Code No: 09A1BS05 **R09** **Set No. 2**

I B.Tech Examinations,December-January, 2011-2012
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT, MIM, MIE
Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the forces in all the members of the truss shown in the figure 1 (All forces are in kN). [15]

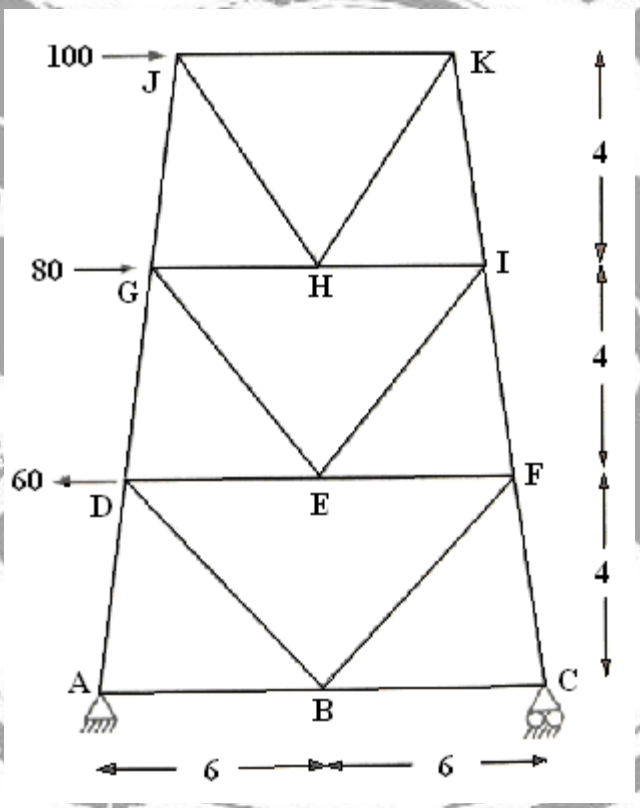

Figure 1:

2 . The motion of a disk rotating about of a fixed point is given by the relation $\theta = 2(1 + e^{-3t})$ where θ is in radius and 't' is in seconds. Determine the angular coordinates, velocity and acceleration of the disk when

(a) t =0 and

(b) t = 2 secs. [15]

3. A 3000 N sphere shown in figure 3 is supported by the pull P and 2000 N weight passing over a friction less pulley. If $\alpha = 30^0$. Calculate the values of P and θ. [15]

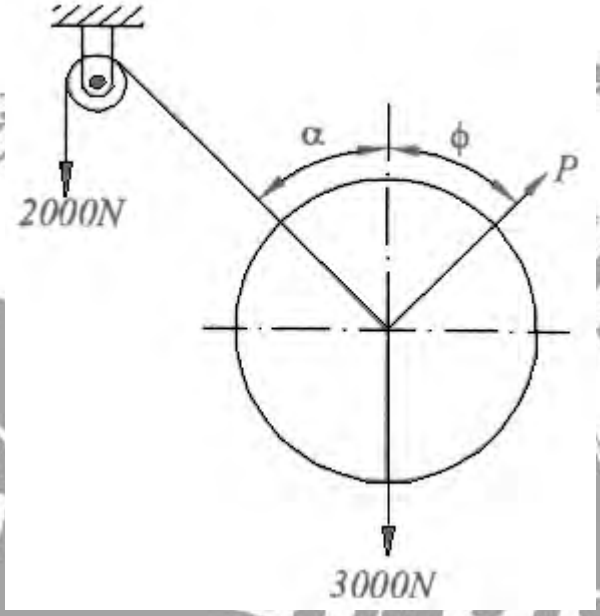

Figure 3:

4. A weight of 100 N is raised by two frictionless pulleys of the same diameter shown in the figure 4. Determine the effort P required to hold the weight in equilibrium using the method of virtual work [15]

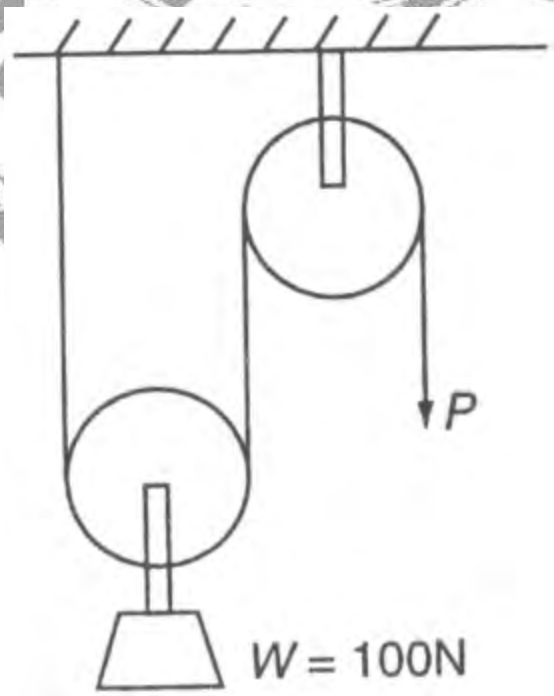

Figure 4:

5. What is the magnitude of 100 N force initiating from A to B as shown in figure 5?
   (a) About point C
   (b) About origin O. [15]

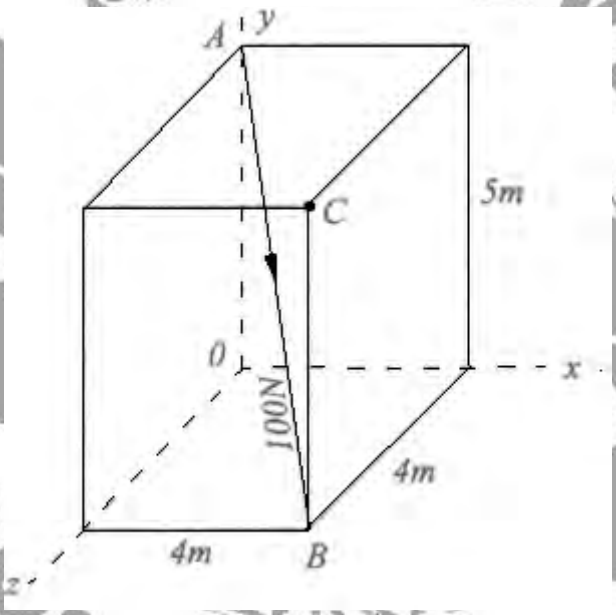

Figure 5:

6. (a) Find the centroid of the shaded figure 6 shown.

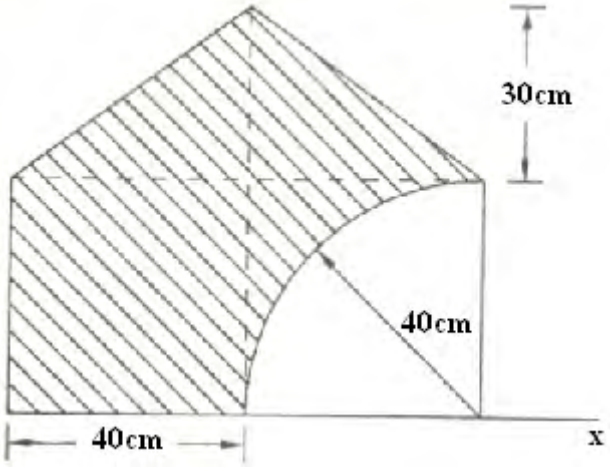

Figure 6:

(b) Determine the centroid of the shaded area, which is bounded by straight lines and a circular are as shown in figure 6. [7+8]

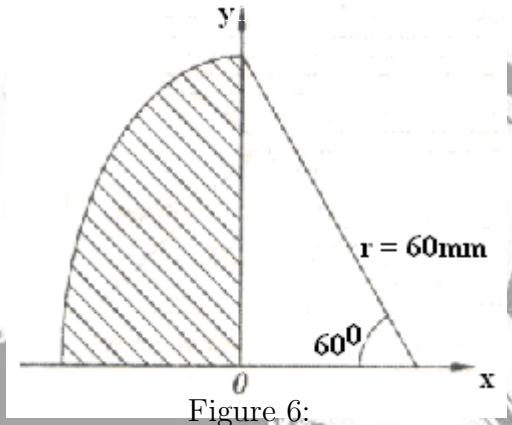

Figure 6:

(b) Determine the centroid of the shaded area, which is bounded by straight lines and a circular are as shown in figure 6.

7. Find the moment of inertia and radius of gyration the horizontal centroidal axis as shown in figure 7. All dimensions are in mm. [15]

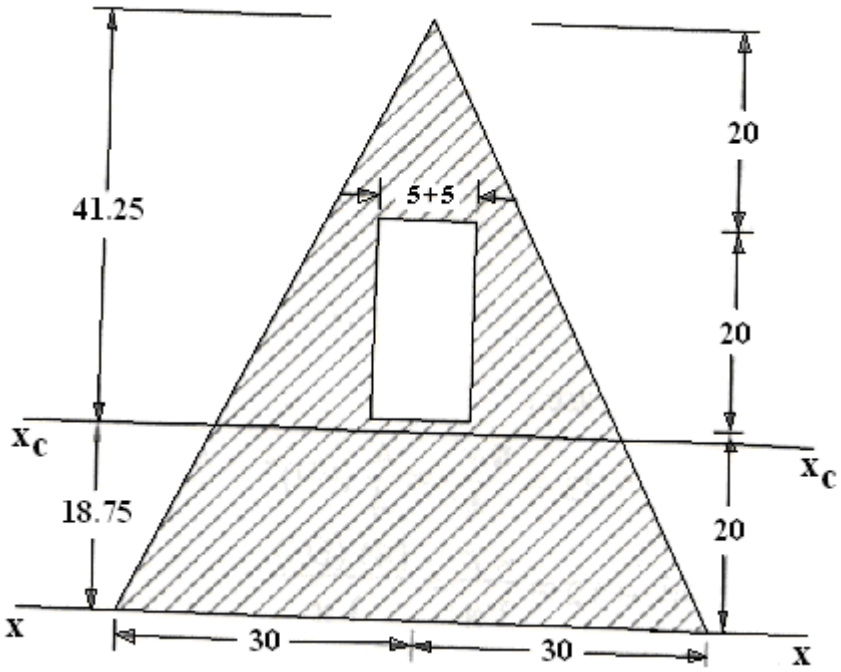

Figure 7:

8. A horizontal force of 480N is used to push a 150 kg box by 4.00m on a rough horizontal surface. If the box moves at a constant speed, find:

   (a) Work done by 470 N force.

