B. Tech Degree I&II Semester(Combined) Examination, June 2008

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 104 ENGINEERING MECHANICS

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer ***ALL*** questions)
(All questions carry ***EQUAL*** marks)

(8 x 5 = 40)

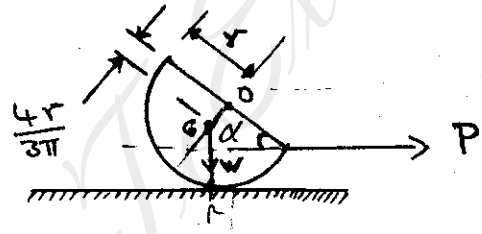
I. (a) Explain Principle of transmissibility of force and Law of superposition.
(b) State and prove Pappus theorem.
(c) Derive expression for Polar Moment of Inertia of a circle of diameter 'd' with respect to its centre.
(d) Explain Principle of Virtual work.
(e) Prove that the trajectory of a projectile is parabolic.
(f) Explain principle of conservation of momentum in case of impact of bodies.
(g) Derive a formulae for equivalent length of a Compound Pendulum.
(h) What is "Centre of Percussion"? Obtain an expression for distance between centre of percussion and rotating axis of a rigid body, considering $x-axis$ through the cetnre of gravity of the rotating body.

PART B

(All questions carry ***EQUAL*** marks)

(4 x 15 = 60)

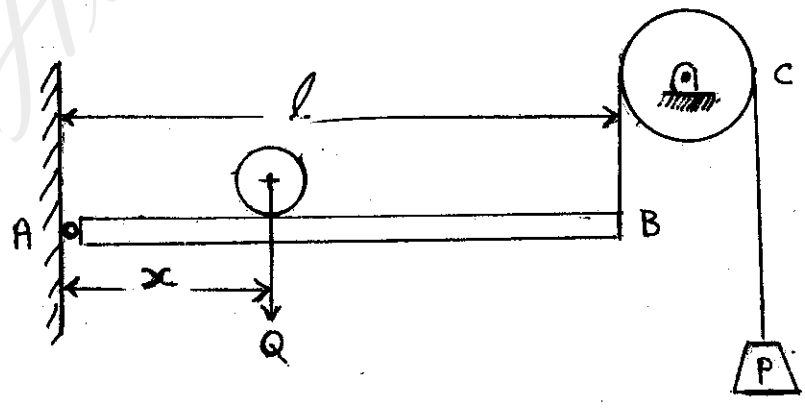
II. A semicircular disc of radius 'r' and weight 'w' rests on a horizontal surface and is pulled at right angles to its geometric axis by a horizontal force 'P' applied as shown in figure.



Find the angle 'α' that the flat surface of disc will make with the horizontal just before sliding begins. Coefficient of friction is 'μ'. The weight 'w' is acting at the centre of gravity.

OR

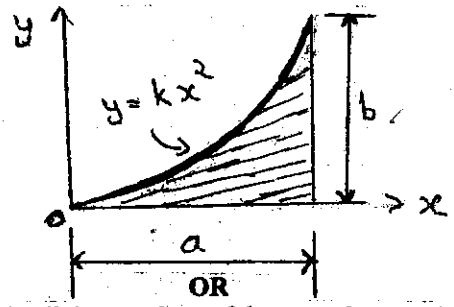
III.



A beam AB is hinged at 'A' and supported at B by a vertical cord which passess over a frictionless pulley at C and carries at its end a load P as shown. Determine the distance 'x' from 'A' at which a load Q must be placed on the beam if it is to remain in equilibrium in a horizontal position. Neglect the weight of beam. If proportion of distance $x:\ell$ is 1: 6 and P = 10 N find load at 'Q'.

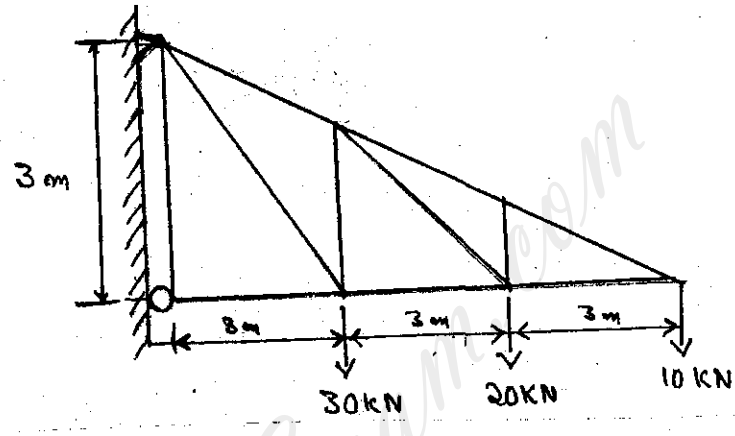
(Turn Over)

IV. Find moment of inertia about x axis.



OR

V. Find out the forces in all the members of the truss shown using the method of joints.



VI. A particle is projected from origin 'O' with a velocity of 120 m/s at an elevation of 60° to the horizontal. At some position 'P', it has a velocity in a direction making an angle of 30° with the horizontal. Determine the velocity of the particle at 'P' co-ordinates of P and the distance OP.

OR

VII. A car traveling at 40 Kmph sights a distant signal at 150 m. and comes uniformly to rest at the signal. It remains at rest for 20 s. As allowed by the signal, it uniformly accelerate and attain 40 Kmph in 250 m. Calculate the time lost due to signal.

VIII. A steam turbine is running at 2400 rev/minute. On shutting off steam, it slows down and comes to rest in 4 minutes. If the angular retardation is uniform, find its magnitude in rad/s^2 and also the number of revolution made by the turbine before coming to rest.

OR

IX. A slender prismatic bar AB of weight 'W' = 36 N is free to rotate in a vertical plane about a fixed axis through 'O'. The bar is released from rest in the unstable position of equilibrium and falls into the horizontal position $A'B'$, where it is brought to rest by two identical springs having constant 'K'. If the spring A is compressed 1.27 cm before the bar come to rest, what is the spring constant?