FE (CBGS) Semr-I - Environmental Studies → 09/06/2015

(REVISED COURSE) QP Code : **1031**

[2 Hours] [Total Marks: 60

N.B. : (1) Question no. **1** is **compulsory.**
(2) Answer any **three** from Question No. **2** to **6.**
(3) **Figures** to the **right** indicate **full** marks.
(4) Draw a neat labelled **diagram** wherever **necessary.**

1. Attempt any **five** from the following:— **15**
   (a) Discuss the sanitation status in developing countries
   (b) How is environmental education important for sustainable development?
   (c) What is acid rain? What are its effects?
   (d) What are the sources of noise pollution? Give its effects.
   (e) What is the role of Minstry of Environment and Forests in Environmental Legislation?
   (f) What is "Geothermal Energy"? Explain
   (g) Explain the term "Carbon Credit".

2. (a) What is "Appropriate Technology"? Explain. 5
   (b) Explain the construction and working of a "Venturi Scrubber". 5
   (c) State the principle and working of photovoltaic cell used for solar energy. 5

3. (a) Explain solid waste management by "Landfilling". 5
   (b) What types of Environmental clearances are required to setup an industrial unit? 5
   (c) Write a case study on Earthquake in Japan. 5

4. (a) Explain the classification of Ecosystem 5
   (b) What are the functions of central pollution control board? 5
   (c) What are the limitation of conventional sources of energy? 5

5. (a) Explain "resources utilization as per carrying capacity" 5
   (b) Discuss "Bhopal Gas Tragedy" 5
   (c) How is electricity generated by using wind energy. 5

6. (a) Discuss the global environmental crisis related to population. 5
   (b) Explain the treatment of industrial waste water. 5
   (c) Explain the role of technology in Environment and Health. 5

F.E.(Rev)(CBGS) Sem I. 3|6|15

Applied physics-I

Q.P. Code : **1027**

(REVISED COURSE)

(2 Hours) [Total Marks : 60

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions from question no. 2 to 6.
(3) **Use** suitable **data** wherever **required**.
(4) **Figures** to the **right** indicate **full** marks.

1. Attempt any five from the following : 15
   (a) Draw the following in a cubic unit cell
   $(0\ 1\ 2)$, $(1\ \bar{2}\ 3)$, $[1\ 2\ 1]$
   (b) Define the term space lattice, unit cell and lattice parameter.
   (c) Determine the lattice constant for FCC lead crystal of radius 1.746 A^0 and also find the spacing of (2 2 0) plane.
   (d) Define : drift current, diffusion current and mobility of charge carriers.
   (e) What is the probability of an electron being thermally promoted to conduction band in diamond at 27°C, if bandgap is 5.6 eV wide.
   (f) Why soft magnetic materials are used in core of transformers ?
   (g) Calculate the electronic polarizability of Ar. Given number of Ar atoms at NTP = $2.7 \times 10^{25}/m^3$ and dielectric constant of Ar = 1.0024.

2. (a) Show that for intrinsic semiconductors the Fermi level lies midway between the conduction band and the valence band. Draw the energy level diagram as a function of temperature for n-type of semi-conductor. 8
   (b) Cu has FCC structure. If the interplanar spacing d is 2.08 A^0 for the set of (111) planes. Find the density and diameter of Cu atom. Given atomic weight of Cu is 63.54. 7

3. (a) What is hysteresis ? Draw a hysteresis loop for ferromagnetic material and explain the various important points on it. For a transformer which kind of material will you prefer-the one with small hysteresis area or the big one ? 8
   (b) Derive Bragg's law. X-rays of unknown wavelength give first order Bragg's reflection at glancing angle of 20^0 with (2 1 2) planes of copper having FCC structure. Find the wavelength of X-rays, if the lattice constant for copper is 3.615 A^0. 7

4. (a) Discuss Diamond structure with neat diagram and also determine the effective number of atoms/unit cell, co-ordination number and atomic radius in terms of lattice constant. 5
   (b) Classify solids on the basis of energy band diagram. 5
   (c) Explain orientational polarization with suitable diagram and write the mathematical expression of orientational polarizability. 5

[TURN OVER

5. (a) Calculate the number of atoms per unit cell of a metal having the lattice parameter 2.9 A^0 and density 7.87 gm/cm^3. Atomic weight of metal is 55.85. Avogadro number is 6.023×10^{23}/gm mole. **5**

   (b) What is Hall effect ? Mention its significance. How mobility can be determined by using Hall effect ? **5**

   (c) The reverberation time is found to be 1.5 second for an empty Hall and it is found to be 1.0 second when a curtain cloth of 20m^2 is suspended at the centre of the Hall. If the dimensions of the hall are 10 x 8 x 6m^3 , calculate the coefficient of absorption of curtain cloth. **5**

6. (a) Describe principle, construction and working of magnetostriction oscillator to produce ultrasonic waves. **5**

   (b) Explain various point defects in crystals. **5**

   (c) Explain how a voltage difference is generated in a p-n junciton when it is used in a photovoltaic solar cell. **5**

F. E. Sem I CBGS
28/05/15 AC- I

(REVISED COURSE) Q.P. Code : **1020**

(2 Hours) [**Total Marks : 60**

N.B.: (1) Question **No.1** is **compulsory**.
(2) Answer **Any Three** questions from the remaining **Five** questions.
(3) **Figures** to the **right** indicate full marks.
(4) **All** questions carry equal **marks.**
Atomic weights : Ca = 40, Mg = 24, C = 12, 0 = 16, H = l, N = 14, S = 32, Na = 23, Cl = 35.5, Si = 28.

