FE. Sem. I (Old Course) 09/06/2015

Computer Programming - I

(OLD COURSE)

Q.P. Code : 3104

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question **No. 1** is **compulsory**.
(2) Attempt **any four** questions from **remaining six** questions.

1.	(a)	Distinguish classes and objects with example.	**5**
	(b)	Differentiate Identifiers and Keywords with example.	**5**
	(c)	Explain use of functions with example.	**5**
	(d)	Differentiate class and structure with example.	**5**
2.	(a)	Write a C++ program to find the largest and second largest elements in the list entered by the user.	**10**
	(b)	Write a C++ program to concatenates a string to the left of a given string without using standard function.	**10**
3	(a)	What is default Constructor? Explain with example.	**10**
	(b)	What is friend class and friend function explain with example.	**10**
4	(a)	Write a program to find the sum of two time objects.	**10**
	(b)	What is recursion? Write a program to display Fibonacci series upto n numbers using recursion.	**10**
5		Consider a class network. The class "Master" derives information from both "Admin" and "Account" class, which in turn derives information from the class "Person". Define all the four classes and create, update and display the code information contained in Master objects. Person class has attributes name and code. Account has pay and Admin has experience attributes.	**20**
6	(a)	Write a program which uses function and pointers to copy an array of double.	**10**
	(b)	Write a program that can enter and display the data upto 10 employees using structure. Employee structure has members employee_code and salary.	**10**
7		Write Short notes on (**any two**).	**20**
	(a)	Access Modifiers	
	(b)	Static and Late Binding	
	(c)	Relational and logical Operators	
	(d)	Destructors and Constructors	

F. E. Sem I
Old
28|05|10
Ac-I

(OLD COURSE) **QP Code : 3093**

(2 Hours) **[Total Marks : 75**

N.B:- **Question No. 1 is compulsory.**

Solve any four questions from remaining questions.

Figures to right indicate full marks.

All questions carry equal marks.

(At-wt Ca=40, H=1, C=12, S = 32, O= 16, Si = 28, Cl=35.5, Mg= 24, Na =23)

Q.1. Solve any five [15]

(a) Give brief account of reverse osmosis.

(b) Distinguish between addition polymerisation and condensation polymerisation.

(c) What is grease? Under which situation it is used as a lubricant.

(d) What are plain carbon steels? How can they be classified on the basis of carbon content.

(e) What are fullerenes? State their uses.

(f) Distinguish between conventional and non conventional energy sources.

(g) 1.50 gm of an oil was saponified with 50 ml of 0.1 N KOH solution. After refluxing the mixture required 7.5 ml of 0.1 N HCl for neutralization. Find saponification value of oil.

Q.2. (a) Calculate the amount of lime (85% pure) and soda (90% pure) required for softening of 10,000 litres of boiler feed water containing following impurities. [6]

$Ca(HCO_3)_2$– 16.2 ppm $MgSO_4$ – 6.0 ppm $CaSO_4$ - 6.8 ppm

$Mg(HCO_3)_2$ – 8.4 ppm $CaCl_2$ – 11.1 ppm SiO_2 – 8.0 ppm

(b) What are the main constituents of plastic? Write the functions and examples of each constituent. [5]

(c) Rechargeable Nickel – Hydrogen batteries. [4]

[TURN OVER

Q.3 (a) What is meant by fabrication of plastic ? Name different methods of fabrication.

Explain transfer Moulding with the help of a neat diagram. [6]

(b) Give in brief the functions of various additives employed for the improvement of lubricants. [5]

(c) Describe the laser method for production of Carbon Nanotubes. State the applications of Carbon Nanotubes. [4]

Q. 4. (a) Explain any two of the following properties of lubricants:- [6]

(i) Oiliness (ii) Cloud point and Pour point (iii) Acid Value.

(b) What is condensed phase rule equation & Explain Lead – Silver system with the help of phase diagram. [5]

(c) The hardness of 25,000 Litres of water was completely removed using zeolite softner. For regeneration of exhausted zeolite bed, 200 Litres of NaCl solution containing 20 gms / ltr NaCl was required. Calculate the hardness of water sample. [4]

Q.5 (a) State the phase rule. Discuss the application of phase rule to one component water system. [6]

(b) How is activated sludge process carried out for the treatment of waste water ? Explain with flow- sheet diagram. [5]

(c) Write a note on conducting polymers. [4]

Q.6 (a) Explain the application of nanomaterials in medicines and catalysis. [6]

(b) Define COD and BOD with its significance. [5]

(c) Write a note on hydrogen as a fuel. [4]

Q.7 (a) Write the preparation and uses of [6]

(i) Urea formaldehyde (ii) Buna – S – Rubber.

(b) Explain the theory of lime soda process with reference to the different functions of lime and soda. [5]

(c) Explain the specific effects of the following metals on the properties of steels. [4]

(i) Cobalt (ii) Molybdenum.

F.E (old) SEM-I BEE M/J-2015 22/5/2015

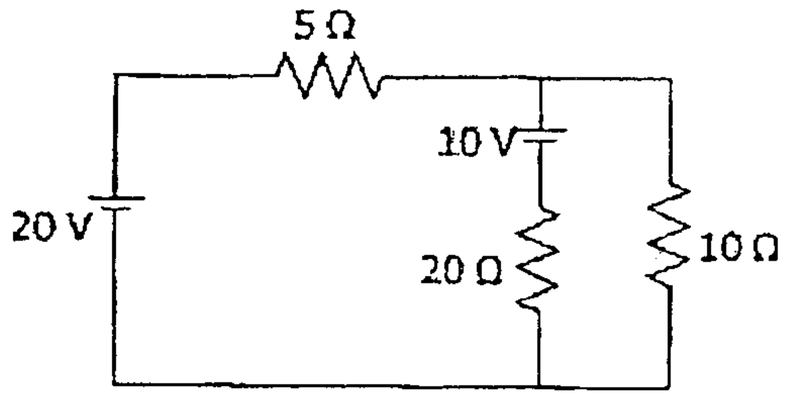
(OLD COURSE) Q.P. Code : **3087**

(3 Hours) [Total Marks : 100

N.B.: (1) Question **No.1** is **compulsory**.
(2) **Attempt** any **four** out of remaining.

