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

I B.Tech Examinations,December 2010
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write the equations of equilibrium when the body is in space.
   (b) A vessel is pulled by two ropes as shown in figure 1. Obtain the resultant force applied on the vessel if the tension on each rope is 1000 N. [5+10]

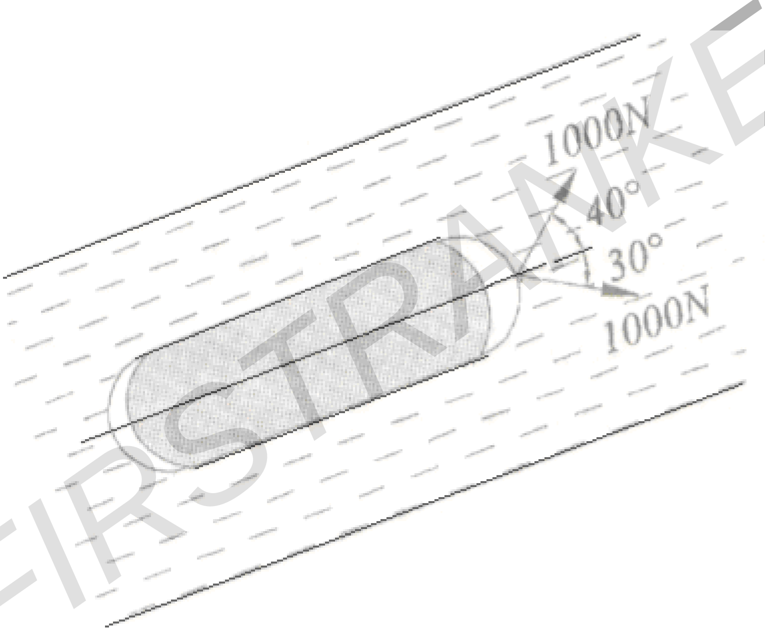

Figure 1:

2. A beam is subjected to following systems of loads shown in the below figure 2. Find the resultant and mark its line of action with respect to A. [15]

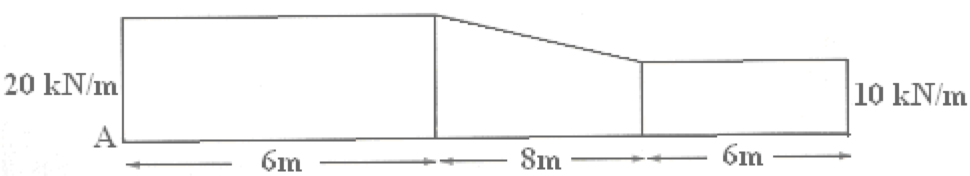

Figure 2:

3. Two rods are connected to form a double pendulum as shown in the figure 3. If the weight of each rod is W and length L and if they are held in position by a horizontal force P, determine equilibrium position as defined by angle θ_1 *and* θ_2. [15]

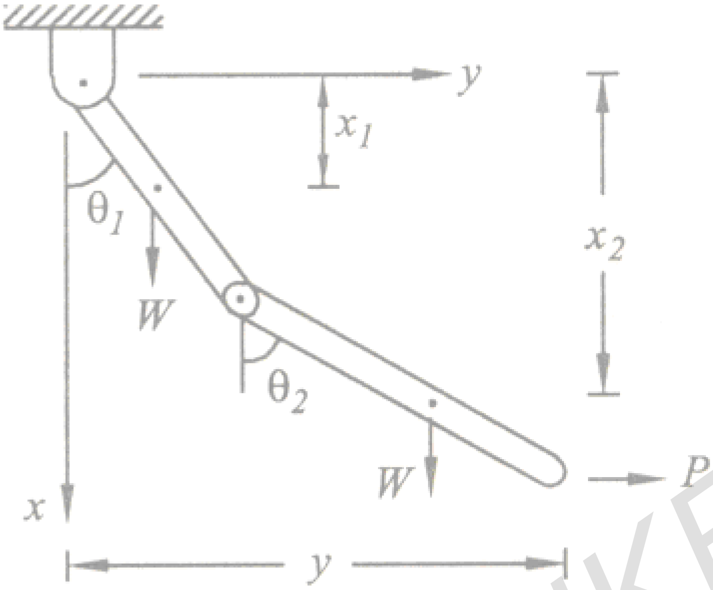

Figure 3:

4. Find the forces in the BD, CE and FG members of the truss shown in figure 4 using method of sections. [15]

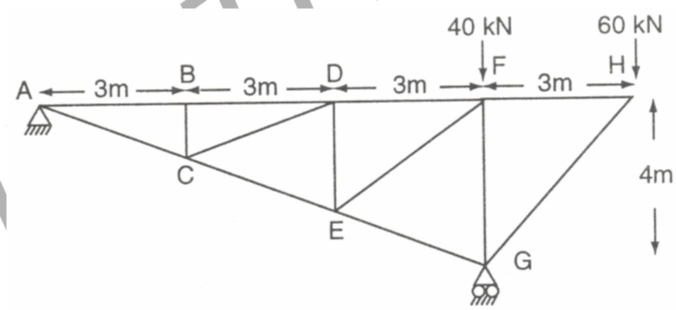

Figure 4:

5. Find the moment of inertia of thin plates about AA - axis shown in the figure 5. Assume $\rho = 7850 kg/m^3$ and thickness 5 mm. All dimensions are in cm. [15]

6. A gear is accelerated from rest to a speed of 1800 rpm and then immediately decelerated to a stop. If the total elapsed time is 12 seconds, then determine total no. of revolutions of the gear. Assume both acceleration and decelerations are constant but not necessarily of the same magnitude. [15]

7. Three bars lying in one plane hinged at their ends are shown in figure 6. 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]

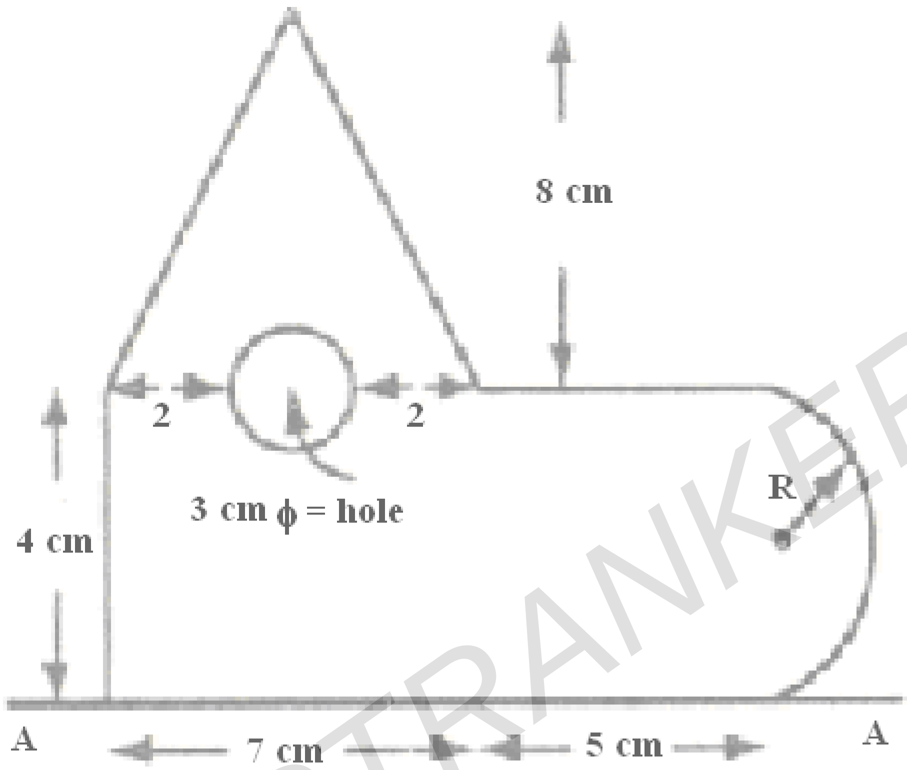

Figure 5:

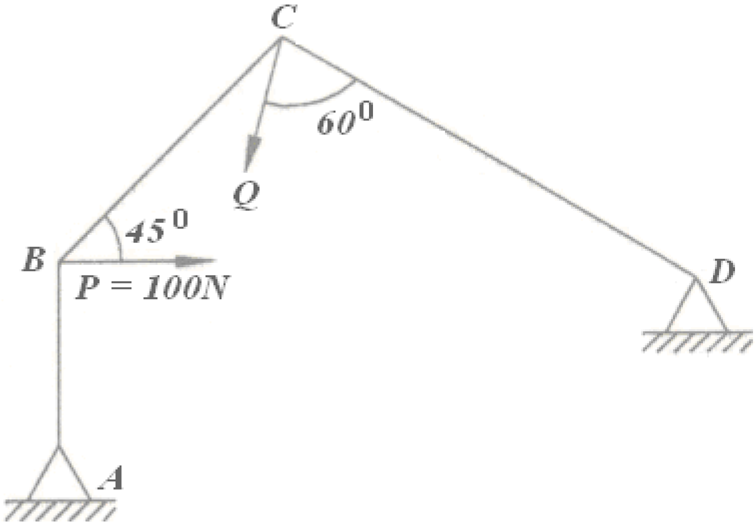

Figure 6:

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 2010
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. Determine the resultant of the three forces acting on the dam shown in the figure 1 and locate its intersection with the base AB. For good design, the intersection should occur within the middle third of the base. Does it. [15]