1. Attempt any Five from the following: **15**
   (a) Differentiate between temporary and permanent hardness.
   (b) Explain Glass transition temperature of polymer and its significance.
   (c) Define lubrication and give functions of lubricant.
   (d) Define Phase, Component and Degree of freedom.
   (e) Write the preparation, properties and uses of Dolomite bricks.
   (f) Give the preparation, properties and uses of Buna- S.
   (g) Calculate all types of hardness of water sample containing:
   $Ca(HCO_3)_2$ = 81 ppm, $MgSO_4$ = 60 ppm, $MgCO_3$ = 42 ppm, $Ca(NO_3)_2$ = 82 ppm.

2. (a) A water sample has the analytical report as under: **6**
   $MgCO_3$ = 84 ppm, $CaCO_3$ = 40 ppm, $CaCl_2$ = 55.5 ppm, $Mg(NO_3)_2$ = 37 ppm, KCl = 10 ppm. Calculate lime & soda required for softening 1 litre of water.
   (b) State Gibb's phase rule. Give its application to one component system. **5**
   (c) What are refractories ? Give the preparation, properties and uses Carborundum bricks. **4**

3. (a) Define and give the significance of the following properties of lubricants: **6**
   (i) Flash point.
   (ii) Pour point.
   (iii) Viscosity Index.
   (b) Explain Compounding of plastics. (five ingredients) **5**
   (c) What is a Condensed phase systems. Draw the phase diagram of an Ag-Pb system with proper labelling. **4**

4. (a) Write the preparation, properties and applications of Bakelite. **6**
   (b) Write note on Ultra filtration and Reverse osmosis. **5**
   (c) 0.5 g of an oil is saponified with 50 ml of alcoholic KOH solution. **4**
   After refluxing the mixture, it required 22 ml of 0.1 N HCl solution.
   Find the Saponification value of given sample.

5. (a) Explain manufacturing of Portland cement (wet process) with a labelled diagram of a rotary kiln. **6**

   (b) Define Fabrication. Explain Compression moulding with labelled diagram. **5**

   (c) A Zeolite softener was regenerated by passing 200 litre of NaCl solution, containing 50g / litre of NaCl. How many litre of water of hardness 50 ppm can be softened by this softener. **4**

6. (a) Describe Zeolite method with a labelled diagram. **6**

   (b) Give the preparation and applications of any two of the following: **5**

   (i) PMMA

   (ii) Kevlar and

   (iii) Silicone rubber.

   (c) Under which conditions use of semi solid lubricants is preferred. **4**

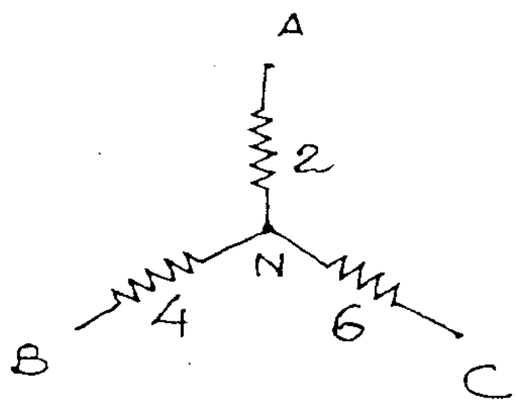
F.E. Sem.I (CBGS) M/J-2015 BEE 22/5/2015

(REVISED COURSE) QP Code : **1015**

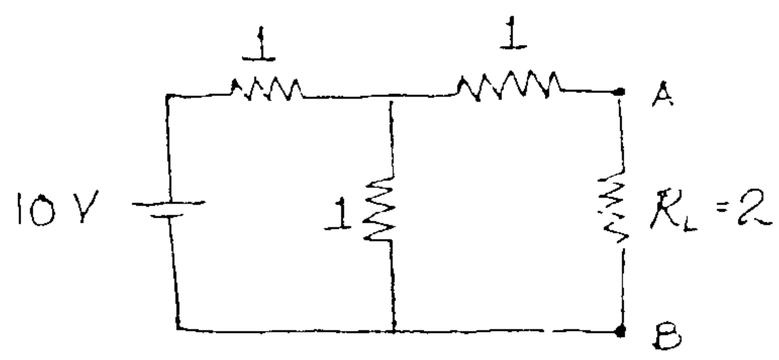
(3 Hours) [Total Marks : 80

N.B. : **(1)** Question no. 1 is **compulsory.**
(2) Attempt any **three** questions from the remaining **five.**
(3) **Figures** to the **right** indicate **full** marks.
(4) Wherever **not** mentioned **values** of resistance is in **ohms.**
(5) **Assume** suitable **data** if **necessary.**

1. (a) Convert the star circuit into its equivalent delta circuit. 3



(b) For the given circuit find the Norton equivalent between points A and B. 3



(c) Draw an a.c. waveform, indicate there on and explain (i) instantaneous value, (ii) peak value and (iii) time period for one cycle of the alternating quantity 3