Q.1 a) The resistance of a motor winding increases from 70Ω at 25°C to 100Ω at 70°C. Find the resistance temperature coefficient at 0°C. (3)

b) Find current through 20Ω by superposition theorem. (3)



c) Instantaneous wave equation for a voltage v=200 Sin(500t - 30°). Find V_{rms}, Time period. (2)

d) Plot the graphs of current Vs frequency in RLC series circuit having very small value of R, medium value of R and very high value of R. (3)

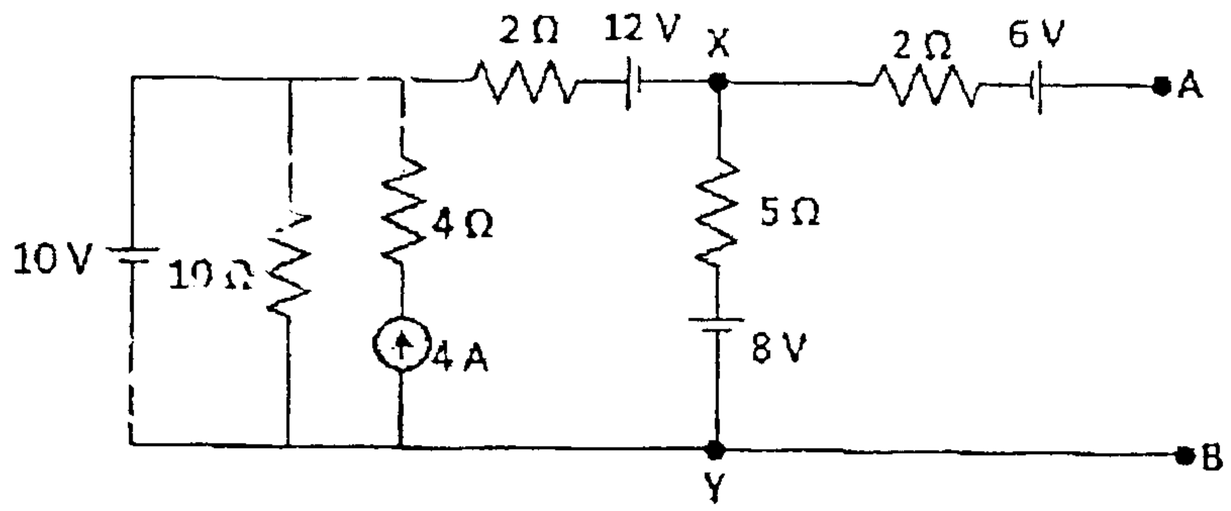
e) In a three phase star connected load, V_{YB}=400∠ 80°. Find V_{RN}. Phase sequence is RYB. (2)

f) For a single phase transformer of 10KVA, maximum efficiency occurs at 8.16KVA load. If iron loss is 80W. Find full load copper loss. (3)

g) Draw the phasor diagram of capacitor start induction run motor. (2)

h) Find ripple factor for half wave rectifier. (2)

Q.2 a) Find voltage across X & Y by nodal analysis. (6)



b) If a voltage of v=260Sin(314t + 30°) V is being applied to an impedance. A current of 2∠-15°A flows through the circuit. Find resistance, reactance and pf of the circuit. (6)

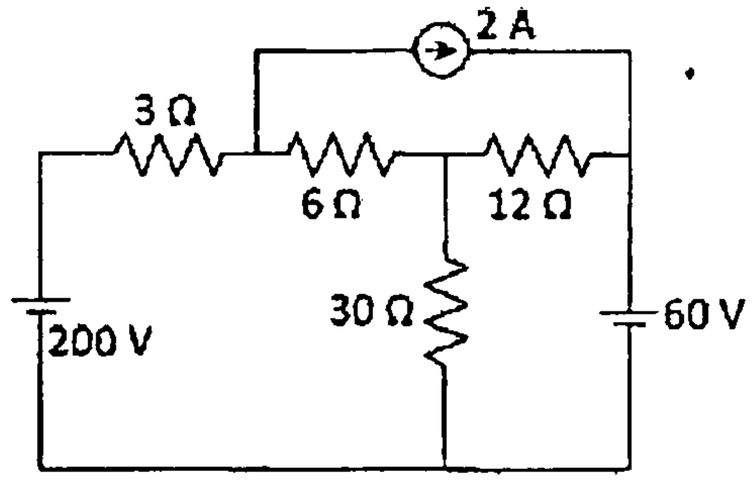
c) Draw the phasor diagram of transformer on lagging power factor load. (8)

Q.3 a) Derive the relation between line and phase quantities in three phase star connected load. (8)

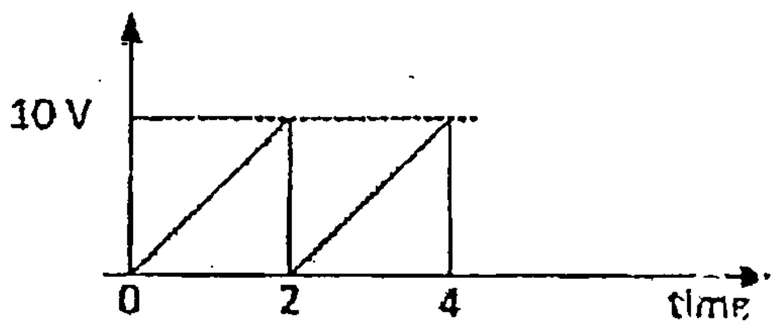
b) Explain short circuit test to find equivalent circuit parameters of the single phase transformer. (4)

c) Explain production of rotating magnetic field in three phase induction motor. (8)

Q.4 a) Calculate current in 12Ω resistance by thevenin's theorem. (7)



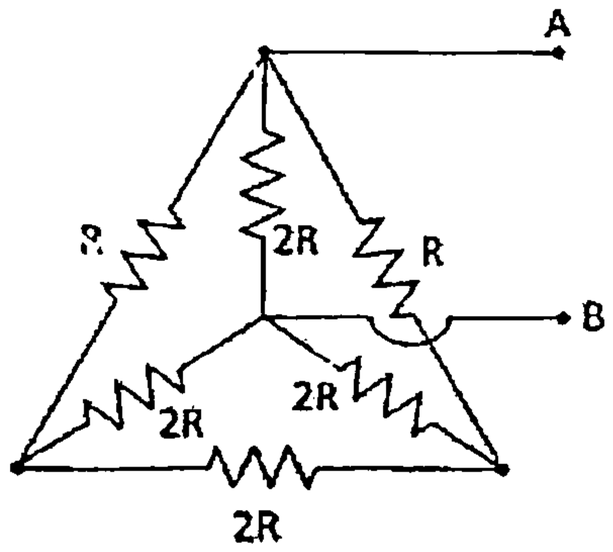
b) Find V_{RMS}. (4)



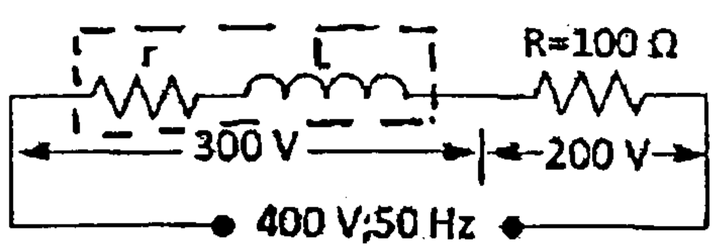
c) Calculate the total power and readings of two wattmeters connected to measure power in three phase balanced load if the reactive power is 15KVAR & load pf is 0.8 lag. (4)

d) Draw the input and output waveforms of full wave bridge rectifier and find ripple factor, rectification efficiency. (5)