   (b) Energy lost due to friction and

(c) Coefficient of kinetic friction. [15]

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Code No: 09A1BS05 **R09** **Set No. 4**

I B.Tech Examinations,December-January, 2011-2012
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT, MIM, MIE
Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. The double pendulum shown in figure 1 consists of two rods of length 2L and L having weight 2w and w respectively. If the rods are held in position by a horizontal force P. What is the virtual work if θ_1 varies by $\delta\theta_1$ *and* θ_2 is fixed. [15]

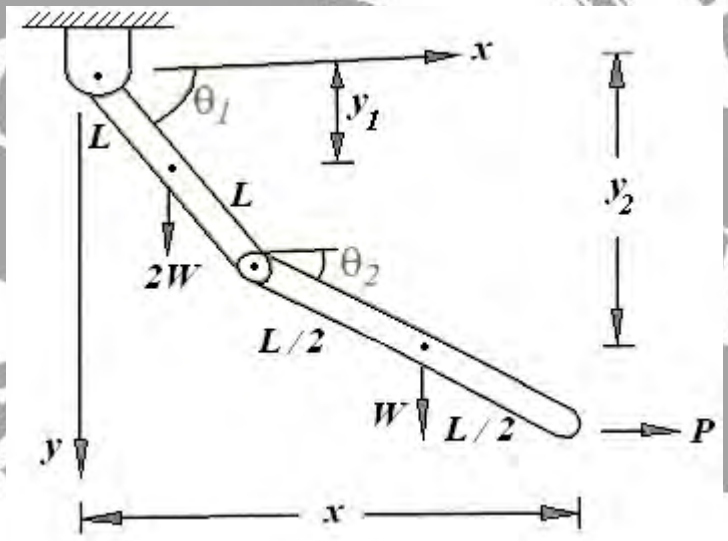

Figure 1:

2. A flywheel which is at rest attains a constant speed of 300 rpm after accelerating uniformly for 10 seconds. Determine the number of revolutions made by the fly wheel during the speed. [15]

3. (a) With neat diagram explain the moment of a force.
   (b) Find the resultant of given concurrent system of forces as shown in figure3. [5+10]

4. Use method of joints to find forces in all members of the truss as shown in figure 4. [15]

5. Find the moment of the inertia of the section shown in the figure 5 about horizontal and vertical controidal axes. All dimension in cm R = 8. [15]

6. Determine the volume and surface area of the solid shown in the below figure 6. [15]

7. (a) Write the equilibrium equations for a body in space.

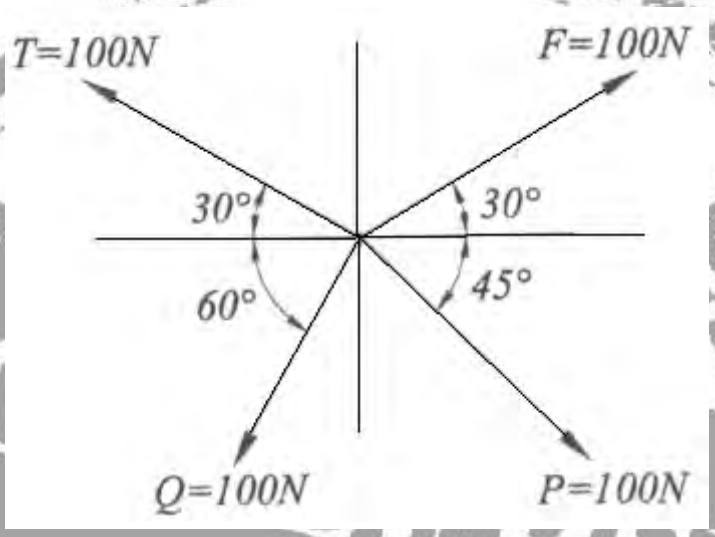

Figure 3:

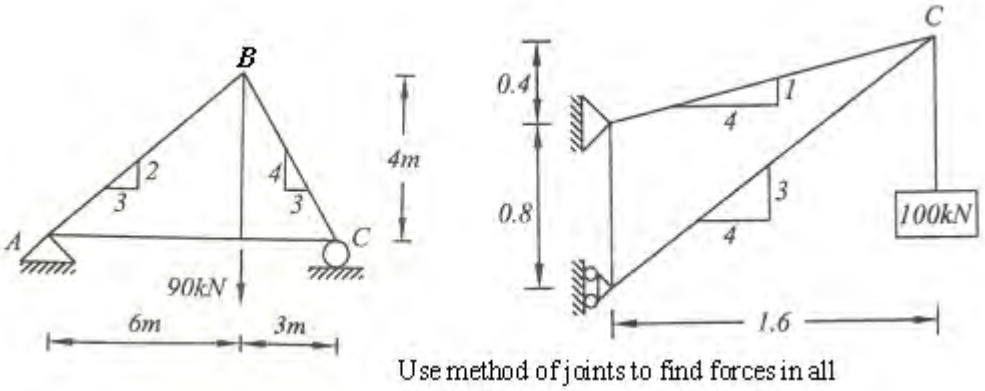

Figure 4:

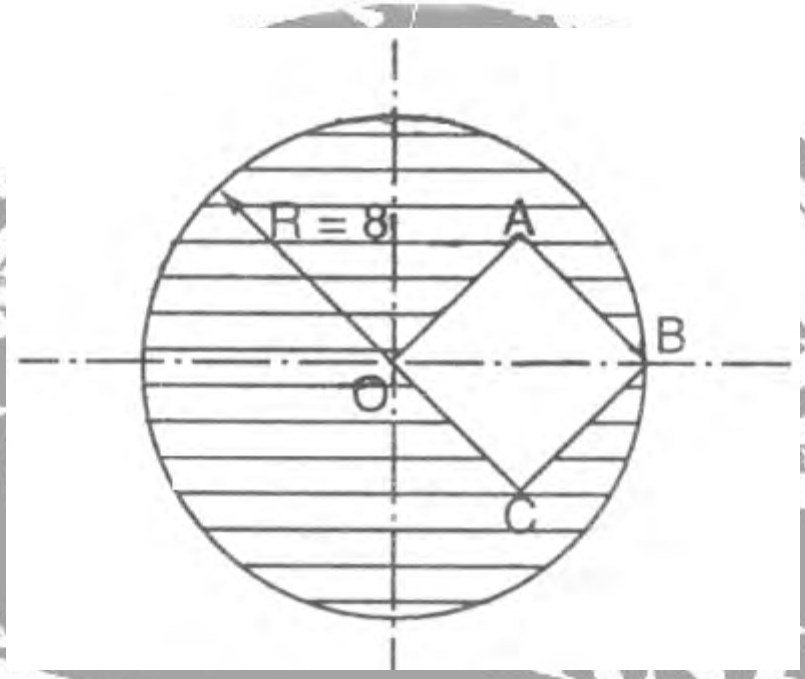

Figure 5:

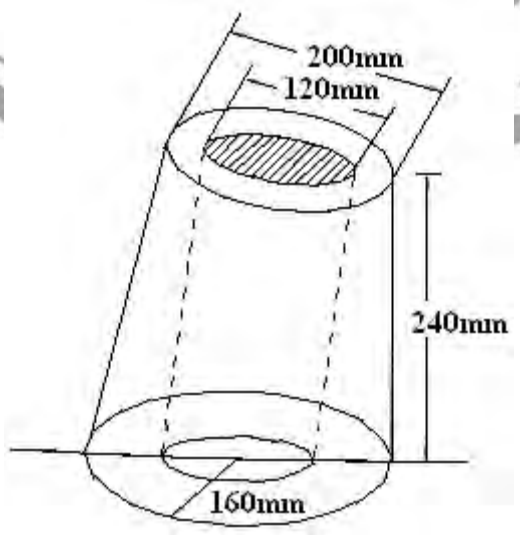

Figure 6:

(b) A vertical mast CE in supported in a ball and socket joint at C by cables BD and AE as shown in figure 7b. A pull P ($=400\bar{i} + 300\bar{k}$) N acts at top of the mast. Find components of reaction at C. [3+12]

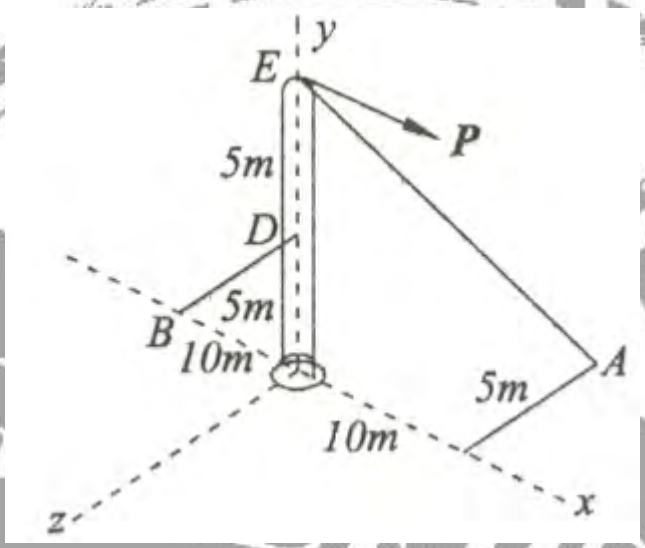

Figure 7b:

8. A Block of weight 20 N falls at a distance of 0.75 m on top of the spring. Determine the spring constant if it is compressed by 150mm to bring the weight momentarily to rest. [15]

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Code No: 09A1BS05 **R09** **Set No. 1**

I B.Tech Examinations,December-January, 2011-2012
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT, MIM, MIE
Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the forces in the BD, CD & CE members of the truss shown in figure 1 using method of sections. [15]

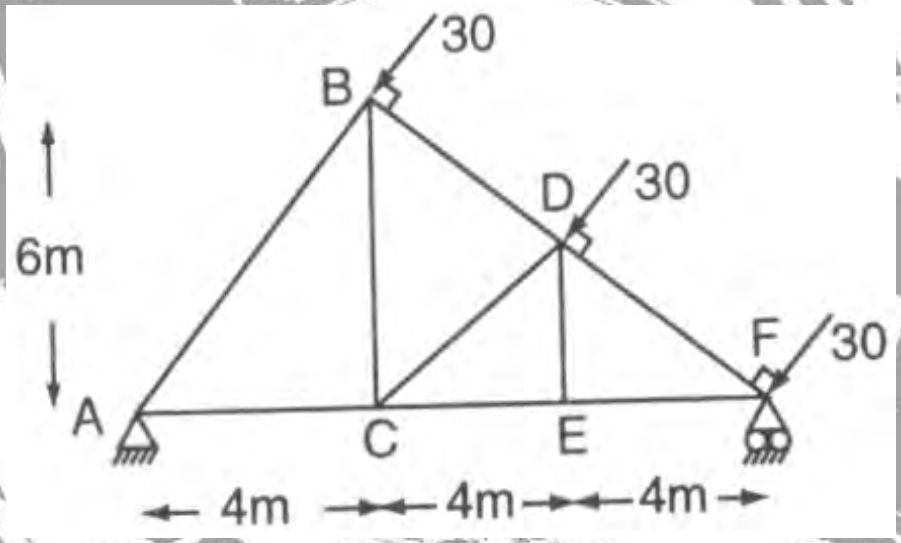

Figure 1:

2. Locate the centroid of plane areas shown in the figure 2. All dimensions are in cm.

[15]

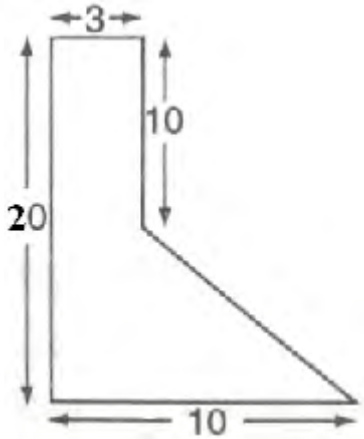

Figure 2:

3. For the mechanism shown in the figure 3, find relation between R and P. Each link is of weight w and length 2a. [15]

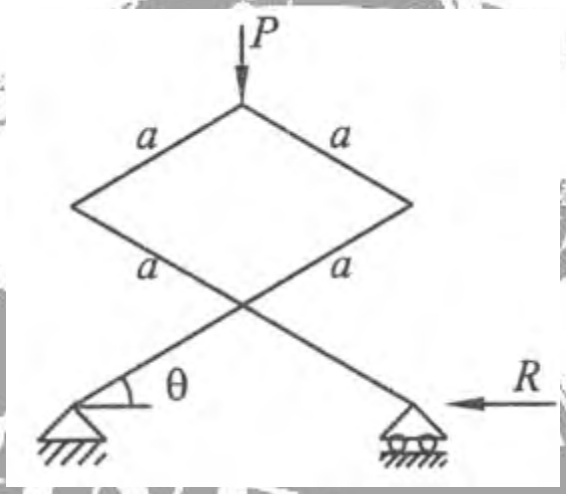

Figure 3:

4. The step pulley shown in figure 4 starts from rest and accelerates at $2rad/s^2$. What time is required for block A to move 20m. Find also the velocity of A and B at that time. [15]

5. Find the moment of inertia of the section about horizontal and vertical axis through the centroid, as shown in the figure 5. All dimensions are in cm. [15]

6. A 25 kg package slides at a speed of 12 m/s from point A on sloping board. Determine the speed at point B if the coefficient of kinetic friction is 0.3 as shown in the figure 6. [15]

7. Find resultant of four loads and any one point at which the line of action of resultant intersects the edge of plate as shown in figure 7. [15]

8. Three bars lying in one plane hinged at their ends are shown in figure 8. They are subjected to force P and Q applied at B and C. If P = 100 N, determine the value of force a necessary to keep the system of bars in equilibrium. [15]