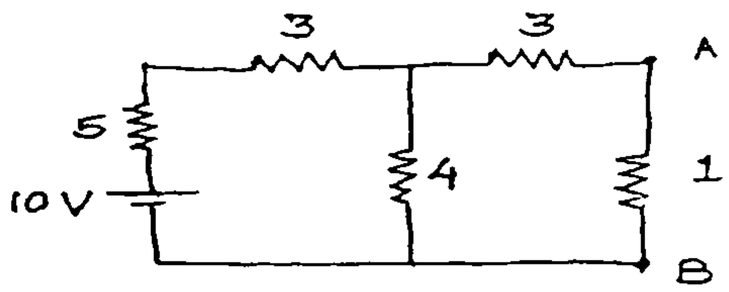
(d) Differentiate between series and parallel resonance with respect to 3
(i) Impedance at resonance
(ii) Current at resonance
(iii) Magnification factor

(e) Draw the phasor diagram for 3 phase delta connected load with a lagging power factor. Indicate line and phase voltage and currents. 2

(f) Derive the emf equation for a single phase transformer. 4

(g) Draw a neat circuit diagram for a full wave bridge rectifier using 4 diodes and the corresponding input and output waveforms for voltage. 2

2. (a) Find the current through 1Ω resistance using Mesh Analysis. 6



(b) A coil having a resistance of 10Ω and an inductance of 40 mH is connected to a 200V, 50 Hz supply. Calculate the impedance of the coil, current, power factor and power consumed. 8

(c) Draw the phasor diagram of a transformer on no load and explain the various currents and voltages in it. 6

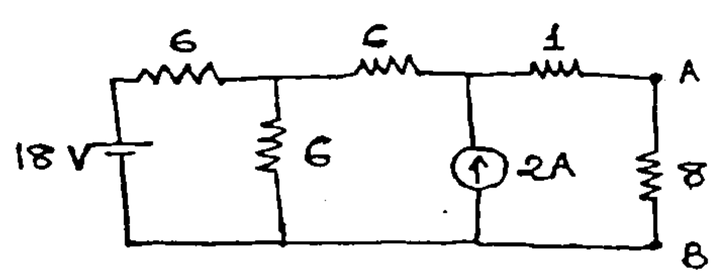
3. (a) Three similar coils each having a resistance of 10Ω and inductance of 0.04 H are connected in star across a 3 phase, 50 Hz, 200V supply. Calculate the line current, total power absorbed, reactive volt amperes and total volt amperes. 8

(b) With the help of a neat diagram explain how short circuit test is conducted on a single phase transformer 6

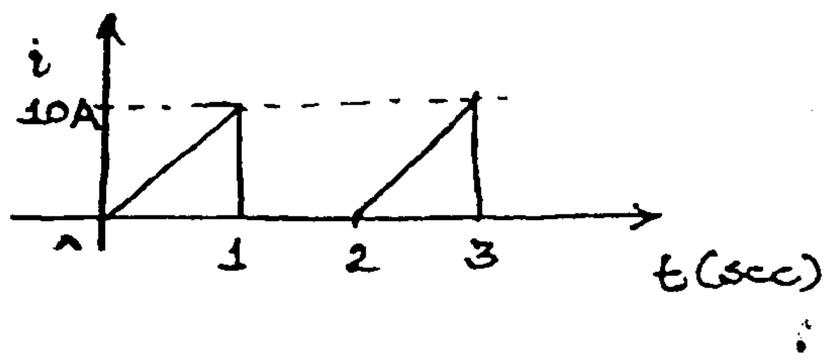
(c) Draw the circuit diagram of a full wave centre tapped rectifier with capacitor filter and the corresponding input and output waveforms. 2

(d) With the help of a neat diagram explain the output characteristics of an NPN transistor in common emitter configuration 4

4. (a) Using source transformation find the current flowing through the 8Ω resistance 7



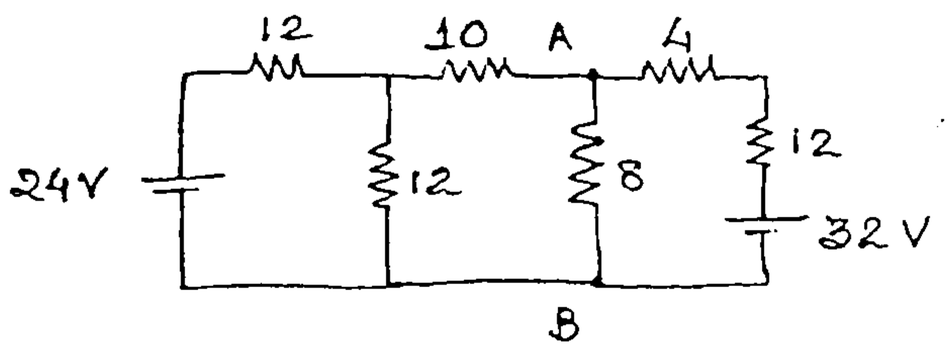
(b) Find the rms value for the given waveform 5



(c) Two wattmeters are used to measure power in a 3ϕ balanced delta connected load using two wattmeter method. The readings of the 2 wattmeters are 500 W and 2500W respectively. Calculate the total power consumed by the 3ϕ load and the power factor 4

(d) With the help of a neat circuit diagram and input and output waveforms explain the working of a half wave rectifier. 4

5. (a) Find the current through 8Ω resistance using Thevenin's theorem 8



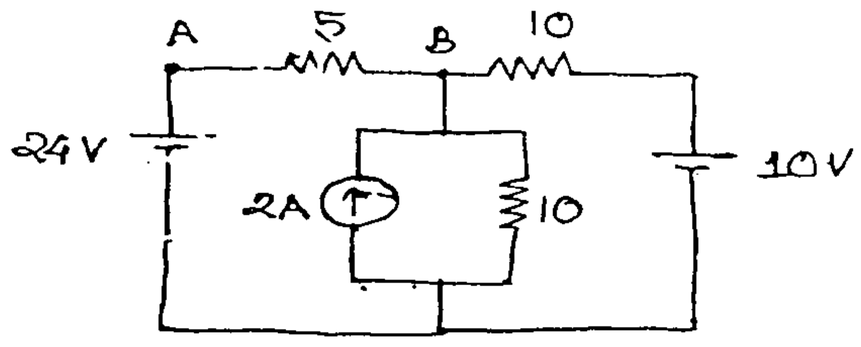
(b) A resistance of 10Ω and a pure coil of inductance 31.8 mH are connected in parallel across 200V, 50 Hz supply. Find the total current and power factor. 4

(c) A 5kVA, 1000/200V, 50 Hz, single phase transformer gave the following test results. 8

OC test (hv side):	1000V	0.24 A	90W
SC test(hv) side:	50V	5A	110W

Calculate the equivalent circuit parameters of the transformer and draw the equivalent circuit diagram.

6. (a) Find the value of current flowing through the 5Ω resistance using superposition theorem. 7



(b) A series RLC circuit has the following parameter values: R= 10Ω , L=0.014H, C= 100μF Compute the resonant frequency, quality factor, bandwidth, lower cut-off frequency and upper cut-off frequency. 7

(c) With the help of a neat circuit diagram and phasor diagram explain the 2-wattmeter method to measure power in a 3ϕ balanced star connected load. 6

F.E(Rev) (CBGS) · Engg. Mechanics 18/5/15 ·
Sem I

(REVISED COURSE) Q.P. Code : **1009**

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **three** questions from remaining.
(3) **Each** full question carries **20** marks.
(4) Assume suitable date, if needed & state it clearly.
(5) Take $g = 9.81\ m/s^2$

Q. 1) a) The guy cables AB & AC are attached to the top of the transmission tower as shown in figure 1. The tension in cable AC is 8 kN. Determine the required tension T in cable AB such that the net effect of the two cable tensions is a downward force at point A. Determine the magnitude R of this downward force. **4**

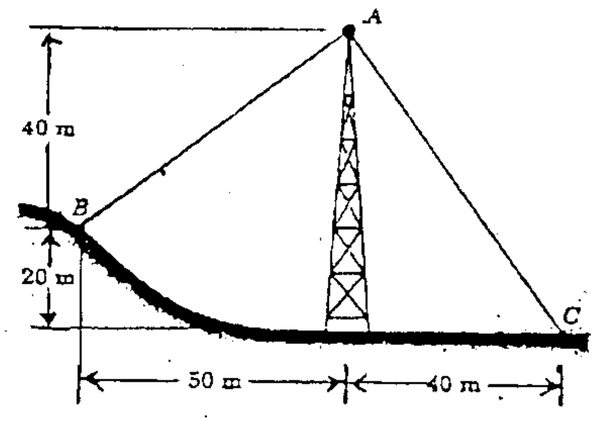


Fig. 1

b) Determine the tensions in cords AB & BC for equilibrium of 30 kg block (Fig. 2). **4**

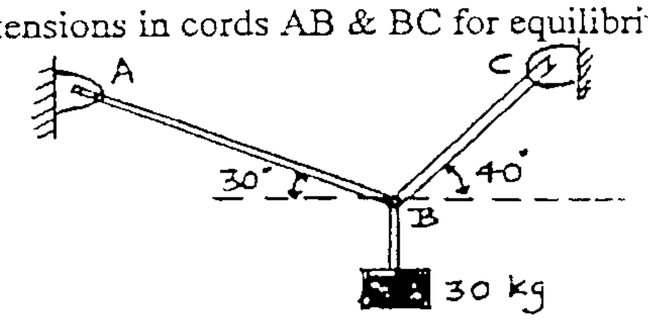


Fig. 2

c) A paint box weighing 9 kg is kept on a wooden block weighing 1.2 kg (Fig. 3). Determine the magnitude & direction of the friction force exerted by the roof surface on wooden block & normal force exerted by the roof on the wooden block. **4**

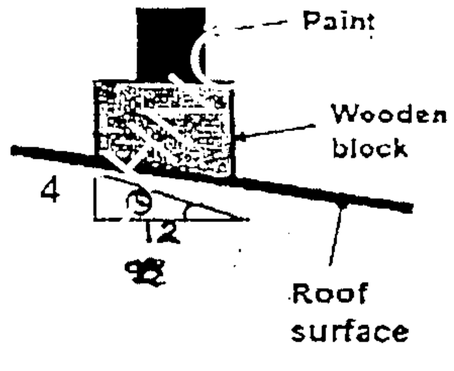


Fig. 3

d) Two cars start towards each other from stop X & stop Y at 1:36 PM, the first car reaches stop Y, travelling 8 km path, at 1:44 PM. Second car reaches stop X at 1:46 PM. If they move at uniform velocity, determine their time of meeting & their distance from stop X. **4**

e) The 550 N box (Fig. 4) rests on a horizontal plane for which the coefficient of kinetic friction $\mu_k = 0.32$. If the box is subjected to a 400 N towing force as shown, find the velocity of the box in 4 seconds starting from the rest. **4**

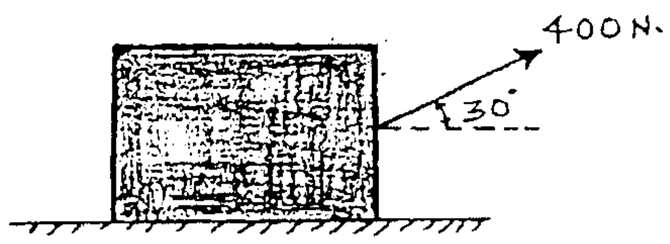


Fig. 4

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Q. 2) a) Replace the force system (Fig. 5) by a single force w. r. to pint C. 6

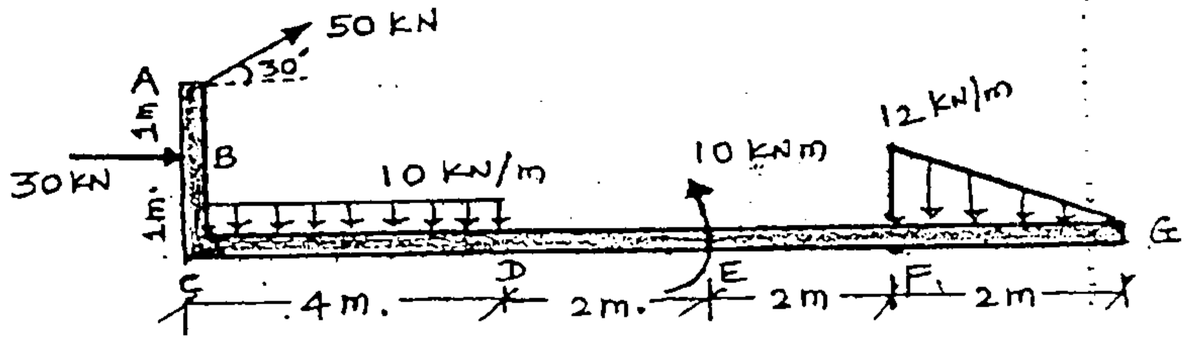

Fig. 5

b) A bar of 3 m. length & negligible weight rests in horizontal position on two smooth inclined planes (Fig. 6). Determine the distance x at which the load Q = 150 N should be placed from point B to keep the bar horizontal. 8

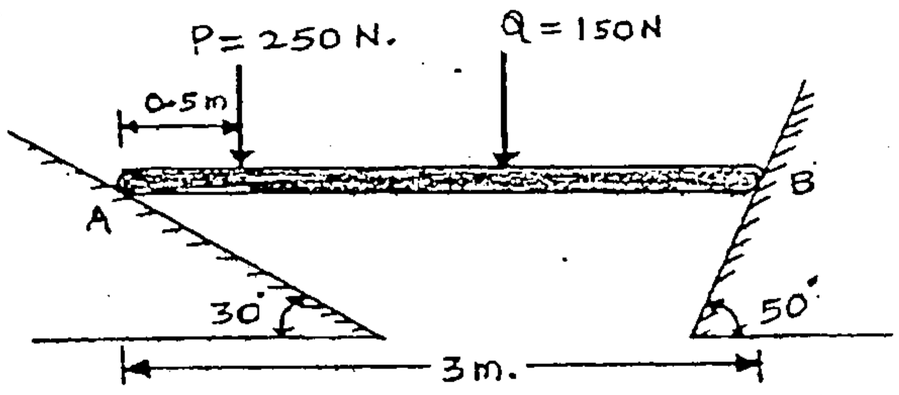

Fig. 6

c) Define the terms with neat sketches: Direct impact, oblique impact & line of impact. 6

Q. 3) a) Locate the centroid of the shaded portion w. r. to ox & oy axes (Fig. 7). 8

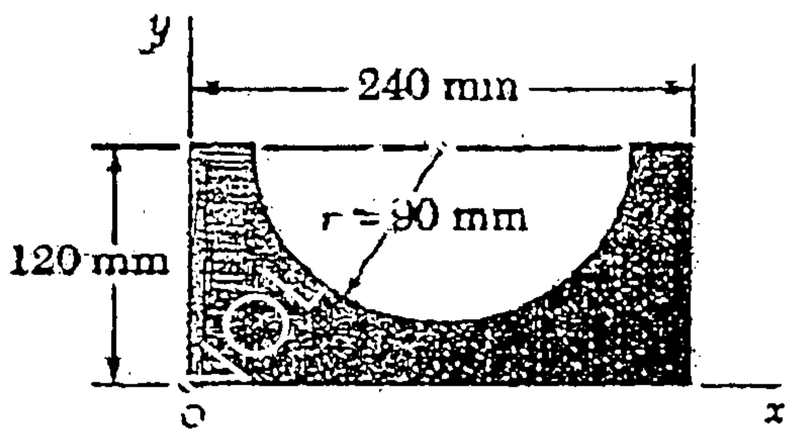

Fig. 7

b) A force $\bar{F} = 80i + 50j - 60k$ passes through a point A(6,2,6). Compute its moment about point B(8,1,4). 6

c) The platform P (Fig. 8) has negligible mass & is tied down so that the 0.4 m long cords keep a 1 m long spring compressed to 0.6 m. when nothing is on the platform. If 4 kg block is placed on the platform & released from rest after the platform is pushed down 0.1 m., find the maximum height 'h' the block rises in the air, measured from the ground. Use Work & Energy Principle. 6

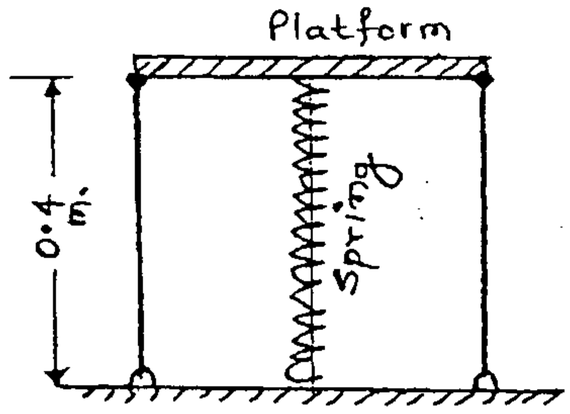

Fig. 8

Q. 4) a) Find the support reactions for the beam (Fig. 9). 8

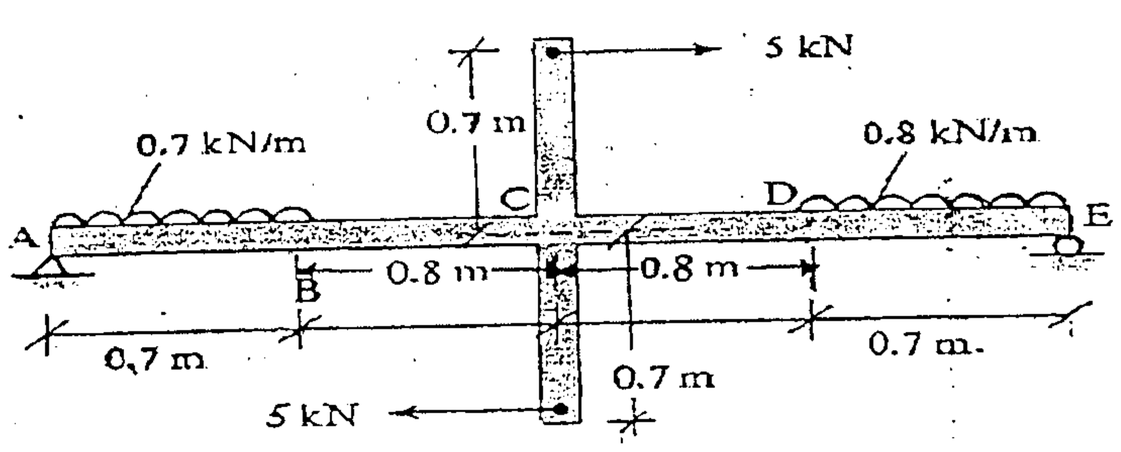

Fig. 9

b) Fig. 10 shows the v-t diagram for the motion of a train as it moves from station A to station B. Draw a-t graph & find the average speed of the train & the distance between the stations. 6

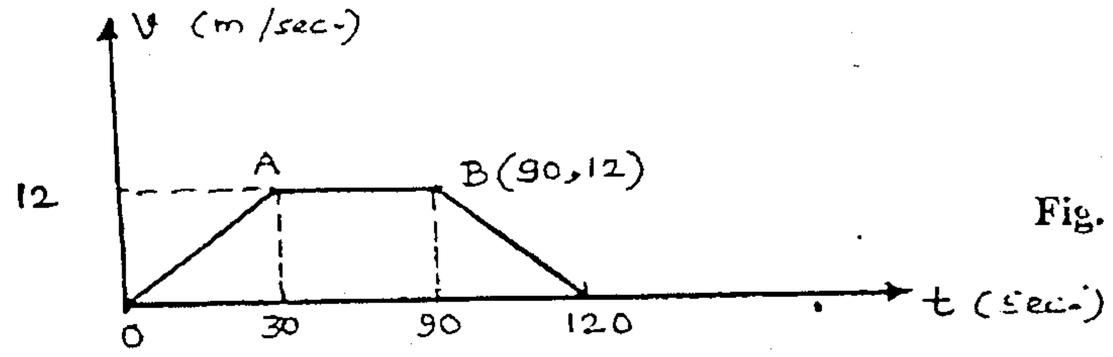

Fig. 10

c) A wheel is attached to the shaft of an electric motor of rated speed of 1740 RPM. When the power is turned on, the unit attains the rated speed in 5 seconds & when the power is turned off, the unit comes to rest in 90 seconds. Assuming uniformly accelerated motion, determine the number of revolutions the unit turns: i) to attain the rated speed & ii) to come to rest. 6

Q. 5) a) Using method of joints, find the forces in truss members (Fig. 11). 8

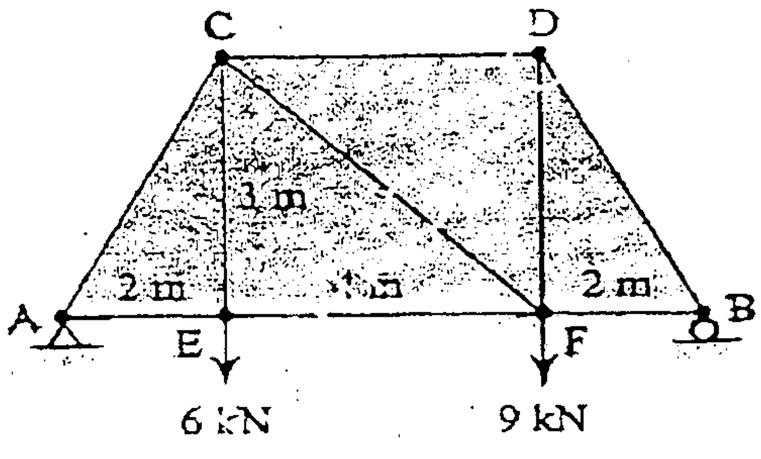

Fig. 11

b) The y coordinate of a particle is given by $y = 6t^3 - 5t$. If $a_x = 14t$ m/sec^2 & $v_x = 4$ m/sec at $t = 0$, determine the velocity & acceleration of particle when $t = 1$ second. 6

c) For crank of concentric mechanism shown in fig. 12, determine the instantaneous centre of rotation of connecting rod at position shown. The crank OQ rotates clockwise at 310 RPM. Crank length = 10 cm, connecting rod length = 50 cm. Also find the velocity of P & angular velocity of rod at that instant. 6

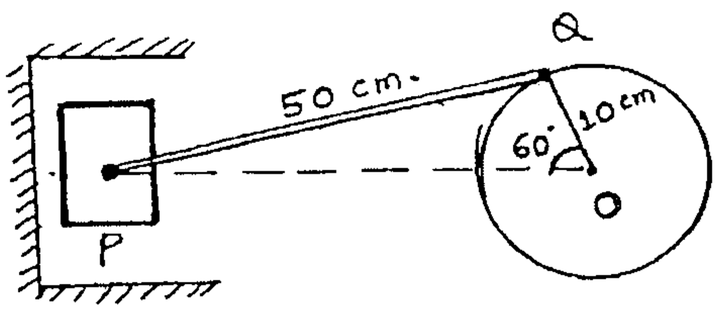

Fig. 12

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Q. 6) a) Discuss the resultant of concurrent forces in space. 4

b) A ladder of 4 m length weighing 200 N is placed as shown in fig. 13. $\mu_B = 0.25$ & $\mu_A = 0.35$. Calculate the minimum horizontal force to be applied at A to prevent slipping. 8

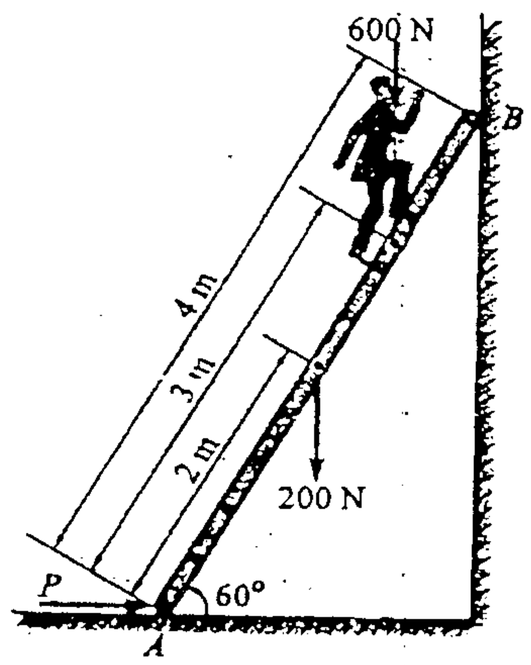

Fig. 13

c) With what minimum horizontal velocity (u) can a boy throw a rock at A & have it just clear the obstruction at B? Refer fig. 14. 4

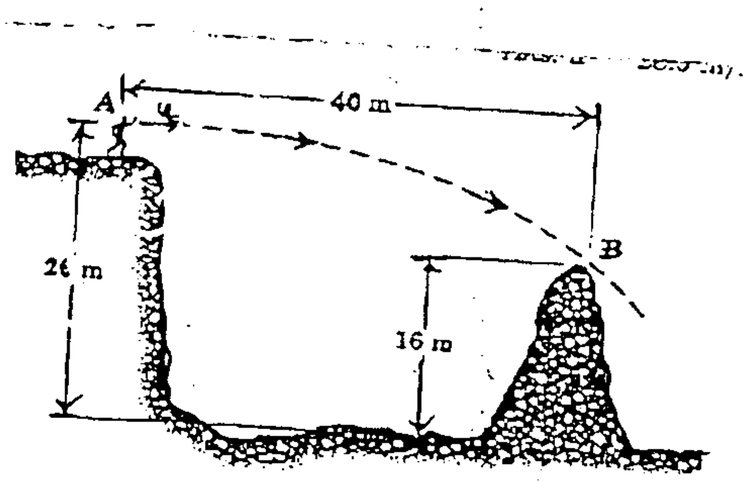

Fig. 14

d) Two masses of 60 N. & 30 N. are positioned over frictionless & massless pulley (Fig. 15). If the 60 N. mass is released from rest, find the speed at which the 60 N. mass will hit the ground. 4

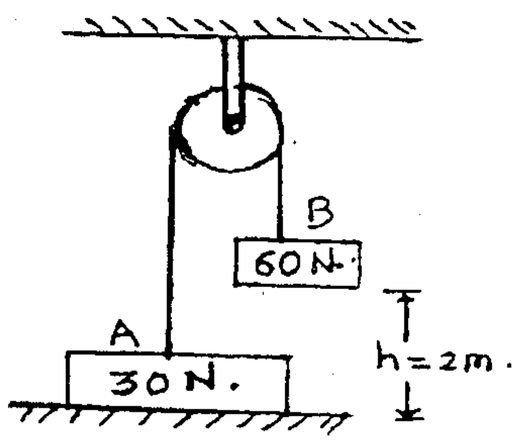

Fig. 15

F.E. (Rev)(CBGS) Sem I. M-2015
App. Maths-I. 12/5/15

QP Code : **1002**

(REVISED COURSE)

(3 Hours) [Total Marks : 80

N. B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **three** questions from remaining.
(3) Assume suitable data if necessary.

1. (a) If $\tan \frac{x}{2} = \tanh \frac{u}{2}$ then S.T. **3**

$$u = \log \tan \left(\frac{\pi}{4} + \frac{x}{2} \right)$$

(b) If $u = x^y$ find $\frac{\partial^3 u}{\partial x \, \partial y \, \partial x}$ **3**

(c) If $ux = yz$, $vy = zx$, $wz = xy$ **3**

find $J\left(\frac{u, v, w}{x, y, z} \right)$

(d) If $y = (x-1)^n$ then P.T. $y + \frac{y_1}{1!} + \frac{y_2}{2!} + \frac{y_3}{3!} + \ldots \frac{y_n}{n!} = x^n$ **3**

(e) P.T. $\sinh x = X + \frac{x^3}{3!} + \frac{x^5}{5!} + \frac{x^7}{7!} +$ **4**

(f) Express the matrix A as sum of Hermition and skew Hermition matrix where **4**

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

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

(b) Reduce the matrix A to normal form and hence find its rank where **6**

$$A = \begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 4 & 3 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$$

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(c) State and prove Euler's theorem for three variables and hence find 8

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

$$u=\frac{x^3y^3z^3}{x^3+y^3+z^3}$$

3. (a) Solve the following system of equations 6

$2x - 2y - 5z = 0$
$4x - y + z = 0$
$3z - 2y + 3z = 0$
$x - 3y + 7z = 0$

(b) Find the maximum and minimum values 6
of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$

(c) Separate into real and imaginary parts of $\tanh^{-1}(x + iy)$ 8

4. (a) If $u = 2xy$, $v = x^2 - y^2$ and 6
$x = r\cos\theta$, $y = r\sin\theta$ then find

$$\frac{\partial(u_1 v)}{\partial(\partial_1 \theta)}$$

(b) If $i^{i^{i^{\cdots^{\infty}}}} = A + iB$, prove that 6

$$\left(\frac{\pi A}{2}\right)=\frac{B}{A} \quad \text{and } A^2 + B^2 = e^{-\pi B}$$

(c) Solve by crouts method the system of equations 8
$3x + 2y + 7z = 4$
$2x + 3y + z = 5$
$3x + 4y + z = 7$

5. (a) By using De Moiverse thm 6
Express $\frac{\sin 7\theta}{\sin\theta}$ in powers of $\sin\theta$ only.

(b) By using Taylor's series expand $\tan^{-1} x$ in positive powers of $(x-1)$ upto 6
first four non-zero terms.

(c) If $y = \sin[\log(x^2 + 2x + 1)]$ prove that 8
$(x + 1)^2 y_{n+2} + (2n+1)(x+1) y_{n+1} + (n^2 + 4)y_n = 0$

6. (a) Determine linear dependance or independance of vectors **6**
$x_1 = [1, 3, 4, 2]$ $x_2 = [3, -5, 2, 6]$
$x_3 = [2, -1, 3, 4]$ and if dependent find the relation between them.

(b) If $u = x^2 - y^2$, $v = 2xy$ and $z = f(u, v)$ prove that **6**

$$\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = 4\sqrt{u^2 + v^2}\left[\left(\frac{\partial z}{\partial u}\right)^2 + \left(\frac{\partial z}{\partial v}\right)^2\right]$$

(c) (i) Evaluate $\lim_{x \to 0} \frac{\sin x.\sin^{-1} x - x^2}{x^6}$ **4**

(ii) Fit straight line to the following data **4**
$(x, y) = (-1, -5), (1, 1), (2, 4), (3, 7), (4, 10)$
Estimate y when $x = 7$
