Code No: R07A10101

R07

I B.Tech Examinations,May/June 2012
APPLIED MECHANICS
Civil Engineering

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. A stone is thrown vertically upward with a velocity of 29.4 m/sec, from the top of a tower of 49 m height. Calculate,

   (a) Time required for the stone to reach the ground.

   (b) Maximum height to which the stone will rise in it's flight.   [16]

2. A beam of length 10 m carries two loads of mass 200 kg at a distances of 3 m from each end together with a central load of mass 1000 kg. Calculate the frequency of transverse vibrations. Neglect the mass of the beam and take I = 10^9 mm^4 and E = 205×10^3N/mm^2.   [16]

3. The rotar of a electric motor is rotating at a speed of 720 rpm. When the steam supply is suddenly cut off, it is observed that 5 min are required for the rotar to come to rest. Assuming uniformly accelerated motion determine

   (a) the angular acceleration and

   (b) the total number of revolutions.   [16]

4. (a) Explain free body diagram.

   (b) Two cylinders of diameters 100 mm and 50 mm, weighing 200 N and 50 N respectively are placed in a trough as shown in figure 1. Neglecting friction, find the reactions at contact surfaces 1,2,3, and 4.   [4+12]

5. (a) Determine the width of a 11 mm thick leather belt required to transmit 25 kW from a motor running at 1000 r.p.m. The diameter of the driving pulley of the motor is 400 mm. The driven pulley runs at 300 r.p.m and the distance between the centre of two pulleys is 4 metres. The density of the leather is 900 kg/m^3. The maximum allowable stress in the leather is 1.5 MPa. The coefficient of friction between the leather and pulley is 0.3. Assume open belt drive and neglect the sag and slip of the belt.

   (b) State the differences between flat belt and V-belt, give applications.   [12+4]

6. A sheet metal is cut and bent as shown in figure 2. Determine the mass moment of inertia about x axis, if the density of material is 16 kg/m^3.   [16]

7. (a) Determine the coordinates of the centroid of the plane area shown in figure 3 with reference to the axes shown. Take x = 40 mm.