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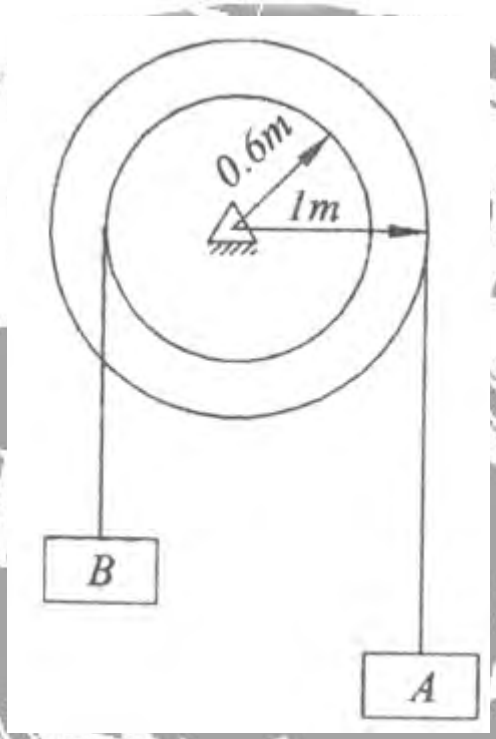

Figure 4:

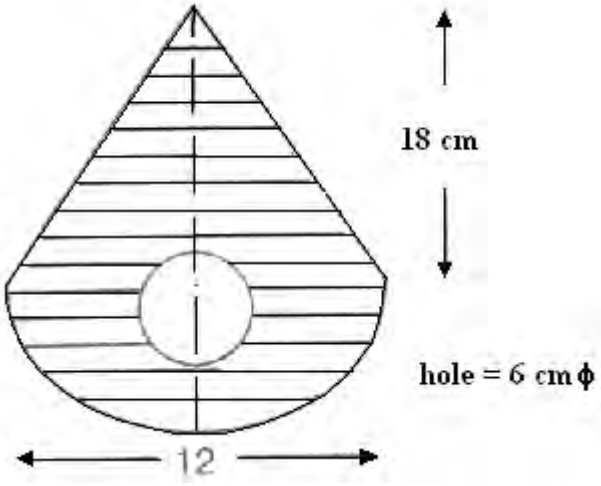

Figure 5:

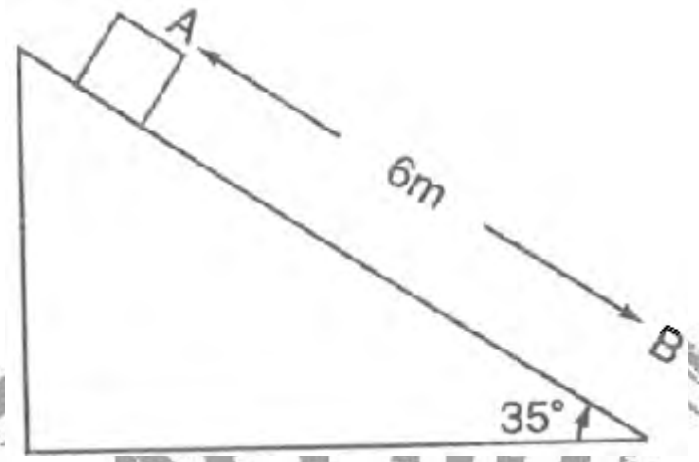

Figure 6:

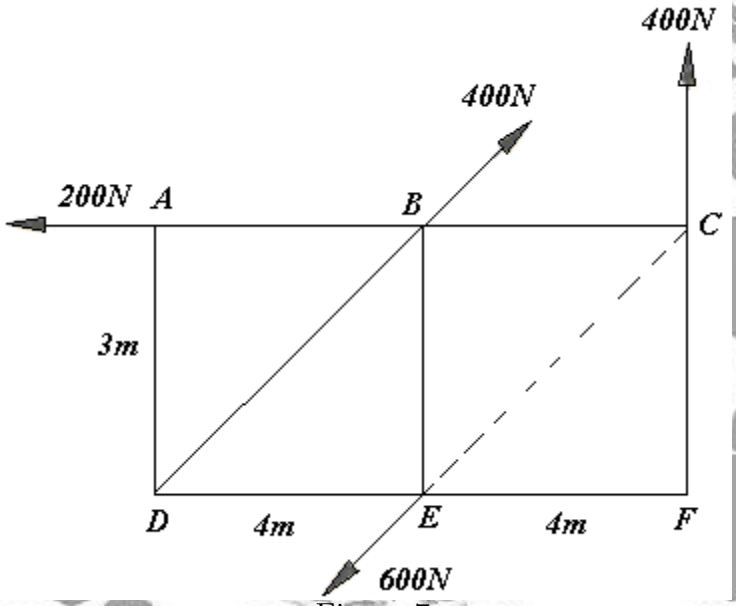

Figure 7:

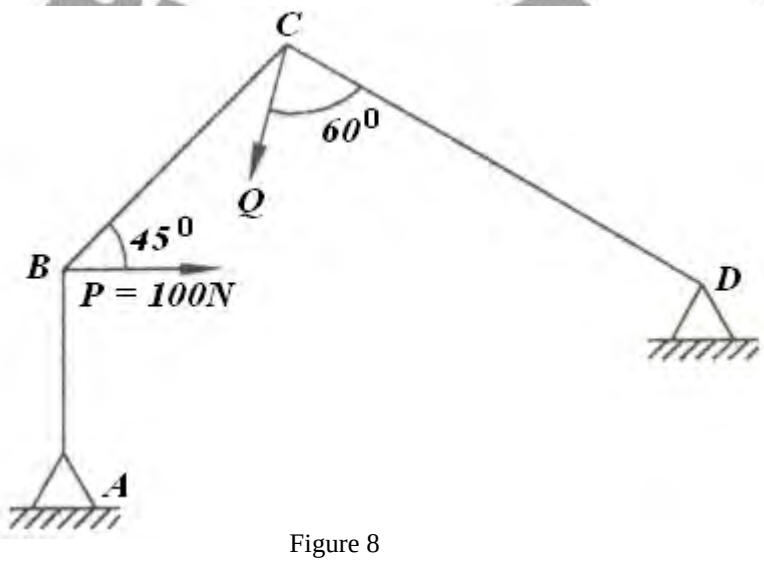

Figure 8

Code No: 09A1BS05 **R09** **Set No. 3**

I B.Tech Examinations,December-January, 2011-2012
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT, MIM, MIE
Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is resultant force? Explain with an example.
   (b) Determine the resultant of a system of concurrent forces having the following magnitudes and passing through the origin and the indicated points.
   P = 3000 N (+12, +6, -4)
   Q = 5000 N (-3, -4, +12)
   F = 28000 N (+6, -3, -6). [5+10]

2. Locate the centroid of plane areas shown in the figure 2. All dimensions are in cm.

   [15]

3. Find the forces in the BD, DG & GE members of the truss shown in figure 3 using method of sections, joints and analytical method. [15]

4. Find the moment of inertia about horizontal and vertical centroidal axis, shown in the figure 4. All dimension in cm. [15]

5. A small box of mass 25 kg starts from rest at 'A' and slides down the inclined plane as shown in the figure 5. Determine the distance it travels along the horizontal plane before it comes to rest. Assume that the velocity at 'B' for the motion along 'BC' is the same as it has gained during travel from A to B and also assume that the coefficient of kinetic friction is 0.35 for the surface AB and BC. [15]

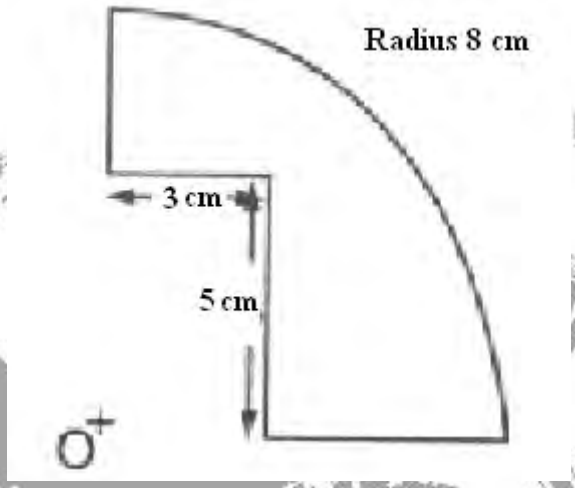

Figure 2:

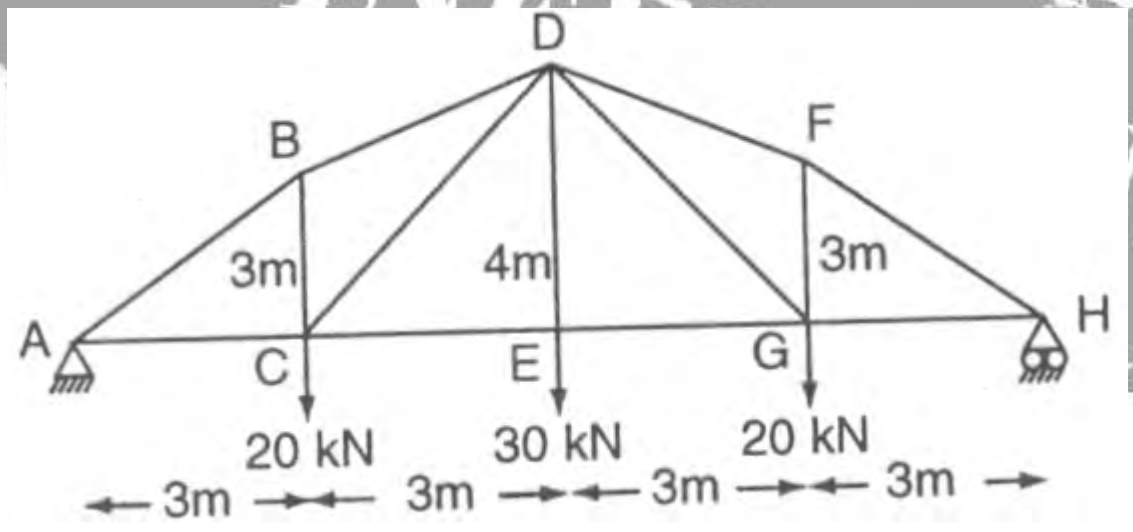

Figure 3:

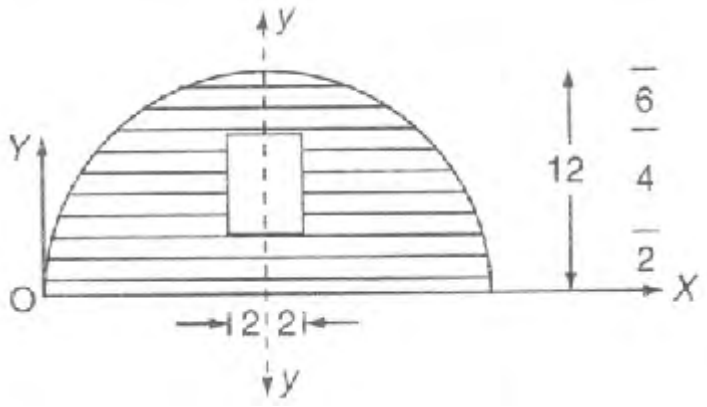

Figure 4:

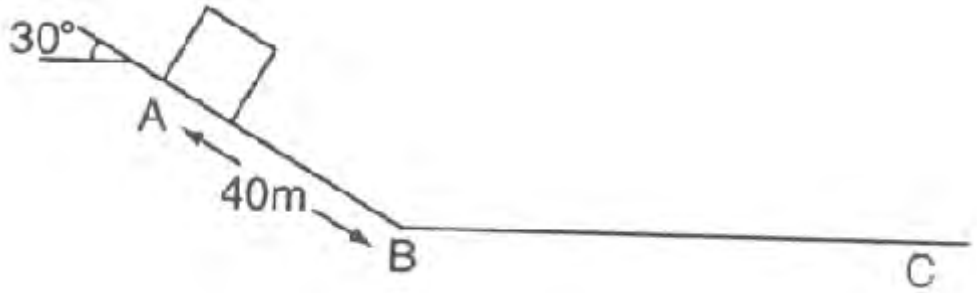

Figure 5:

6. (a) Determine the compressive force in the boom and the tensile force in the cable as shown in figure 6a.

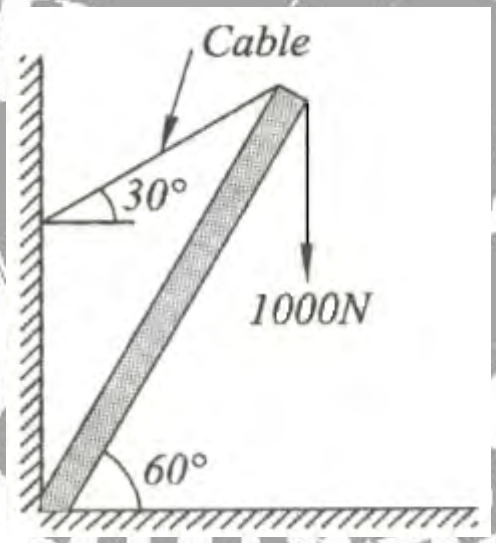

Figure 6a:

(b) Obtain reactions at supports A and B of a simply supported beam loaded with 100 N and 200 N as shown in figure 6b. [7+8]

7. The angle of rotation of a body is given as a function of time by the equation $\theta = \theta_0 + bt + ct^2$. Find the general expressions for the angular velocity and angular acceleration of the body. Determine also the values of the constants b and c if the initial angular velocity is 2π rad per sec. and sec later it is 4π rad per sec. [15]

8. Determine reaction at supports using the principle of virtual work as shown in figure 8. [15]

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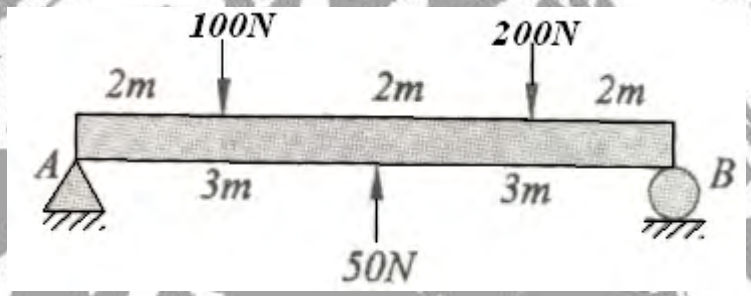

Figure 6b:

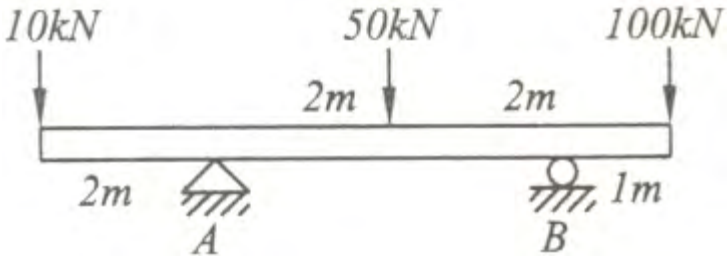

Figure 8: