief. 5M

Q.6 Attempt the following:- **15M**

(a) Give the neat and labeled diagram for photovoltaic cell. Give the principle, construction, working, advantages (any two) and disadvantages (any two) involved in photovoltaic cell. 6M

(b) What is e-pollution? State any four sources and any four bad effects of e-pollution. What are the preliminary actions to be taken to avoid e-pollution? 5M

(c) What is acid rain? Give the reactions taking place in the environment during acid rain. Give any two bad effects of acid rain. 4M

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FE/All Branches/Choice based/Sem-II 5/12/2019

(3 Hours) [Total Marks : 80]

N.B 1) Question **No. 1** is **Compulsory**.

2) **Answer** any **three** questions from remaining questions.

3) Figures to the right indicate full marks.

Q.1 a) Evaluate $\int_0^\infty xe^{-x^4}\,dx$. 3

b) Find the length of the arc of the curve $r = asin^2\left(\frac{\theta}{2}\right)$ from $\theta = 0$ to any point $P(\theta)$. 3

c) Solve $(D^4 - 2D^2 + 1)y = 0$. 3

d) Solve $(x - 2e^y)dy + (y + xsinx)dx = 0$. 3

e) Evaluate $\int_0^1 \int_0^x x^2y^2(x + y)dydx$. 4

f) Solve $\frac{dy}{dx} = x^3 + y$ with initial condition $x_0 = 1$, $y_0 = 1$ by Taylors method. Find the approximate value of y for x=0.1. 4

Q.2 a) Solve $\frac{d^2y}{dx^2} - 4y = x^2e^{3x} + e^{3x} - sin2x$. 6

b) Show that $\int_0^\infty \frac{log(1+ax^2)}{x^2}dx = \pi\sqrt{a}, (a > 0)$ 6

c) Change the order of integration and evaluate $\int_0^5 \int_{2-x}^{x+2} dydx$. 8

Q.3 a) Evaluate $\iiint z\,dxdydz$ over the volume of tetrahedron bounded by the planes $x = 0, y = 0, z = 0$ *and* $\frac{x}{3} + \frac{y}{4} + \frac{z}{5} = 1$. 6

b) Find the mass of the lamina bounded by the curves $y^2 = 4x$ and $x^2 = 4y$ if the density of the lamina at any point varies as the square of its distance from the origin. 6

c) Solve $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = -x^4sinx$. 8

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Q.4 a) Find by the double integration the area between the curves $y^2 = 4x$ and $2x - 3y + 4 = 0$. 6

b) Solve $(1 + siny)\frac{dx}{dy} = 2ycosy - x(secy + tany)$. 6

c) Solve $\frac{dy}{dx} = x^2 + y^2$ with initial conditions $y_0 = 1$, $x_0 = 0$ at at x=0.2 in steps of h=0.1 by Runge Kutta method of fourth order. 8

Q.5 a) Evaluate $\int_0^1 \frac{x^2}{\sqrt{1-x^4}}dx \cdot \int_0^1 \frac{dx}{\sqrt{1-x^4}}$. 6

b) The distance x descended by a parachute satisfies the differential equation $\left(\frac{dx}{dt}\right)^2 = k^2\left(1 - e^{-2gx/k^2}\right)$ where k and g are constants. If x=0 when t=0, show that $x = \frac{k^2}{g} logcosh\left(\frac{gt}{k}\right)$. 6

c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using i) Trapezoidal ii) Simpsons (1/3)rd and iii) Simpsons (3/8)th rule. 8

Q.6 a) Find the volume in the first octant bounded by the cylinder $x^2 + y^2 = 2$ and the planes $z = x + y, y = x, z = 0 \; and \; x = 0$. 6

b) Change to polar coordinates and evaluate $\iint_R \frac{dxdy}{(1+x^2+y^2)^2}$ over one loop of the lemniscates $(x^2 + y^2)^2 = x^2 - y^2$. 6

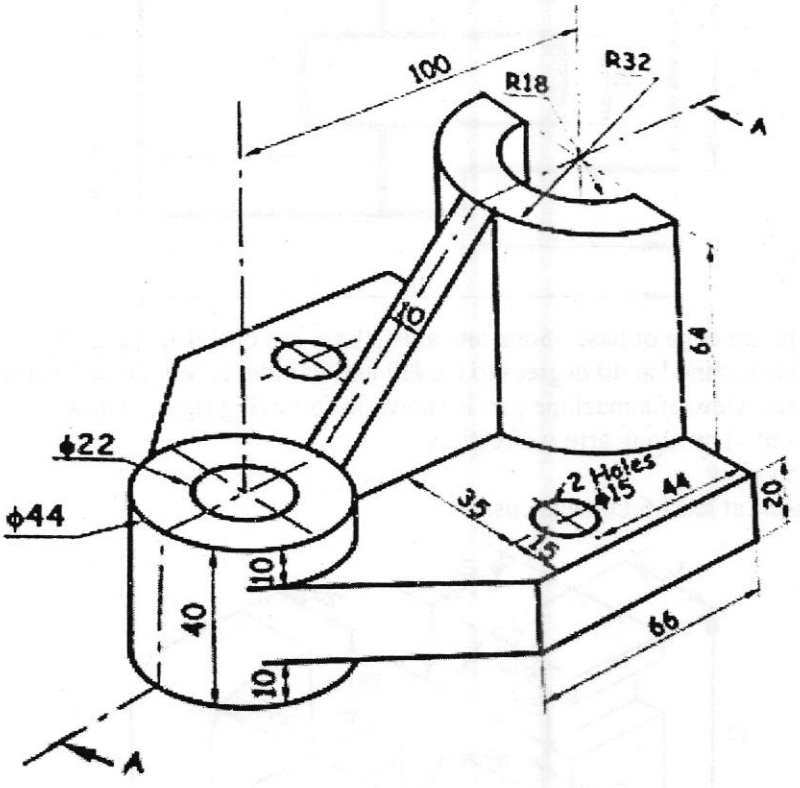
c) Solve by method of variation of parameters $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$. 8

FE / All Branches / choice Base / Sem-II / ~~2-9706~~ Date:- 3/12/201

(3 Hours) [Max Marks: 60]

i) Solve any **FOUR** questions.
ii) All dimensions are in mm.
iii) Use first angle method of projection.
iv) Assume suitable dimension if it is necessary.
v) Retain all construction lines.

Q.1 Following figure shows the pictorial view of an object, draw
i) Sectional front view along section A-A [5]
ii) Top view. [4]
iii) Left Hand Side view [4]
iv) Insert 10 major dimensions. [2]



Q.2 A right circular cone of base 60mm diameter and axis 75mm long is lying on VP on one of its end generator. Draw projections of the cone when FV of the axis inclined 45^0 with HP and base nearer to observer. [15]

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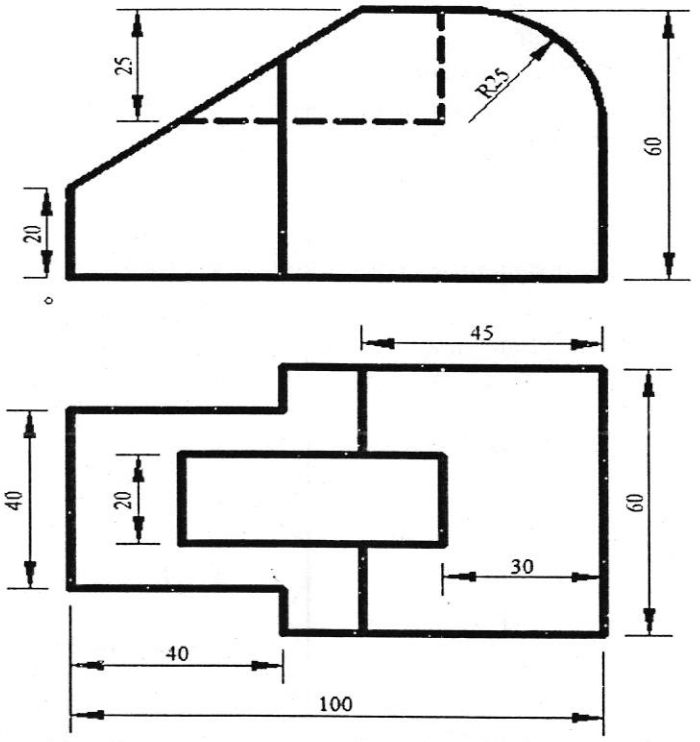
Q.3 (a) Front view and top view of an object is shown in figure, draw an Isometric View. **[9]**



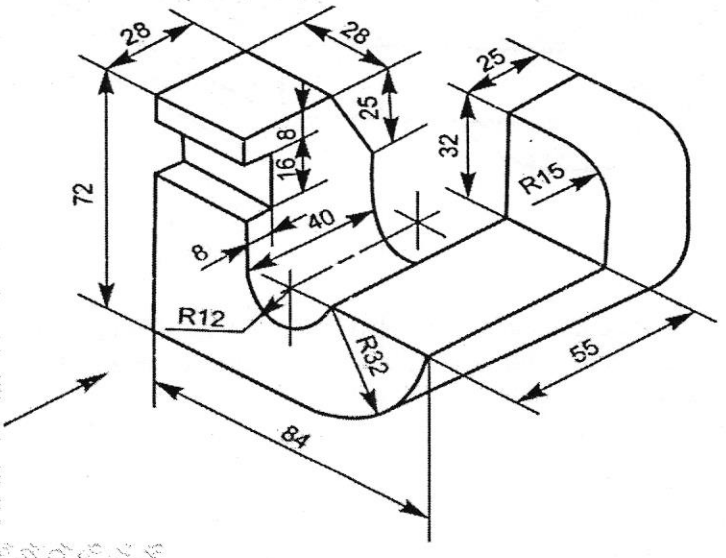
(b) A square prism edge of base 35mm and axis 70mm has one of its base edges in the HP with its axis inclined at 40 degrees to the HP and Parallel to VP. Draw its projections. **[6]**

Q.4 (a) The pictorial view of a machine part is shown in following figure. Draw

i) Front view along arrow direction **[4]**

ii) Top view **[4]**

iii) Insert at least 6 Dimensions. **[1]**

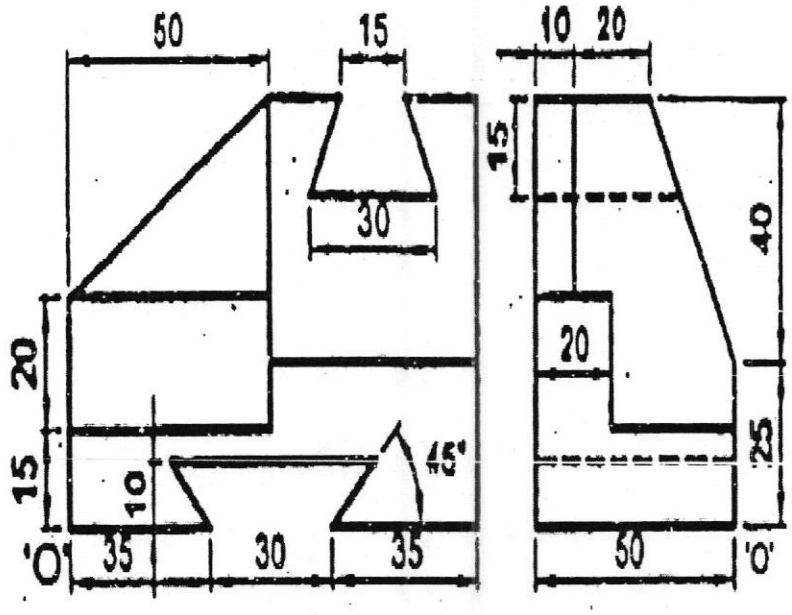


(b) Draw a helix of pitch 80mm on a cylinder of 60mm diameter. **[6]**

Q.5 A hexagonal pyramid of 30mm edge of base, 60mm axis length rests on its base on HP with an edge of base perpendicular to VP. It is cut by a section plane normal to VP and 60^0 inclined to HP bisects the axis of the pyramid. Draw sectional FV, sectional TV, True shape of section and Development of Lateral surface of the pyramid after removing apex. **[15]**

Q6 (a) The TV of 75mm long line AB measures 60mm. Pont A is 15mm below HP and 50mm in front of VP. Point B is 15mm in front of VP and above HP. Draw projections of line and determine its inclination with HP and VP. **[8]**

(b) Front view and side view of an object are shown in figure, draw an isometric view. **[7]**



FE (All BRANCHES) CHOICE BASE SEM-II 12/12/2019

Duration: 2 Hours **Total Marks: 60**

N.B.: (1) Question no. I is compulsory.
(2) Attempt any three questions from Q. 2 to Q. 6.
(3) All questions carry equal marks.
(4) Figures to the right indicate full marks.
(5) Atomic weights: H= 1, C =12, O =16, S =32, N =14, Cl = 35.5, Ba =137.3.

1. Answer any five of the following: **(15)**

(a) What is passivity? With an example explain how it affects the rate of corrosion?
(b) Name a green solvent and explain its properties.
(c) Give the detailed classification of composites with examples.
(d) A coal sample was found to contain the following constituents:
C= 81%, H= 6%, S =1%, N= 2%, ash = 4% and rest is oxygen.
Calculate the minimum weight of air required at STP for complete combustion of 1 kg of the coal sample.
(e) State and explain the Pilling Bedsworth rule.
(f) Give the classification and composition of plain carbon steels.
(g) Draw the diagram of the alkaline fuel cell and write the reactions taking place at the anode and cathode.

2. (a) Explain the impressed current cathodic protection method with the help of following points:-
1) Principle and diagram
2) Explanation of process.
3) Applications. **(6)**

(b) i) 1.5gm of a coal sample was kjeldahlised and the ammonia evolved was absorbed in 49 ml N/10 H_2SO_4. After absorption the excess H_2SO_4 required 32.5ml of 0.1N NaOH for neutralization. 0.5gm of the same coal sample was burnt in a bomb calorimeter and on treatment with $BaCl_2$ produced 0.08gm of $BaSO_4$. Calculate the percentage of nitrogen and Sulphur in the given coal samples. **(3)**

ii) Give an example to explain why it is beneficial to prevent waste formation in chemical processes rather than treat waste? **(2)**

(c) Classify structural composites and explain their properties and uses along with diagram. **(4)**

3. (a) Explain fixed bed catalytic cracking with the help of the following points:-
i) Principle ii) Labelled Diagram iii) Flow chart of process. **(6)**

(b) i) What are special steels? Explain the properties and applications of any one type of special steel. **(3)**

ii) Name the type of microscopic corrosion affecting Alpha brass and explain the conditions under which it occurs. **(2)**

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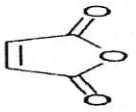
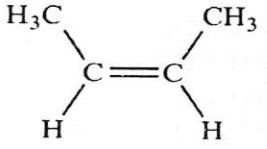
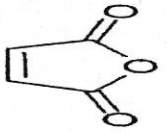
(c) Calculate the percentage atom economy of the following reactions with respect to the target product Maleic Anhydride and state which is the greener reaction.

a) $C_6H_6 + 4.5\ O_2 \rightarrow$  $+ 2\ H_2O + 2CO_2$

Maleic Anhydride

b)  $+ 3O_2 \rightarrow$  $+ 3\ H_2O$

(4)

Maleic Anhydride

4. (a) How do the following factors affect the rate of corrosion:
i) Conductance of corroding medium ii) Relative area of anode and cathode
iii) Temperature (6)

(b) i) Give the traditional and green synthesis of adipic acid and compare the starting materials used. (3)

ii) What are the properties of composites which make them popular engineering material. (2)

(c) Give the composition and properties of **any two**:
i) German Silver ii) Magnalium iii) Wood's Metal (4)

5. (a) A gas has following composition by volume: H_2 =10%, C_2H_6=25%, CO=16%, H_2O=20%, C_2H_2= 15%, CH_4=4%, O_2 = 4% and the rest is CO_2. Calculate the volume of air supplied per $2m^3$ of the gas at STP. Also calculate the weight of air to be supplied at STP per $2m^3$ of the gas. (Average molar mass of air at STP =28.94gm). (6)

(b) i) Part of an iron nail corrodes inside a piece of wood. Identify the type of corrosion and explain the mechanism with a labelled diagram and reactions. (3)

ii) What is shape memory effect? (2)

(c) The Bhopal Gas Tragedy was one of the worst industrial disasters. With reactions explain the synthesis of the intermediate which caused the tragedy and the final product. Also give the alternative route of synthesis of the final product explaining the green chemistry principle being adhered to. (4)

6. (a) What are the steps involved in powder metallurgy? Name the different moulding techniques used. Explain any one method of moulding with detailed diagram. (6)

b) (i) How are particle reinforced composites different from fibre reinforced composites? (3)
(ii) Distinguish between galvanizing and tinning. (2)

(c) What is knocking? Explain the role of antiknocking agents. (4)

FE (All Branches) CHOICE BASED SEM II 10/12/2019

(2 Hours) [Total Marks : 60

1) Question no.1 is compulsory
2) Attempt any three questions from Q.2. TO Q. 6
3) Use suitable data wherever required.
4) Figures to the right indicate full marks.

1. Attempt any five of the following
   a) Why does an excessively thin film appear to be perfectly dark when illuminated by white light. **15**
   b) In a plane transmission grating the angle of diffraction for the first order principal maximum is 20^0 for a wavelength of $6500A^0$. Calculate the number of lines in one cm of the grating surface.
   c) Explain the term V-number of an optical fibre .
   d) Differentiate between Spontaneous Emission & Stimulated Emission
   e) Show that divergence of the curl of a vector is zero.
   f) An electron is accelerated through a potential difference of 18 Kv in a colour Cathode ray tube.Calculate the kinetic energy & the speed of the electron.
   g) What will happen when a liquid is introduced between the plano convex lens and glass plate in Newton's rings experiment.

2. (a) What do you mean by thin film? Obtain the conditions for the maxima and minima of the light reflected from a thin transparent film of uniform thickness **8**
   (b) Explain Step index and Graded index fibres. A Step Index fibre has a core diameter of $2.9*10^{-6}$ m , the refractive indices of core & claddings are 1.52 &1.5189 resply . If the light of wavelength 1.3 μm is transmitted through the fibre determine the normalized frequency & number of modes supported by the fibre. **7**

3. (a) With neat energy level diagram describe the construction and working of Nd-Yag laser **8**
   (b) What is grating element. The visible spectrum ranges from 4000 A^0 to 5000 A^0 . Find the angular breadth of the first order visible spectrum produced by a plane grating having 6000 lines/cm when light is incident normally on the grating **7**

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4. (a) Explain with neat diagram, construction and working of SEM. 5

   (b) Explain spherical co-ordinate system? State the transformation relation between Cartesian and Spherical coordinates 5

   (c) What is Holography? Distinguish between holography and ordinary photography? 5

5. (a) Show that diameter of Newton's dark ring is directly proportional to square root of natural number? 5

   (b) What are the different techniques to synthesise nanomaterial & explain one of them in detail. 5

   (c) In a Newton's rings experiment the diameter of n^{th} and $(n+12)^{th}$ rings are 4.3mm and 6.8mm respectively . Radius of curvature of plano-convex lens is 1m. Find the wavelength of light. 5

6. (a) Explain the physical significance of divergence and curl of a vector field? 5

   (b) State Bethe's law and explain electrostatic focusing of electron beam? 5

   (c) Two glass plates enclose a wedge –shaped air film touching at one edge are separated by wire of 0.03mm diameter at distance 15 cm from the edge. Monochromatic light of Wavelength λ=6000A° from a broad source falls normally on the film .Calculate the fringe width. 5

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FE/ sem-II/ All Bsanches/ choice based
18/12/2019.

(2 HOURS) [Total Marks:40]

N.B. 1. Question no. 1 is compulsory
2. Attempt any three out of the remaining five questions
3. Figures to the right indicate full marks
4. Answers to all the sub questions should be grouped together.

Q.1.a.Answer **any two** of the following: (05)

i. Describe the process of communication with a suitable diagram. Would the communication cycle be considered incomplete if the feedback is in a different medium and not the same as the original message? Justify your answer.

ii. What is the importance of feedback? Give instances where feedback is not immediate or altogether missing.

iii. A sales letter best captures the AIDA Principle---Comment.

iv. Explain "Complete block form" of writing a business letter with a diagrammatic representation.

b. Identify the Sender, Receiver, Medium, Message, Feedback in the following communication situations: (05)

i. The Managing Director calls an urgent business meeting to discuss about the falling market prices and its repercussions on the company. Executives attend the meeting in full strength.

ii. The Sales officer proposes some strategies to increase the sales target of a newly launched product in a seminar. The sales manager appreciates his proposal.

Q.2. a. Write short notes on: **(any two)** (05)

1. Information Overload ,a barrier to communication
2. Proxemics and its impact on communication at the workplace
3. SQ3R Technique of Reading
4. Upward Communication and its limitations.

b. Identify and explain the barriers in the following situations : (05)

i) Shekhar is feeling disturbed and is unable to concentrate on his work , as he is constantly thinking about the argument that he had with his boss , this morning.

ii) Norman was struggling to explain his peril to the French Police officer who was not very conversant in English, but to no avail.

Q.3. a. As the Senior Sales Manager of "Kings Electronics Pvt Ltd." Mumbai, draft a sales letter addressed to the Principals of Degree Colleges in your city, to promote the sale of the new interactive smart boards, that your company has recently manufactured. Point out its salient features and utility. Invent the necessary details and write the letter in complete block form. (05)

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b. Do as directed: (05)

i. The captive fell down on his knees. The captive pleaded for mercy.(join the pair of sentences with suitable conjunctions)

ii. Give the synonym for the word " Ruckus "

iii. Didnt you hear that theyre arriving today (Punctuate the given sentence)

iv. I appreciated his work with me in resolve the conflict.(Correct the error and rewrite)

v. " SPECULATE " (Expand this verb into a suitable noun by adding a suffix)

Q.4. a. You are the Branch Manager of "Quantum group of companies Pvt Ltd." Noida. You want to set up a new branch office in Baruch . Write a letter inviting quotations for office furniture from "Woodwork Destination Pvt Ltd", Mumbai. Write the letter in modified block form. (05)

b. Write short notes on: (05)

i. Grapevine and its effects on organizational communication.

ii. Choose a useful computer program and write five instructions on how to use it.

Q.5. a. You are going to make a project presentation for your department . What aspects of non-verbal communication will you take care of, to make an impactful presentation ? (03)

b. Construct precise definitions for the following: (03)

i. Telescope ii. Power bank iii. Hard disk

c. Write short notes on: (04)

i. Language as a tool of communication.

ii. The importance of "Clarity, Conciseness, Correctness and Courtesy" in business correspondence.

Q.6.a. Read the following passage and answer the questions given below: (06)

When I go into a stranger's library I wander round the bookshelves to learn what sort of person the stranger is, and when he comes in I feel that I know the key to his mind and the range of his interests. A house without books is a characterless house, no matter how rich the Persian rugs. These only tell you whether he has a lot of money, but the books tell you whether he has got a mind as well. It is not a question of money but we do not buy books. I repeat that the books are the cheapest as well as the best part of the equipment of a few dollars. Nearly all the best literature in the world is at your command at two dollars a volume. For 100 dollars you can get a library of fifty books. Even if you do not read them yourself, they are priceless investment for your children. What delight is there like the revelation of books- the sudden impact of a master-spirit, the sense of a window flung wide open to the universe? It is the adventures of the mind, the joy of which does not pass away, that give the adventure of life itself beauty and fragrance.

Questions

1. Why does the adventure of mind not pass away?
2. Why does the writer wander round the bookshelves when he goes to a stranger's house?
3. What delight does a good book provide?

4. What can books tell you about a stranger?
   a. That he is a rich man
   b. That he believes in priceless investment
   c. That he has good mental faculties

5. When one reads a good book , one is delighted because
   a. One finds the windows of the library opened
   b. One feels the influence of a great writer
   c. One knows much about the universe

6. The word 'master-spirit' in the passage mean
   a. a prominent writer
   b. the spiritual effect of a master
   c. one who has a control over the spirit of man

Q6. b. i. Compare the salient features of oral and written communication. (02)
ii. Differentiate between caution , warning, note and instructions, with a suitable example for each of them. (02)

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16/12/2019.

Paper / Subject Code: 29704 / Structured Programming Approach

F.E (Sem-II) All branches. Choice based

Time: 3 hours **Marks: 80**

N.B

(1) Question no. 1 is compulsory.
(2) Attempt any 3 from the remaining questions.
(3) Assume suitable data if necessary.
(4) Figures to right indicate full marks.

Q.1 a. Attempt the Multiple Choice Questions **6**

i)The format identifier '%i' is also used for _____ data type?
(a) char (b) int (c) double (d) float

ii) Which keyword can be used for coming out of recursion?
(a) break (b) exit (c) return (d)all of above

iii) What will happen if in a C program you assign a value to an array element whose subscript exceeds the size of array?
(a)The element will be set to 0
(b) The compiler would report an error
(c) The program may crash if some important data gets overwritten
(d)The array size would appropriately grow.

iv)A pointer is
(a) A keyword used to create variable
(b) A variable that stores address of an instruction
(c) A variable that stores address of other variable
(d) All of the above

v) In which order do the following gets evaluated
1. Relational
2. Arithmetic
3. Logical
4. Assignment

(a) 2134 (b) 1234 (c) 4321 (d) 3214

vi) Which of the following cannot be a structure member?
(a) Another structure (b) Function (c) Array
(d) None of the mentioned

b) Find the output of following **4**

i)) #include<stdio.h>
```
void main()
{
 int c;
for(c=1;c<=5;)
printf("%d",++c);
}
```

ii) How many ' x' are printed by the following code?
```
#include<stdio.h>
void main()
{
 int i=5;
while(i-- > 0)
printf("x");
printf("x");
}
```

c) Draw a flowchart for printing the sum of even terms contained within the numbers 0-20. **4**

d) Solve the following **6**
i)Convert 238 decimal to octal
ii)Convert A3D Hexadecimal to decimal

Q.2 a) Distinguish between **6**
i)While and do-while loop
ii)break and continue

b) Write a c program that will convert a decimal number into any base. **6**

c) Write a program to calculate the sum of following series without pow( ) library function **8**
$S=1-x+x^2/2!-x^3/3!$ + ... N terms

Q.3 a) What is an array? What does an array name signify? Can array index be negative? Write a c program to arrange the number stored in an array in such a way that the array will have the odd numbers followed by even numbers. **10**

b) Write a program that accepts a word from the user and prints it in the following way. For ex. If the word is "STUDY" the program will print it as **10**
S
ST
STU
STUD
STUDY

Q.4 a) What is string? Explain the use of gets( )?Write a c program that will read a word and rewrite it in alphabetical order. For ex. If the word is "matrix" the program should print "aimrtx". **10**

b) Explain recursion and its advantages? Write a recursive c program to find the factorial of a given number. **10**

Q.5 a) Explain the storage classes with example. **10**

b) Declare a structure to store the information of 10 cricketers. **10**
i. Cricketer name
ii. Matches Played
iii. Runs Scored
iv. Strike rate
Use a function to display the cricketer information having the maximum strike rate.

Q.6 a) How do pointers differ from variables in c? Write a c program to add two pointers. **10**

b) What is file? Write a c program that include the menu that must have the following capabilities **10**
i) Enter the several lines of text and store them in a data file.
ii) Retrieve and display the particular line.
iii)Delete n lines

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