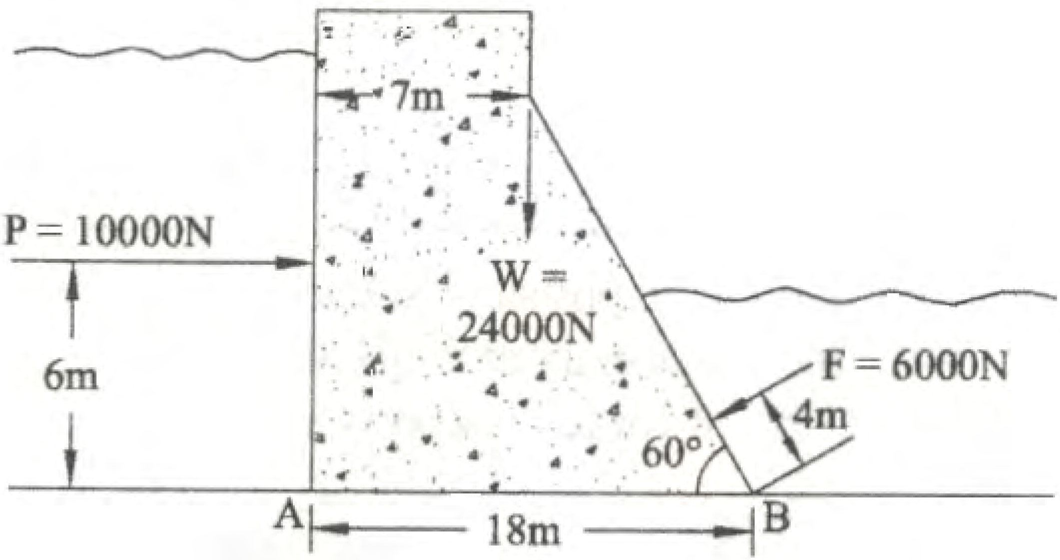

Figure 1:

2. Calculate the magnitude of the force supported by the pin at B for the bell crank loaded and supported as shown in figure 2. [15]

3. Referring to the figure 3, Determine equilibrium positions as defined by angles θ_1 and θ_2. [15]

4. Locate the centroid of a shaded area as shown in the below 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. 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. Determine zero force member on the frame shown in fig 7. [15]

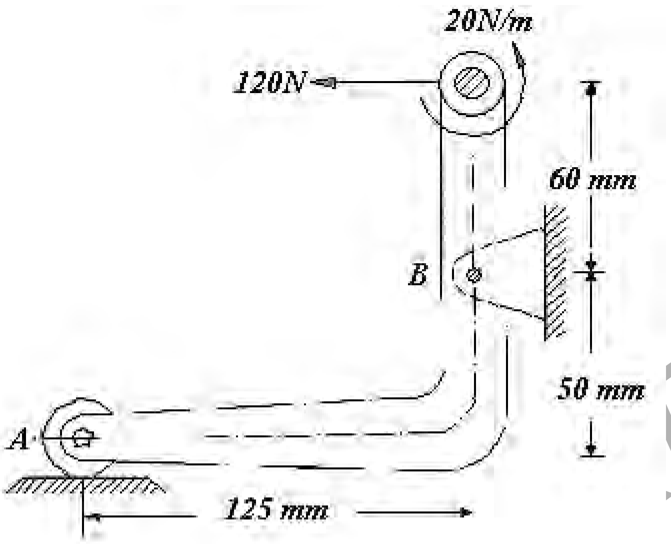

Figure 2:

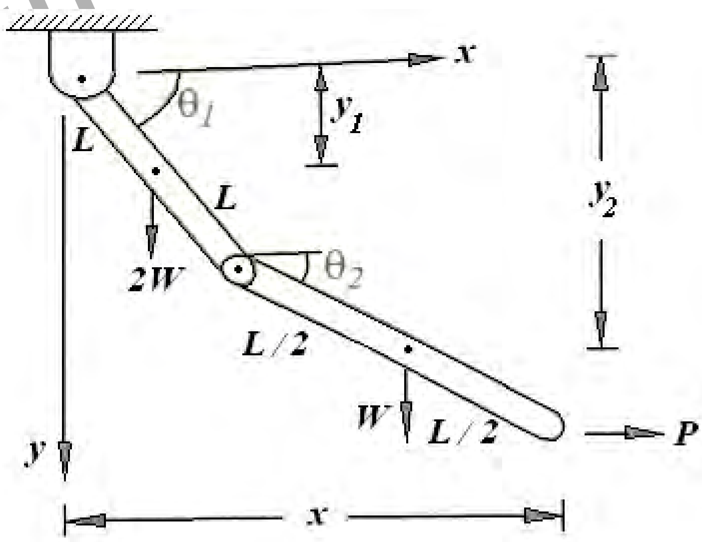

Figure 3:

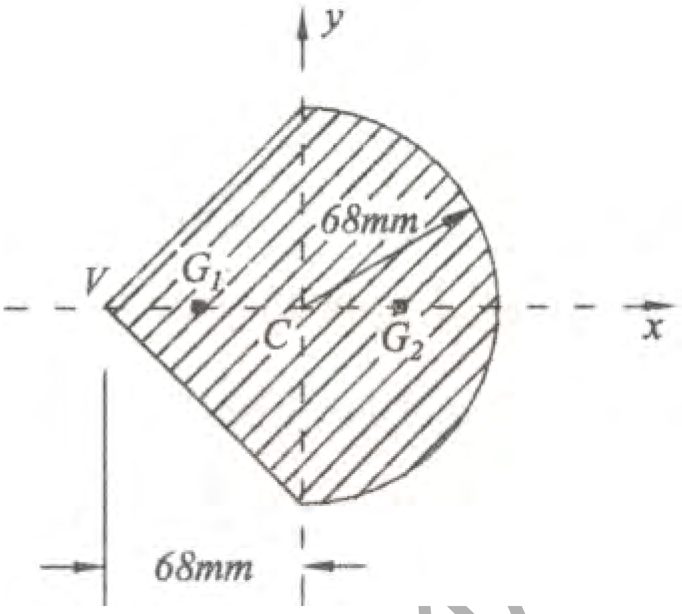

Figure 4:

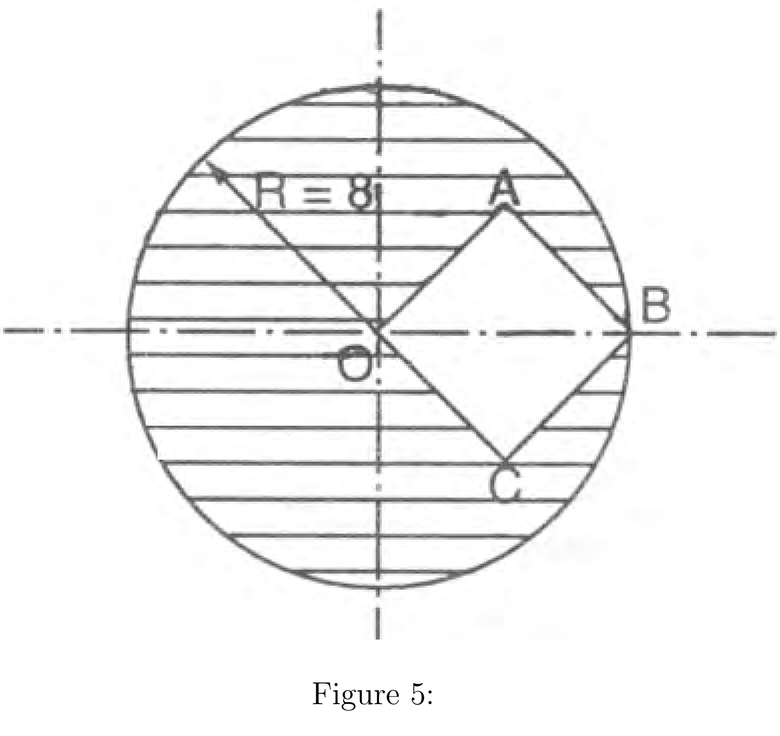

Figure 5:

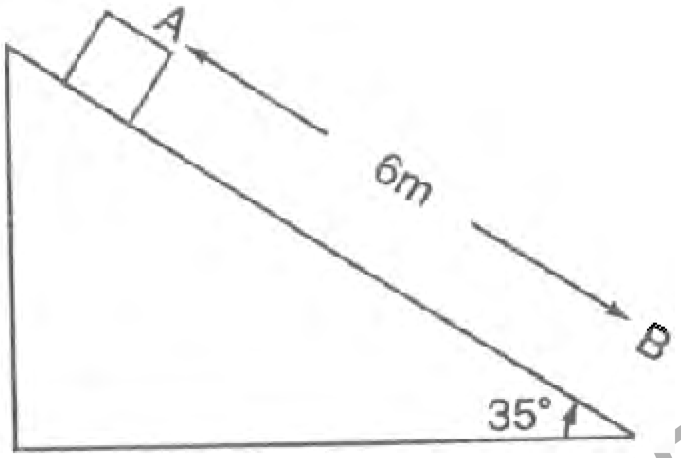

Figure 6:

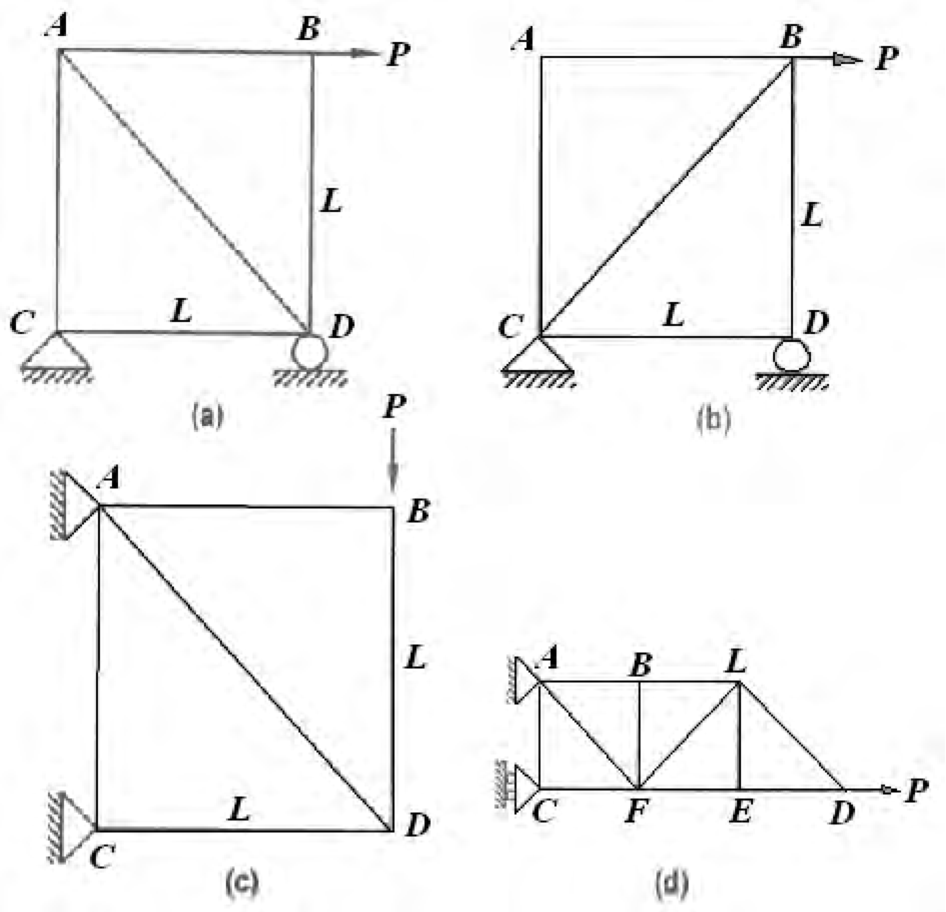

Figure 7:

8. 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]

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

I B.Tech Examinations,December 2010
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. Find the moment of inertia about 'AA' and 'BB' axis for the areas shown in figure 1. [15]

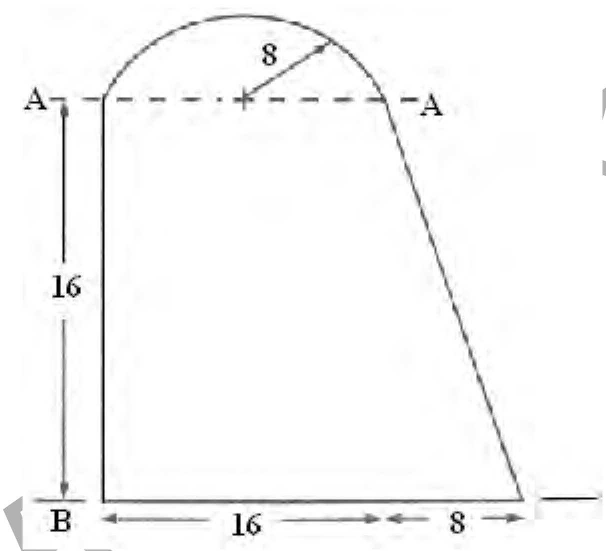

Figure 1:

2. Two blocks A and B of masses $m_A = 280kg$ and $m_B = 420kg$ are joined by an inextensible cable as shown in figure 2. Assume that the pulley is frictionless and $\mu = 0.30$ between block 'A' and the surface. The system is initially at rest. Determine the velocity of block after it has moved 3.5m. [15]

3. Calculate the magnitude of the clockwise couple M required to turn the 50 kg cylinder in the supporting block shown in figure 3. The coefficient of kinetic friction is 0.30. [15]

4. Find the supporting force at A in the figure 4 by the method of virtual work.[15]

5. Determine the volume and surface area of the solid shown in the below figure 5. [15]

6. (a) P is a force directed from A(2, 1, -4) to B(4, 4, 1). Find moment of P about origin and magnitude of this moment.
   (b) A force F = 4i+3j+2k is applied at a point whose position vector from O is given by r = i+2j+3k. What is the resulting moment about O. [7+8]

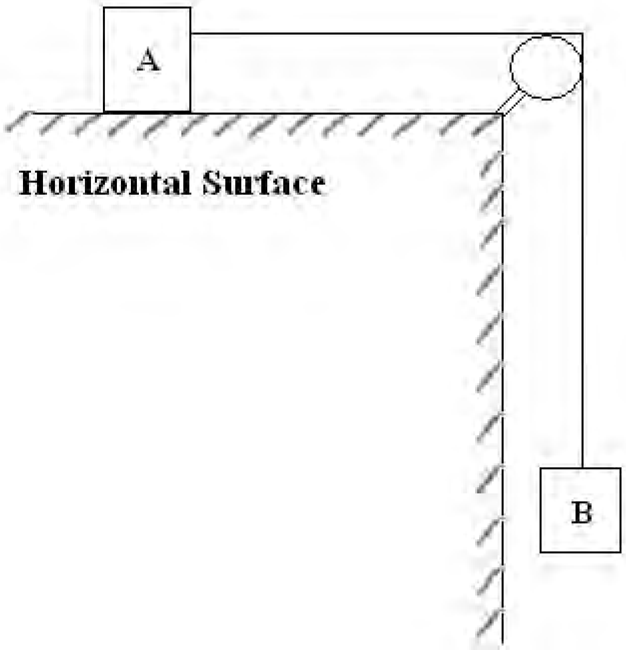

Figure 2:

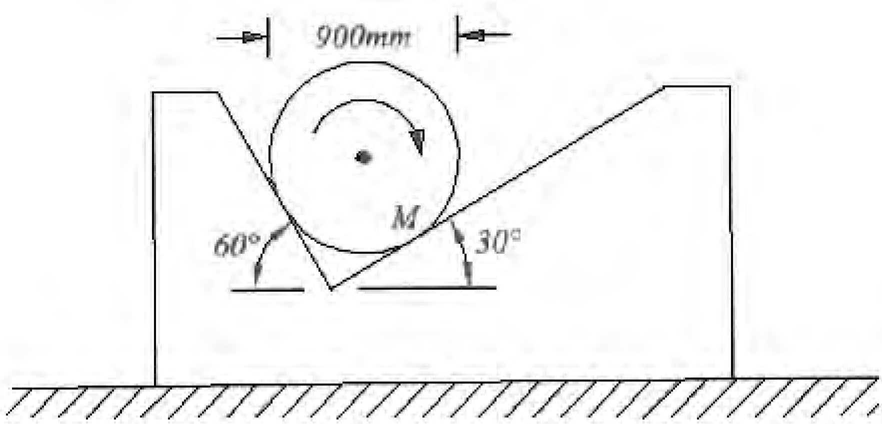

Figure 3:

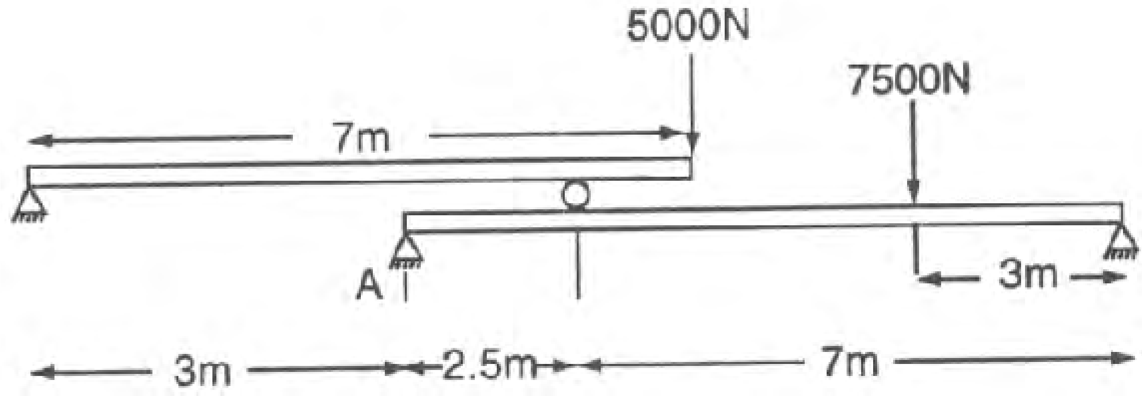

Figure 4:

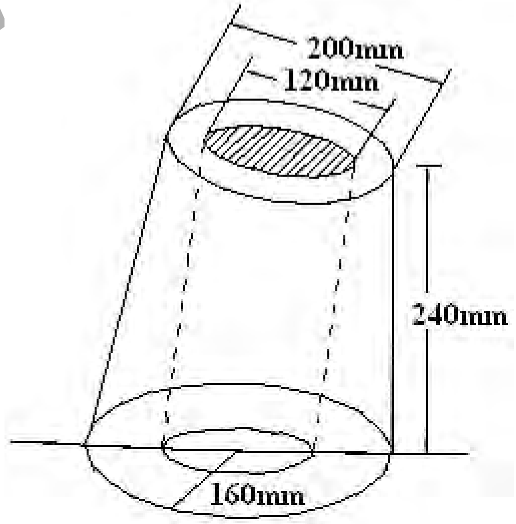

Figure 5:

7. (a) Prove that the path of a projectile is a parabola.
   (b) Distinguish between normal and tangential components of acceleration. [7+8]

8. Determine zero force member as shown in figure 6. [15]

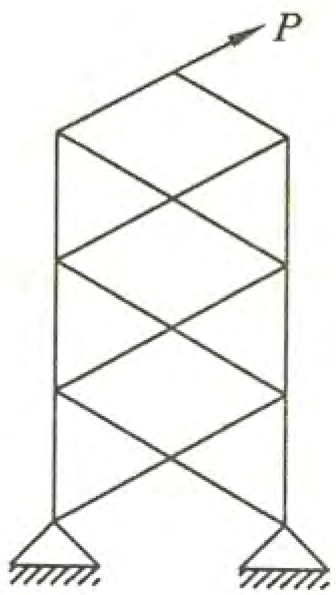

Figure 6:

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

I B.Tech Examinations,December 2010
ENGINEERING MECHANICS
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

Time: 3 hours Max Marks: 75

Answer any FIVE Questions
All Questions carry equal marks
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1. Find the moment of inertia about 'AA' and 'BB' axis for the areas shown in figure 1. [15]

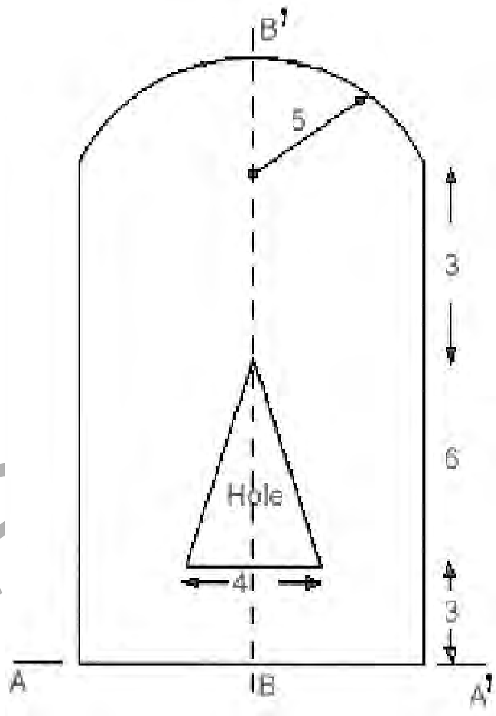

Figure 1:

2. A Block of weight 12 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]

3. A fighter plane is directly over an antiaircraft gun at time t=0 and at an altitude of 1800m. The plane is moving with a speed of 600 km/hour. A shell is fixed at time t=0 in an attempt to hit the plane. If the muzzle velocity is 1000 m/sec, find out the angle at which the gun should be held. [15]

4. What is the moment of force P and F about points A, B, C as shown in figure 2? [15]

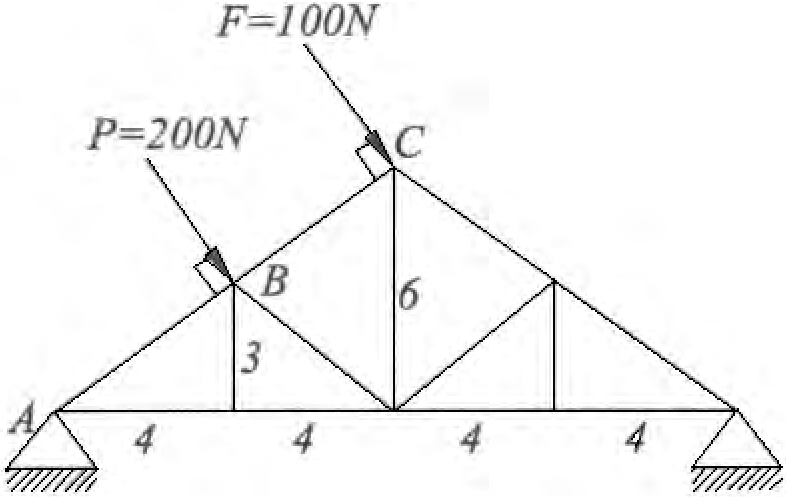

Figure 2:

5. Two beams AC and CD of length 9m and 10m respectively are hinged at C. These are supported on rollers at the left and right ends (A and D). A hinged support is provided at B, 6m from A. Using the principle of virtual work, determine the reactions at the hinge C and at support B when a load of 600 N acts at a point 5 m from D. [15]

6. (a) Find the centroid of the plane lamina shown in figure 3a.

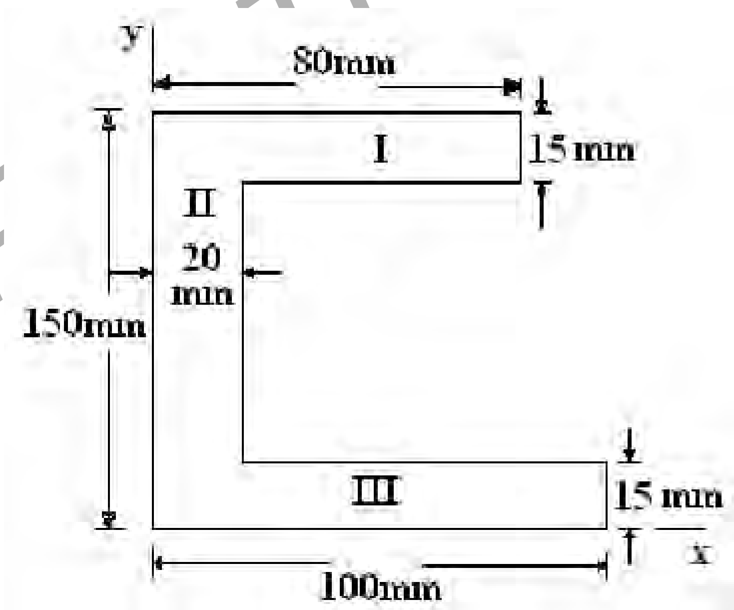

Figure 3a:

(b) Find the centroid of the plane lamina shown in figure 3b. [7+8]

7. Find the forces in the AB, CD & CE members of the truss shown in figure 4 using method of sections. [15]

8. A load of 60kN is to be resisted by means of a shear leg arrangement as shown in figure 5. Determine forces in legs AB, AC and rope AD. [15]

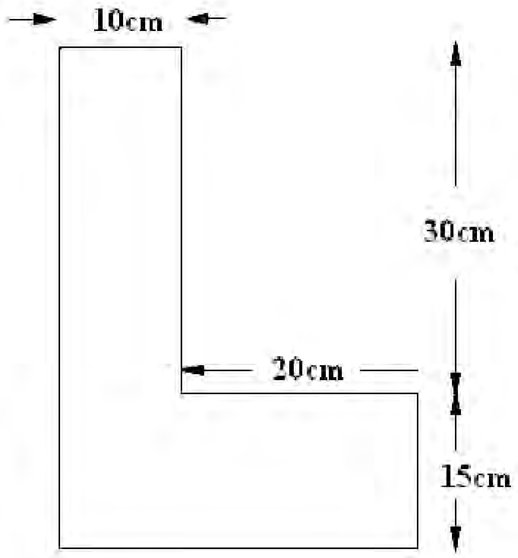

Figure 3b:

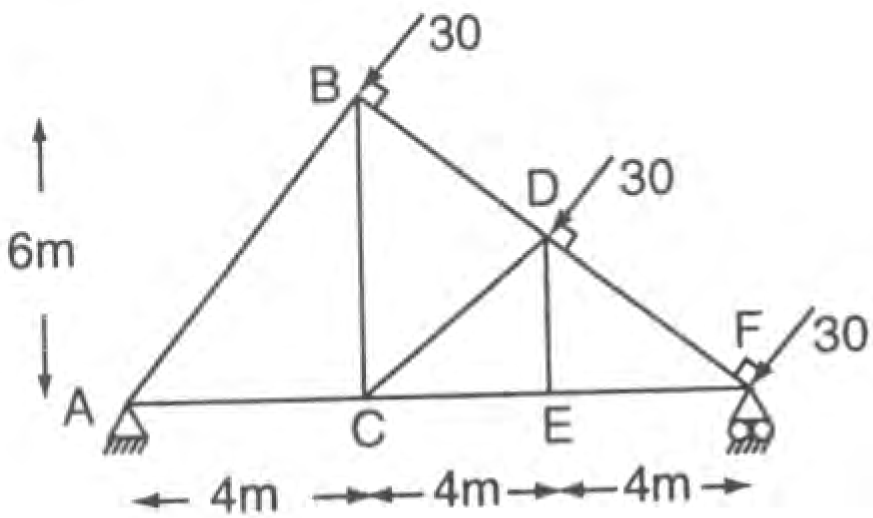

Figure 4:

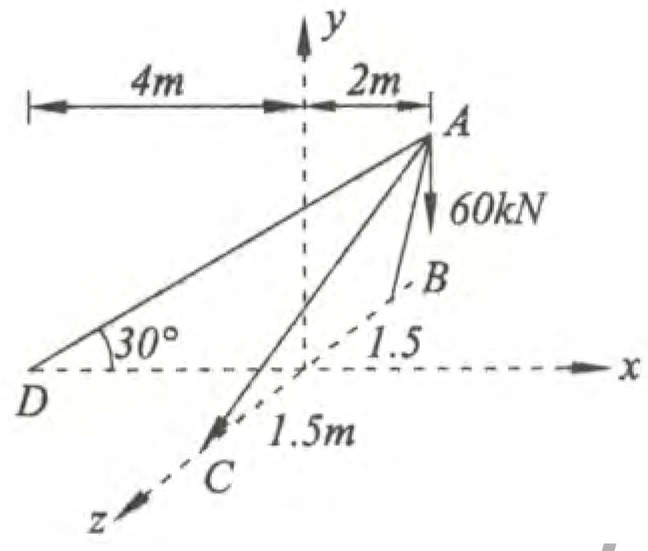

Figure 5:

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