Q.5 a) Determine equivalent resistance between A & B. (7)

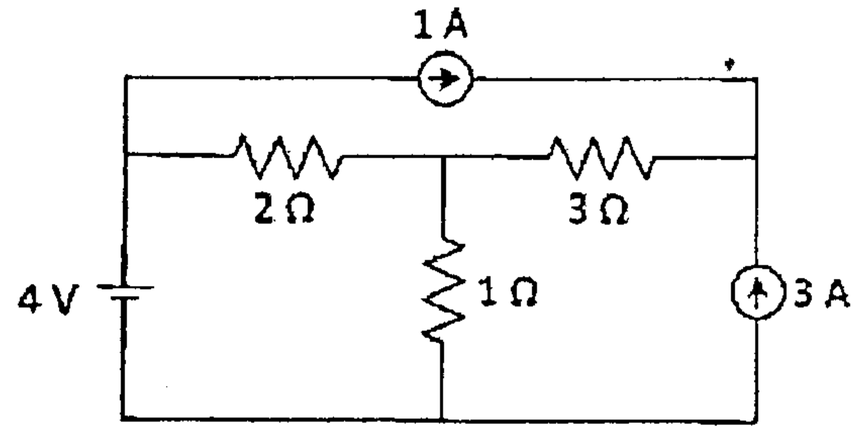


b) Find power & power factor of choke coil and power factor of complete circuit. (5)



c) A 10KVA, 450V/120V, 50 Hz, single phase transformer gave following results (8)
OC test(LV side):- 120V, 4.2A, 80W
SC test(HV side):- 9.65V, 22.2A, 120W.
Calculate equivalent circuit parameters referred to primary, efficiency at 0.8 pf lag and maximum efficiency at 0.8 pf lag.

Q.6 a) Find current in 1Ω resistance by superposition theorem. (7)



b) A coil of 400Ω resistance & an inductor of 318μH is connected in parallel with a capacitor and the circuit resonates at 1MHz. If a second capacitor of 23.5pF is now connected in parallel with first capacitor, Find the frequency at which the new circuit resonates. (7)

c) A three phase star connected load across 400V, 50Hz three phase supply takes 10KW and a line current of 20A. Find the readings of two wattmeters connected to measure power in the circuit. (6)

Q.7 a) An alternating current of 50Hz frequency has a maximum value of 100A. Calculate its value 1/600 seconds after the instant of current zero and increasing positively thereafter. (2)

b) Two currents i_1 & i_2 are meeting at a point. Find resultant current. (3)
$i_1 = 10 \sin(\omega t - 30°)A$ & $i_2 = 5 \cos(\omega t - 70°)A$

c) Find all day efficiency of a 500KVA transformer where full load copper loss and iron loss are 4.5KW and 3KW respectively. During a day, it is loaded as follows (5)

Loading in KVA	No. of Hours	pf
500 KVA	6	0.8
400 KVA	10	0.75
125 KVA	4	0.8
No load	4	

d) Derive an expression for emf induced in DC motor. (5)

e) Draw and explain input and output characteristics of CE configuration of BJT. (5)

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1 F.E (old) sem I 18/5/15

Engg. Mechanics

(OLD COURSE) **QP Code : 3082**

(3 Hours) **[Total Marks : 100**

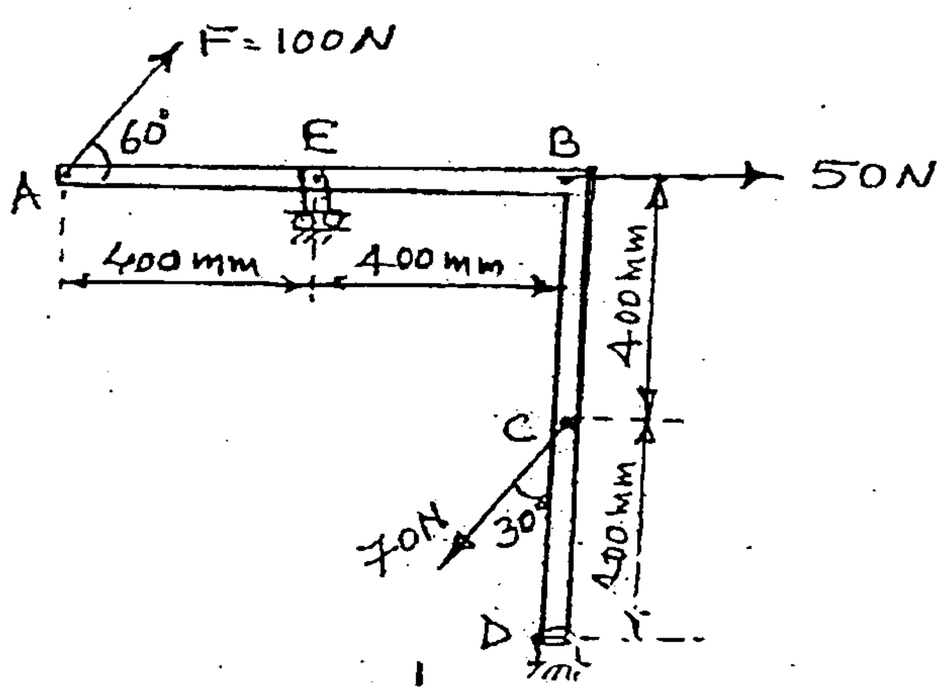
N.B.:- 1) Question **No.1** is **compulsory**

2) Attempt **any three** out the remaining questions

3) Draw neat sketches to illustrate your answers

4) Figures to the right indicate full marks

1. a) Replace the given force system as single force –moment system at C **[04]**



b) Explain perfect and imperfect truss, stable and unstable truss. **[04]**

c) Derive an expression to find the centrifugal tension in a belt drive. **[04]**

d) A stone is dropped from the ground surface into a well and the sound of splash is heard 2.5 seconds later. How far below the surface of water from the ground level. Assume the velocity of sound as 330 m/s **[04]**

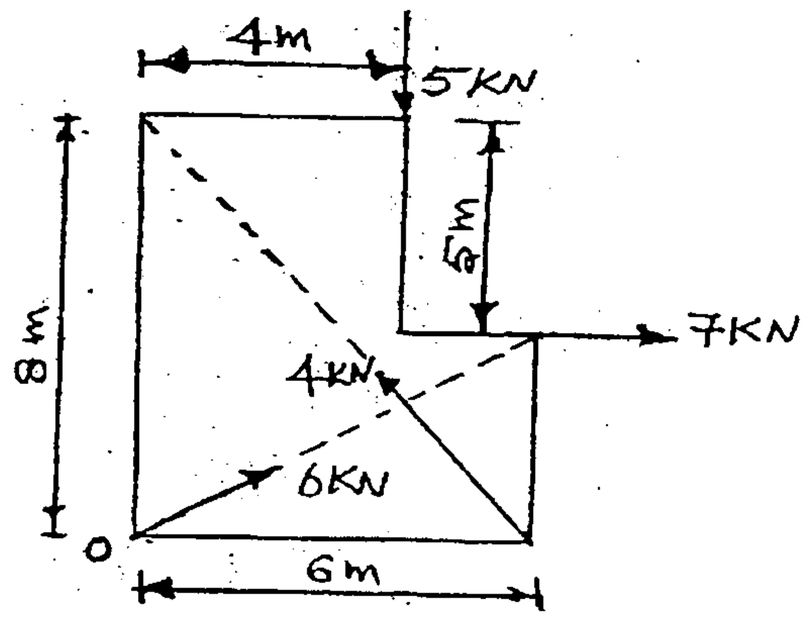
e) A wooden block of 7 N resting on floor (μ=0.4) is fired with a bullet of 0.25 N weight at a velocity of 150 m/s, and it is embedded into the block. Find **[04]**

i) The velocity of bullet and block together after the impact

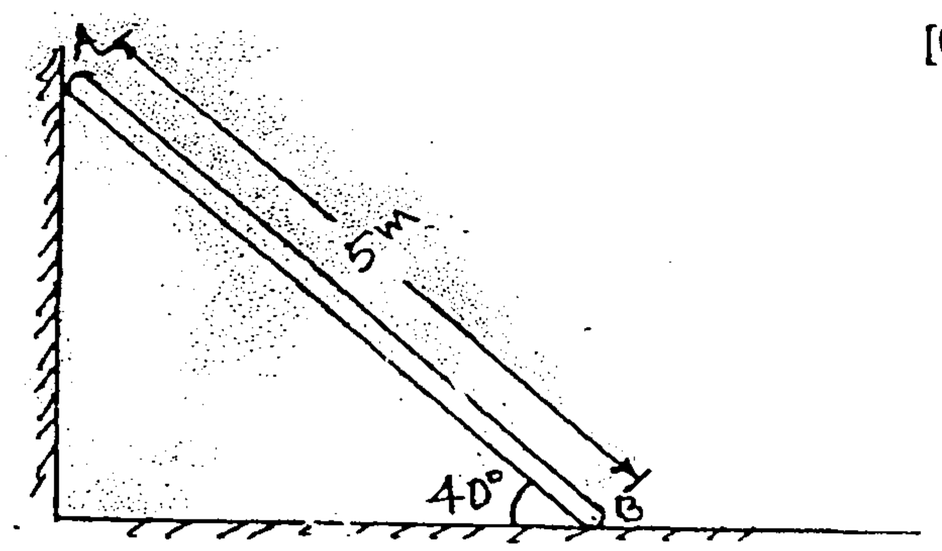
ii) The distance travelled by the combined mass along the floor.

[TURN OVER

2. a) Find the Resultant of general force system shown below and locate it w.r to O. [08]

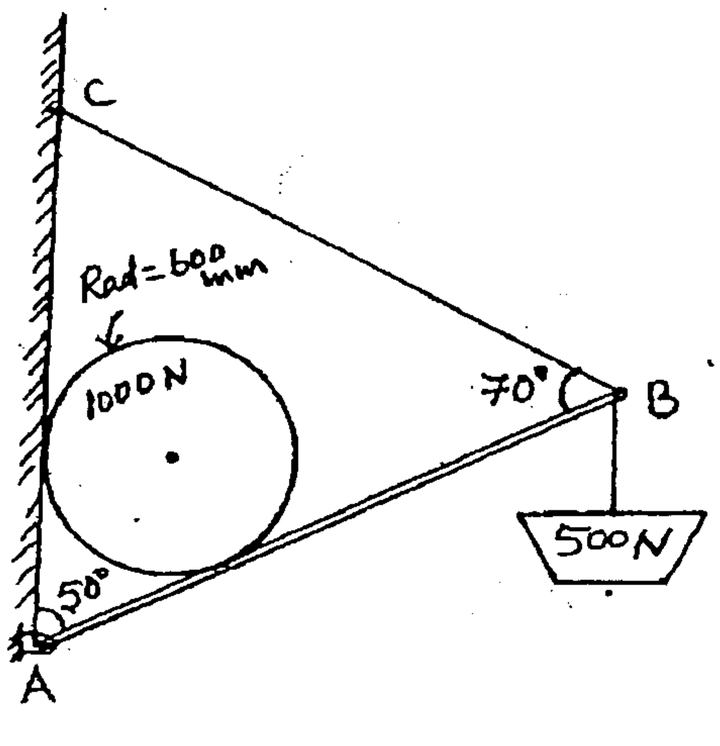


b) A Ladder of weight 20kg is kept as shown in figure. Check whether the ladder is in equilibrium. If not, What is the minimum angle at which the ladder will be in equilibrium? [06]



c) A rocket follows the a path such that the acceleration is given by $\hat{a} = (4\,i + t\,j)$ m/s^2. At t= 10 sec determine (i) sped of the rocket (ii)radius of curvature of the path (iii)magnitude of Normal and Tangential components of accelerations [06]

3. a) A sphere of weight 1000 N is held in equilibrium as shown in figure. Determine the reaction at Hinge A and the Tension on the string BC. [08]

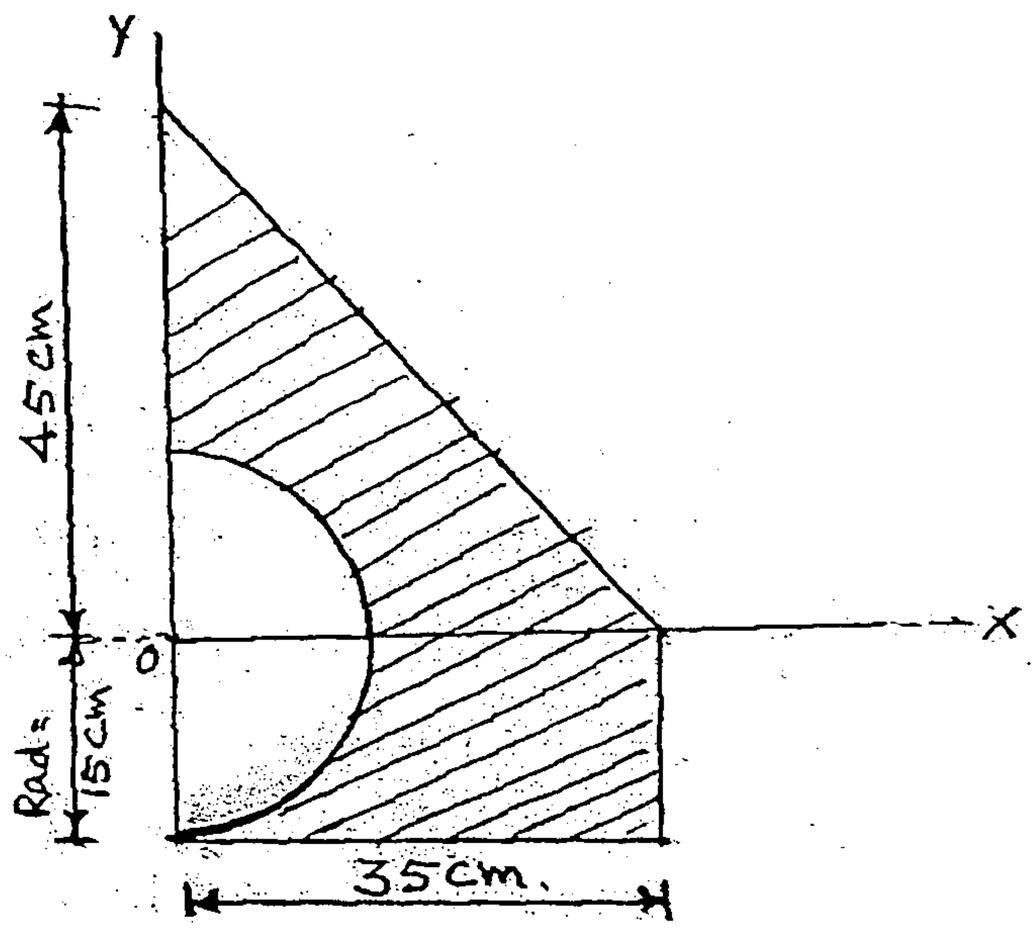


[TURN OVER

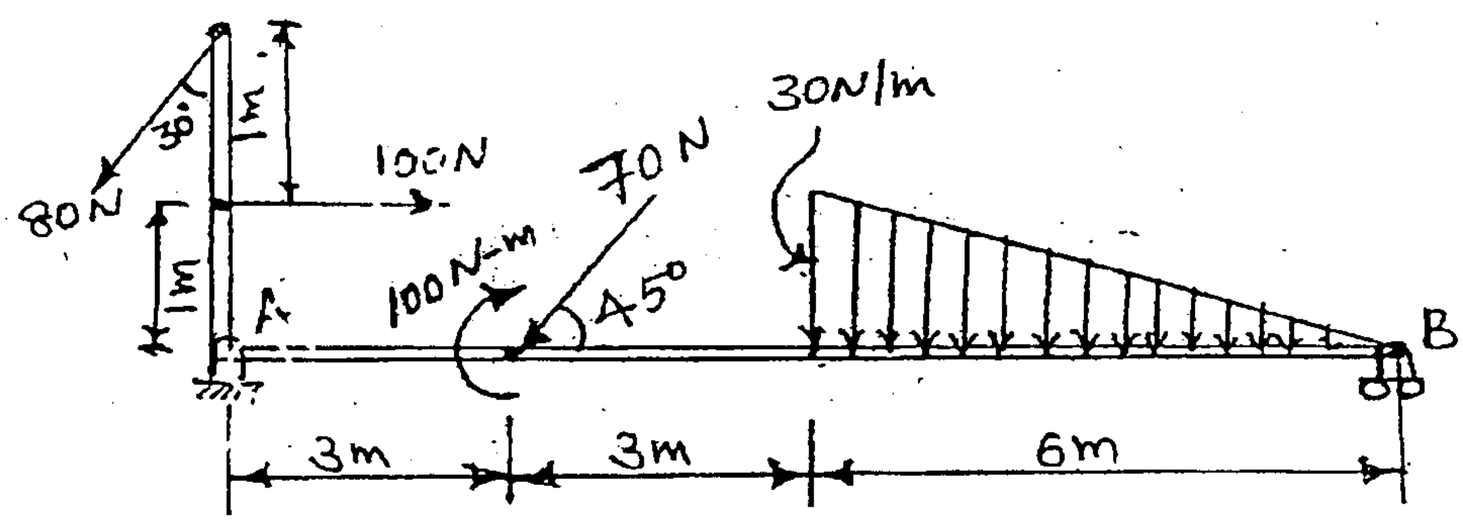
b) A boy throws a ball from a height of 2m from ground with a velocity of 24m/s at an angle 'α' to hit a wall from a distance of 30m from the wall. Determine the maximum height h that can be reached by the ball and the corresponding angle 'α'. **[06]**

c) What is general plane motion? Explain Instantaneous center of rotation **[06]**

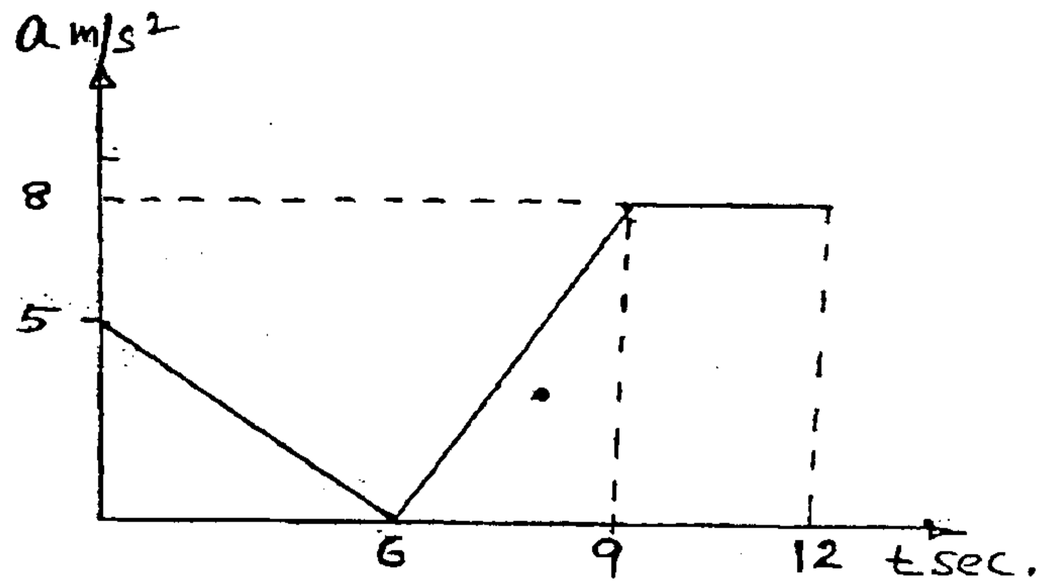
4. a) For the figure given below, locate the centroid of the shaded area with respect to given x-axis and y axis. **[08]**



b) Determine the support reactions at A and B of the Beam shown below **[08]**



c) Acceleration – time (a-t) diagram for a particle moving in a straight line is shown below. Draw the v-t and x-t diagrams. [08]

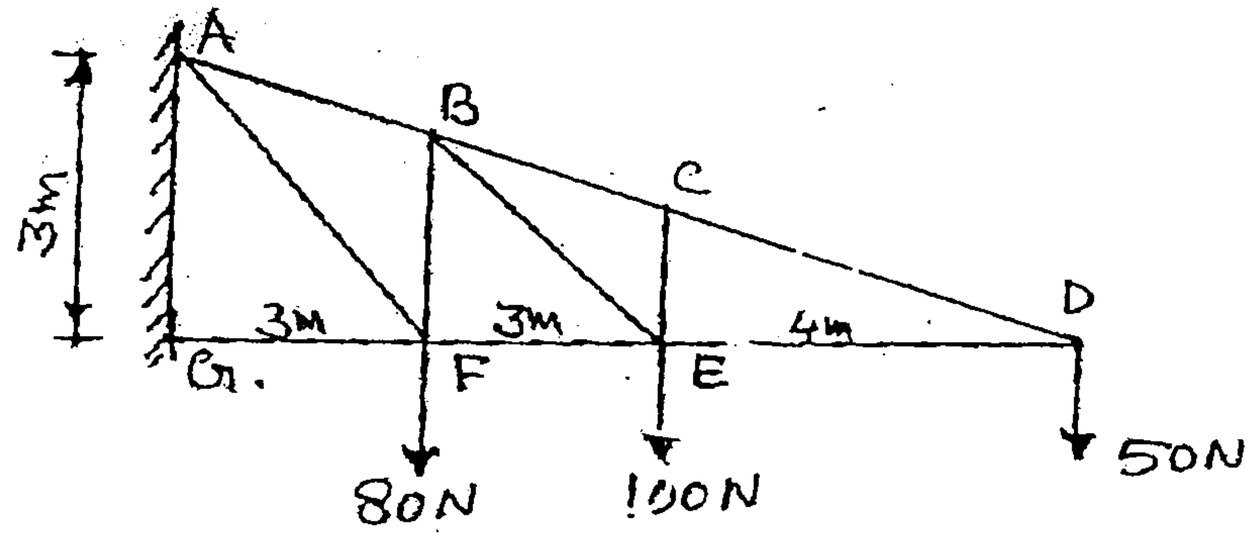


5. a) Find [06]

(i) The reactions at the support of the truss given below.

(ii) Forces on BC, BE & EF by method of section.

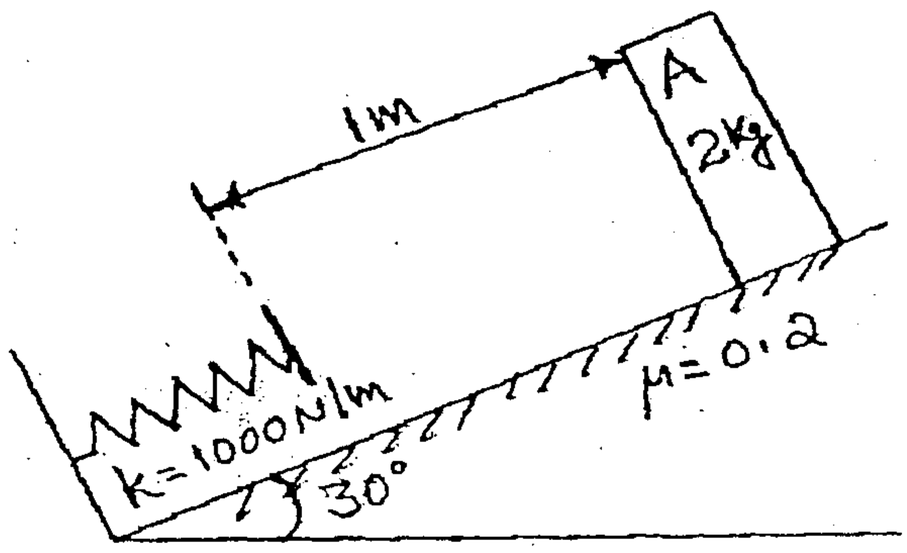
(iii) Other member forces by method of joints.



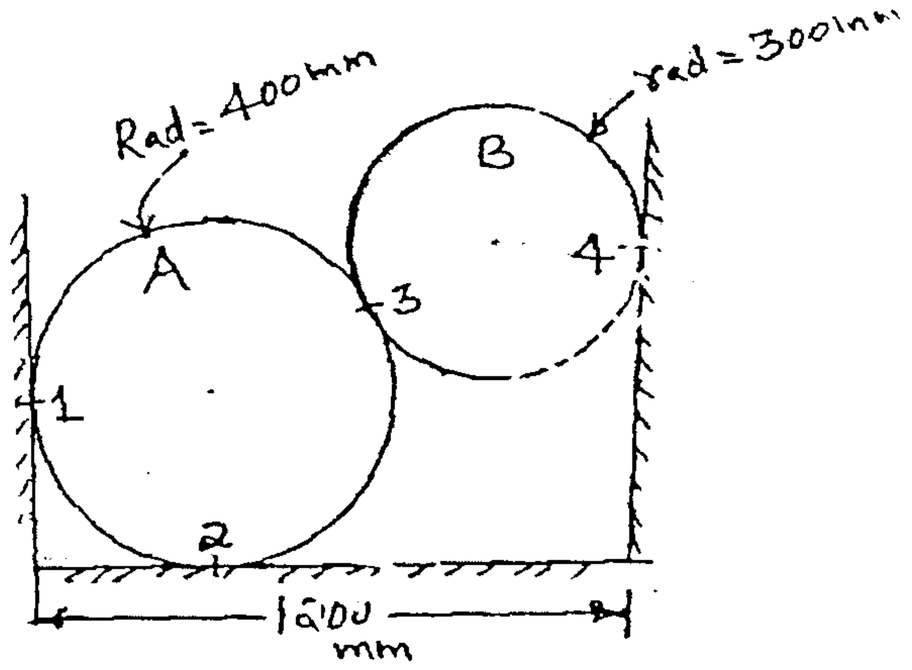
b) A belt, 100 mm wide and 8mm thick is transmitting power at a belt speed of 1600 m/min. the angle of lap on the smaller pulley is 165^0 and coefficient of friction is 0.3. The maximum permissible stress in the belt material is $2N/mm^2$ and the mass of the belt is 0.9 kg/m. Find the power transmitted and the initial tension in the belt. Also find the maximum power that can be transmitted and the optimum speed of the belt. [08]

[TURN OVER

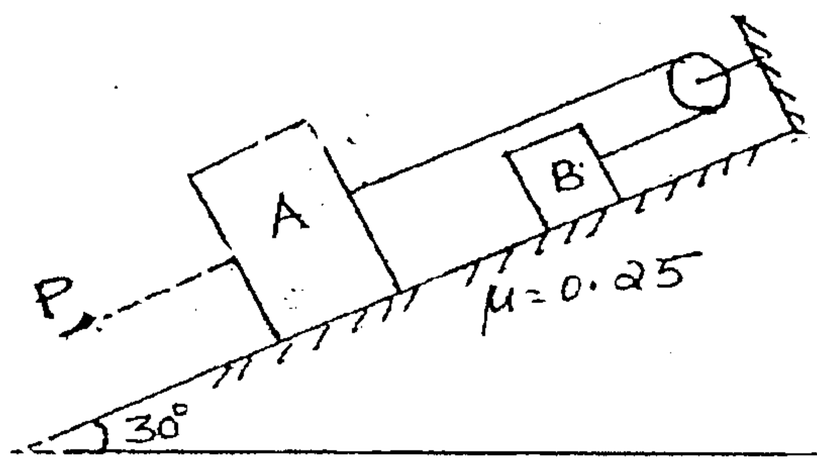
c) Block A of mass 2Kg is released from rest as shown in figure. It strikes a spring (K =1000N/m) on its way. Determine the maximum compression of the spring and the maximum velocity of the block. [06]



6. a) Two spheres A (weight = 800 N) and B (weight = 500N) are kept in a vessel as shown. Determine the reactions at 1,2,3 and 4 [06]

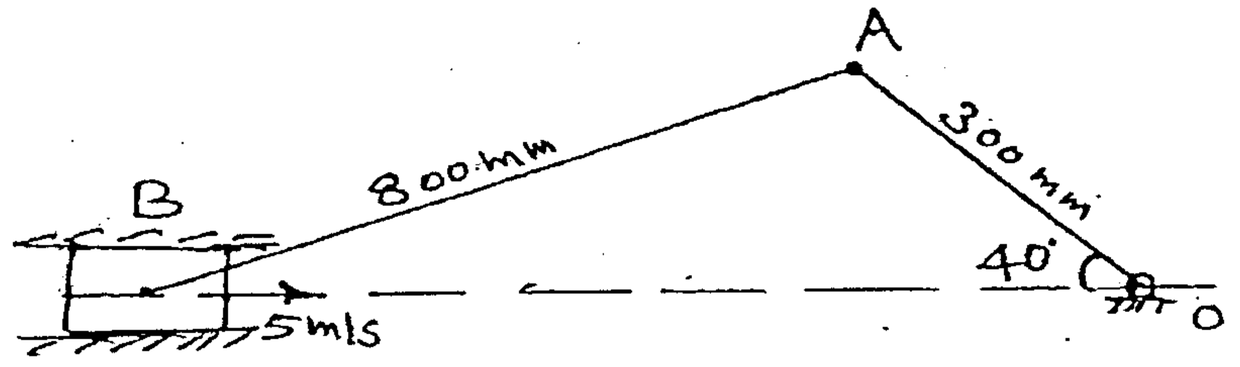


b) Two blocks A and B are connected as shown. Find the force P required to just move block A down the plane . W_A = 5 kg, W_B =6 kg. [06]

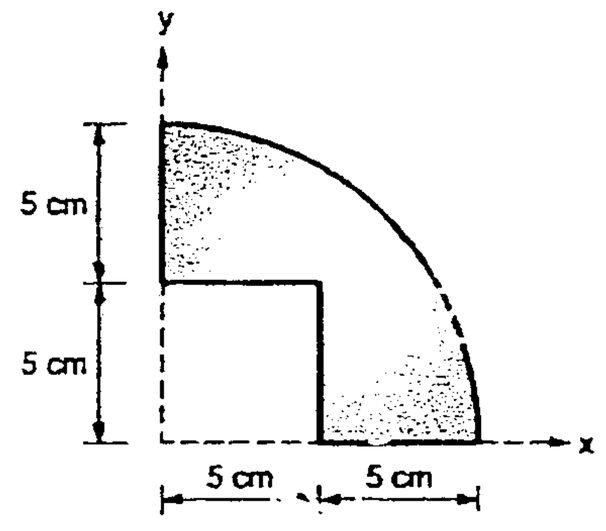


[TURN OVER

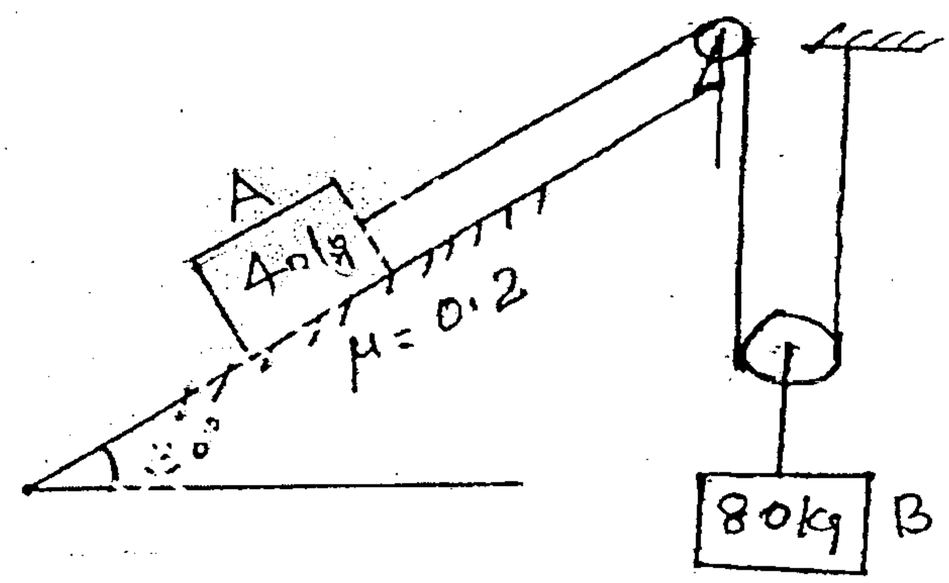
c) Locate the Instantaneous center of rotation for crank and connecting rod mechanism and find the angular velocity of crank OA if the velocity of B is 5m/s to right. [08]



7. a) Determine the moment of Inertia of the shaded area about given X and Y Axis. [06]



b) Determine the acceleration on A and B if the system is released from rest. [08]



c) A smooth spherical ball A of mass 250 gm is moving from left to right with a velocity of 2m/s in a horizontal plane. Another ball B of mass 15gm is travelling in the perpendicular direction to A with a velocity of 6m/s. If A collides with B find the velocity of A and B after collision. Take e = 0.6. [06]

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F.E (Old) · Sem I
App. Maths - I

12/5/15

QP Code : **3075**

(OLD COURSE)

(3 Hours) **[Total Marks :100]**

N.B. : (1) Questions No. **1** is **compulsory.**
(2) Attempt any **four** questions form **2** to **7.**
(3) Answer to subquestion should be written together.

1. (a) P.T. amp ($z_1 . z_2$) = am (z_1) + amp (z_2). **3**
   (b) Find y_n where $y = \sin^4 x$. **3**
   (c) P.T. $[(\bar{a} \times \bar{b}) \times (\bar{a} \times \bar{c}).\bar{d} = (\bar{a}.\bar{d})[\bar{a}\,\bar{b}\,\bar{c}]$. **3**
   (d) P.T. $\cos x = 1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+\ldots$ **3**
   (e) If $u=e^{xyz}$ then S.T. **4**

$$\frac{\partial^3 u}{\partial x \partial y \partial z}=[1+3xyz+x^2y^2z^2]e^{xyz}$$

   (f) Divide a in three parts such that their product is maximum. **4**

2. (a) If $\sin\theta + \sin\phi = 0$ and $\cos\theta + \cos\phi = 0$ then prove that **6**
   $\sin(2\theta)+\sin(2\phi) = 2\sin(\pi+\theta+\phi)$.
   (b) Separate into real and imaginary parts of $\tanh^{-1}(x+iy)$ **6**
   (c) State and prove Euler's Thm for 2 variables and hence find **8**

$$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y} \text{ where}$$

$$u = x^3 \tan^{-1}\left(\frac{x^3+y^3}{x^3-y^3}\right)$$

3. (a) Verify Rolle's Throm for $f(x) = \log\left[\frac{x^2+ab}{(a+b)x}\right]$ in [a, b] ; a, b>0. **6**
   (b) P.T. $(\bar{a} \times \bar{b}), (\bar{b} \times \bar{c}), (\bar{c} \times \bar{a})$ are coplanar if and only if $\bar{a}, \bar{b}, \bar{c}$ are coplanar. **6**
   (c) Prove that $\log(1+e^x) = \log 2+\frac{1}{2}x+\frac{x^2}{8}-\frac{1}{192}x^4+\ldots$ **8**

4. (a) Solve $x^7+x^4 + i\,(x^3 +1) = 0$ 6

(b) Test the convergence of $\sum \frac{3^n + 4^n}{4^n + 5^n}$ 6

(c) If $Y = \sinh^{-1}x$ then prove that $(1+x^2)\, y_{n+2} + (2n+1)\, x\, y_{n+1} + n^2\, y_n = 0$ 8

5. (a) If $Y = X \log\left(\frac{x-1}{x+1}\right)$ then S.T. 6

$$y_n = (-1)^{n-2}\,(n-2)\,!\left[\frac{x-n}{(x-1)^n} - \frac{x+n}{(x+1)^n}\right]$$

(b) Evaluate $\lim_{x \to y} \frac{x^y - y^x}{x^x - y^y}$ 6

(c) Find Divergense $\overline{F}$ and curl $\overline{F}$ where $\overline{F} = \nabla\,(x^3+y^3+z^3-3xyz)$. 8

6. (a) If $z = f(x, y)$ and
$x = u \cos \alpha - t \sin \alpha$
$y = u \sin \alpha + t \cos \alpha$ P.T. 6

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

(b) Find directional derivative of $\phi = xy^2+yz^3$ at point (2, -1, 1) towords the point (3, 1, 3) 6

(c) If $\cos\left(\frac{\pi}{4} + ia\right) \cosh\left(b + i\frac{\pi}{4}\right) = 1$ then 8

S.T. $2b = \log(2+\sqrt{3})$

7. (a) If $u = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$, then find

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$$ 6

(b) Find the extreme value of $x^3 + y^3 - 3axy$; $(a > o)$. 6

(c) If $\frac{(1+i)^{x+iy}}{(1-i)^{x-iy}} = \alpha + i\beta$ then 8

Considering only principal values S.T.

$$\tan^{-1}\left(\frac{\beta}{\alpha}\right) = \frac{\pi x}{2} + y \log 2$$

F.E (Old) (Sem I)

App. Physics-I

3/6/15

(OLD COURSE) **QP Code : 3102**

(2 Hours) **[Total Marks : 75**

Note:
1. Q.1 is compulsory.
2. Answer any FOUR from the Q. 2 to Q. 6.
3. Symbols have their usual meanings.
4. Assume suitable data wherever necessary.

Q.1 Attempt any FIVE of the following

(a) Define liquid crystals. List its different phases. [03]

(b) X rays of wavelength 0.97A° are incident on the planes having inter-planer spacing 4.08 A°. At what glancing angle first order brag reflection will occur? [03]

(c) Write Fermi-Dirac distribution function and explain the meaning of each term. Define Fermi energy. [03]

(d) Define Mobility of charge carriers. State its SI unit. [03]

(e) Describe Meissner effect. [03]

(f) Write down the Sabine's formula and average absorption coefficient, also explain meaning of terms in it. [03]

(g) Calculate the length of Ni rod needed to produce ultrasonic waves of frequency 80 KHz. Density is 8900 Kg/m^3 and Young's Modulus is 20.8 x 10^{10} N/m^2. [03]

Q.2 A Obtain the expression for inter-planer spacing between adjacent parallel planes in terms of Miller indices. [08]

B Explain Hall effect. A 2 cm wide and 1mm thick copper strip is placed in a magnetic field 1.5 Wb/m^2. If current of 200 mA is set up in the strip, calculate Hall voltage appears across the strip. (R_H = 6 x 10^{-4} m^3/sec) [07]

Q.3 A Describe the Type – I and Type – II superconductors. [08]

B Draw block diagram of CRO and explain various functions of it. [07]

Q.4 A Draw BCC unit cell. Obtain relation between atomic radius and lattice constant for it. [05]

B Explain how energy bands are formed in solid. [05]

C State acoustic requirements of good auditorium. [05]

Q.5 A Molybdenum has BCC structure. Its density is 1.02 x 10^4 Kg/m^3 and its atomic weight is 95.94. Determine the radius of Molybdenum atom. [05]

B With energy band diagram of unbiased P-N junction, explain the concept Barrier Potential and depletion region. [05]

C Explain the structure of naturally occurring quartz crystal. [05]

Q.6 A Describe X-ray diffraction experiment and obtain Bragg's law. [05]

B Explain DC and AC Josephson effect. [05]

C Find the depth of sea water from a ship on the sea surface if the time interval of 2 seconds is required to receive the signal back. Given that the temperature of sea water is 20° C and salinity 10 gm /lit. [05]

Q.7 A Explain Schottkey and Impurity defects. [05]

B Hall of dimension 20 x 15 x 5 cm^3 has the reverberation time 3.5 second. Calculate total absorption of surface and average absorption. [05]

C Explain construction and working of CRT. [05]

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