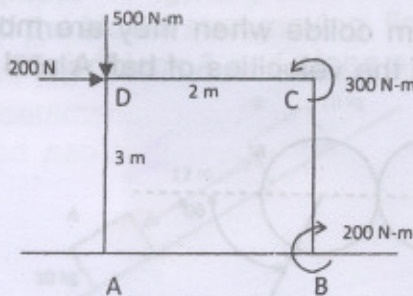


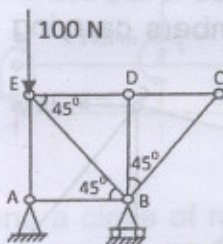
- N.B.** (1) Question No. 1 is compulsory.  
 (2) Attempt any four questions from the remaining six questions.  
 (3) **Figures to the right indicate full marks.**  
 (4) **Assume** suitable additional data if necessary and state the same clearly in your answer.  
 (5) Take  $g = 9.81 \text{ m/s}^2$ .

1. Solve any four of the following :—

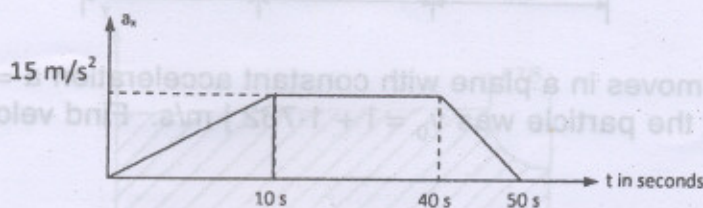
(a) For the **Figure** shown, find resultant force and moment at point A. 5



(b) Find forces in members AB, AE, ED, BC, CD. 5



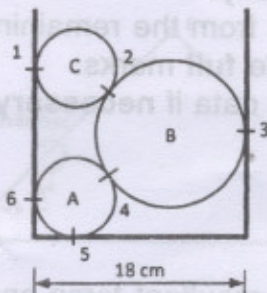
(c) **Figure** shows an plot of  $a_x$  versus time for a particle moving along x-axis. 5  
 What is the speed and distance covered by the particle after 50 seconds ?



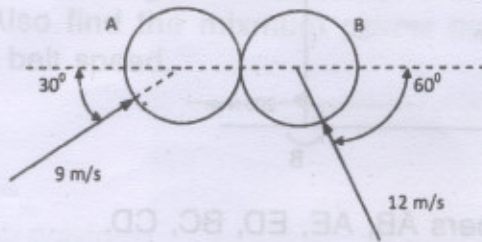
- (d) By what percentage the range of projectile is increased if initial velocity is increased by 5% ? 5  
 (e) A ball is dropped from a height of 12 m upon a horizontal slab. If it rebounds to height of 4 m. Find coefficient of restitution. 5



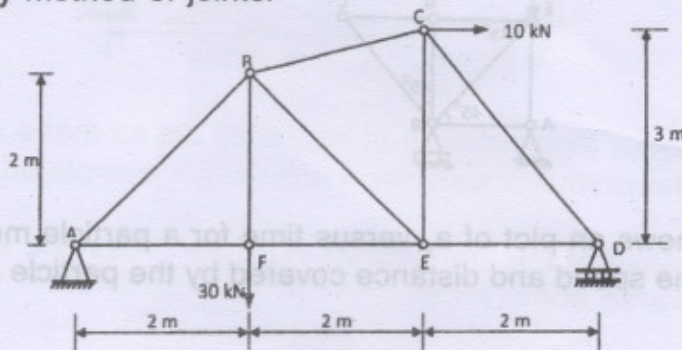
2. (a) Three cylinders are piled up in a rectangular channel as shown in figure. 12  
 Determine the reactions at point 6 between the cylinder A and the vertical wall of the channel. (Cylinder A : radius = 4 cm, m = 15 kg, Cylinder B : radius = 6 cm, m = 40 kg, Cylinder C : radius = 5 cm, m = 20 kg).



- (b) Two identical balls of 120 gm collide when they are moving with velocities as shown in figure. 8  
 Determine the velocities of ball A and B completely after the impact. Take  $e = 0.8$ .

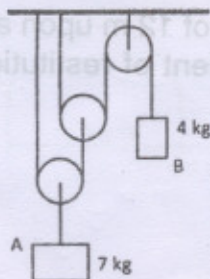


3. (a) A simply supported pin jointed truss is loaded and supported as shown in the 12  
 following figure. Identify the members carrying zero force and find forces in members by method of joints.



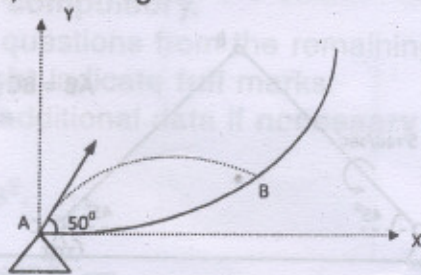
- (b) A particle moves in a plane with constant acceleration  $a = 4i \text{ m/s}^2$ . At  $t = 0$  the 8  
 velocity of the particle was  $v_0 = i + 1.732j \text{ m/s}$ . Find velocity of the particle at  $t = 1 \text{ sec}$ .

4. (a) Determine the tension developed in chords attached to each block and the 12  
 accelerations of the blocks when the system shown is released from rest. Neglect the mass of the pulleys and chords.

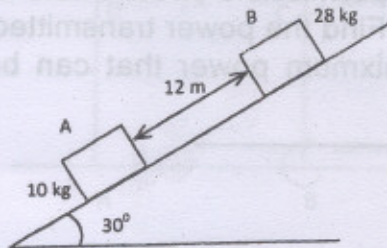




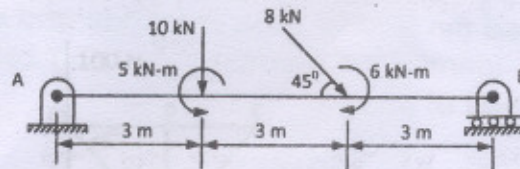
- (b) The water sprinkler positioned at the base of a hill releases a stream of water with a velocity of 6 m/s as shown. Determine the point B (x,y) where the water particles strike the ground on the hill. Assume that the hill is defined by the equation  $y = 0.2x^2$  m, and neglect the size of the sprinkler. 8



5. (a) Two blocks A (mass 10 kg), B (mass 28 kg) are separated by 12 m as shown in the figure. If the blocks start moving, find the time 't' when the blocks collide. Assume  $\mu = 0.25$  for block A and plane and  $\mu = 0.10$  for block B and plane. 12

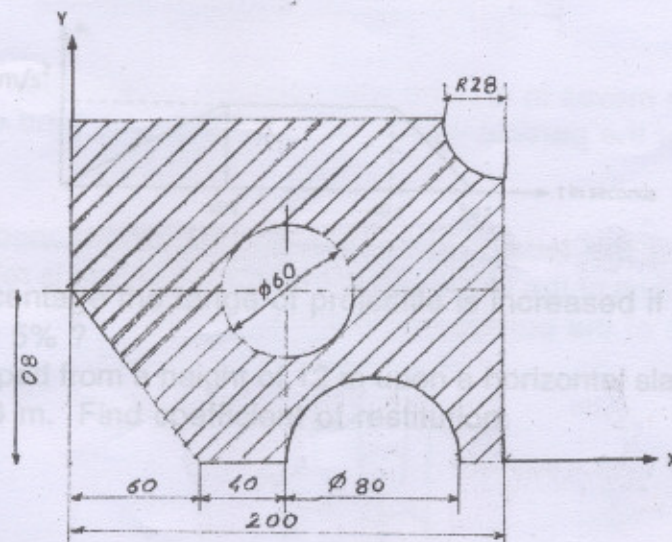


- (b) Find the reactions at the supports of the beam applying conditions of equilibrium. 8

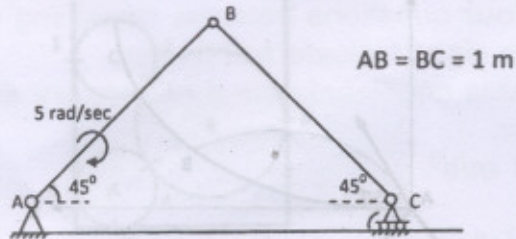


6. (a) A particle moves along a circle of radius 20 cm so that  $s = 20\pi t^2$  cm. Find its tangential and normal acceleration after it has completed a revolution. 8

- (b) Find the centroid of the area shown in figure. Also find the moment of inertia of the same area about x axis. 12



7. (a) In the mechanism shown, find velocity of point C and angular velocity of link BC if angular velocity of link AB is 4 rad/sec. Solve the problem when link AB and link BC make angle of  $45^\circ$  with horizontal as shown in the figure. 8



- (b) A belt 120 mm wide and 8 mm thick is transmitting power at a belt speed of 1400 m/min. The angle of lap of the smaller pulley is  $160^\circ$  and coefficient of friction is 0.3. The maximum permissible stress in the belt is  $2 \text{ N/mm}^2$  and the mass of the belt is  $0.8 \text{ kg/m}$ . Find the power transmitted and the initial tension in the belt. Also find the maximum power that can be transmitted and the corresponding belt speed. 12