   (b) Determine the product of inertia of a rectangle about their edges using parallel axes theorem.   [12+4]
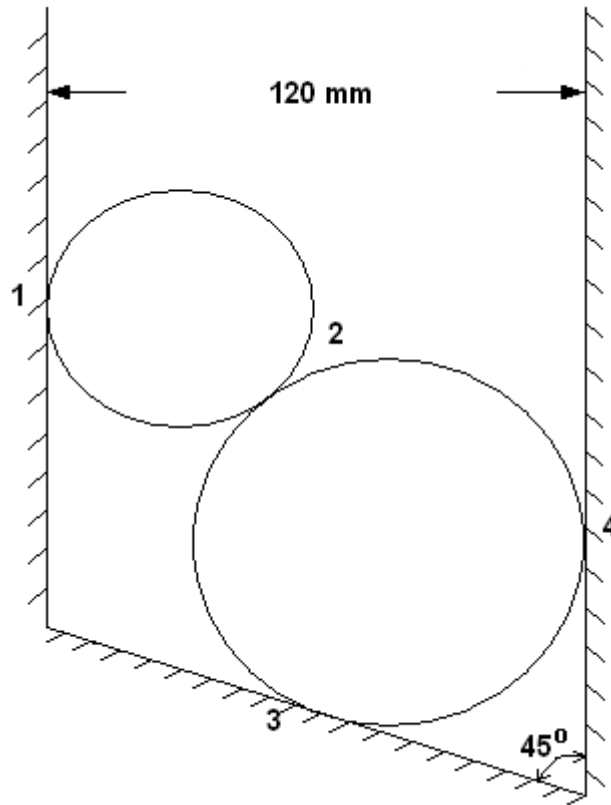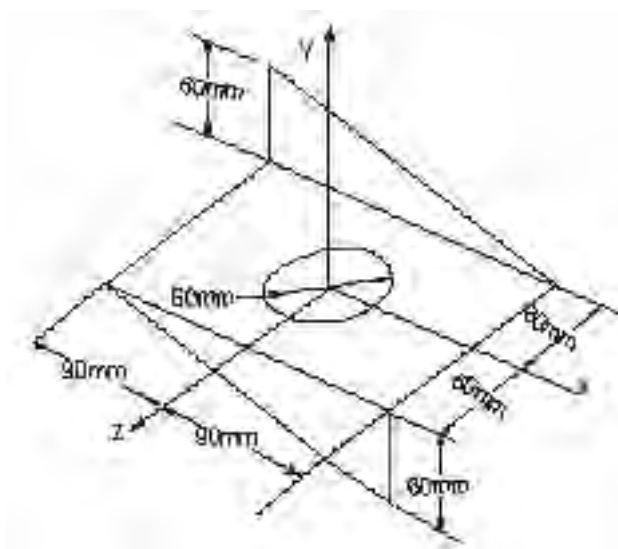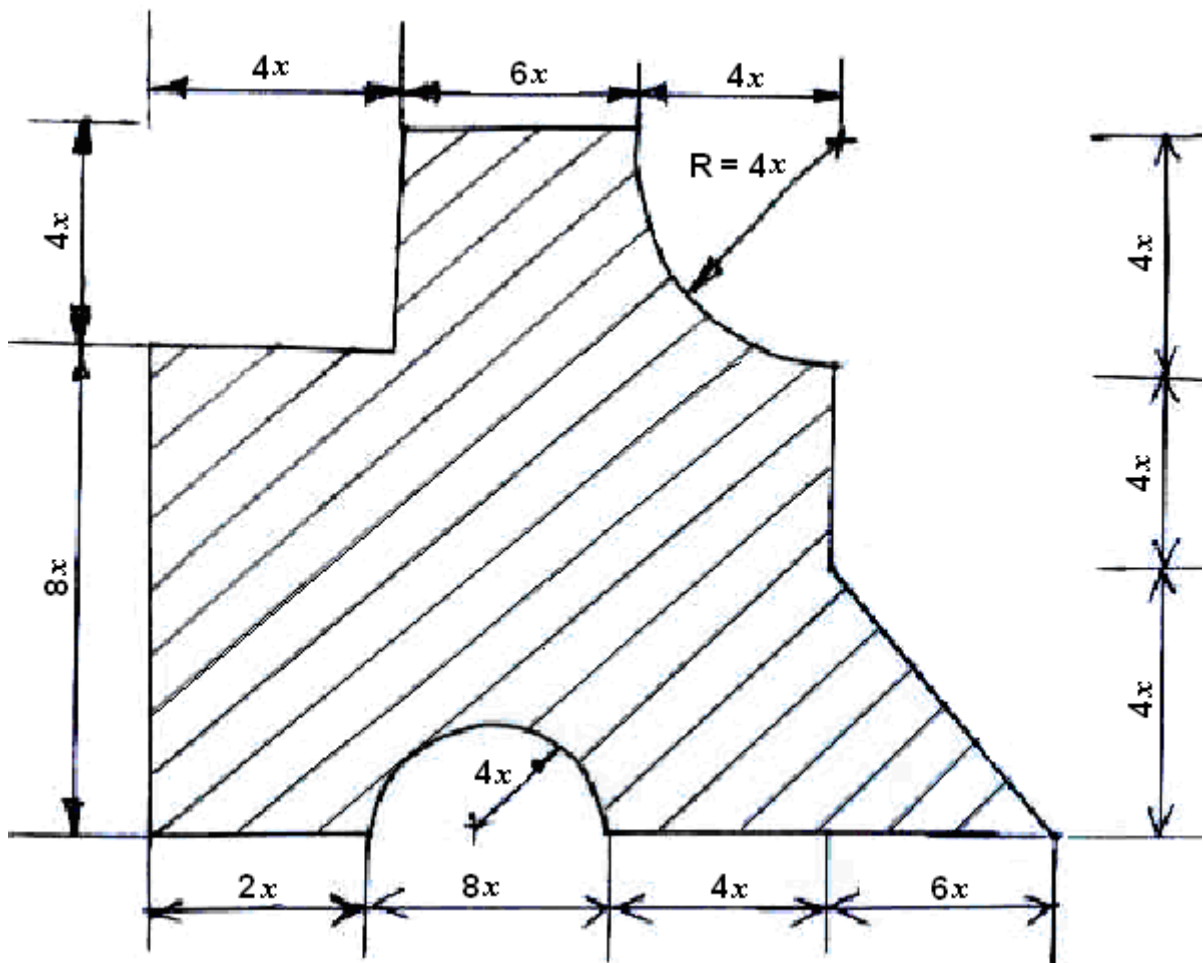
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Figure 1:

Figure 2:

Figure 3:

8. (a) A screw jack requires a force F applied at a radius on a handle to lift a load W on top of it. Determine the effort for raising the load for a helix angle α for the screw and coefficient of friction μ. Would the effort be different for lowering the load?

(b) The force required to pull a body of weight 80 N on a rough horizontal plane is 25 N. Determine the coefficient of friction.   [12+4]

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