

**[5351] - 109**  
**ENGINEERING**  
**Engineering Mechanics**  
**(2015 Pattern) (Semester - II)**

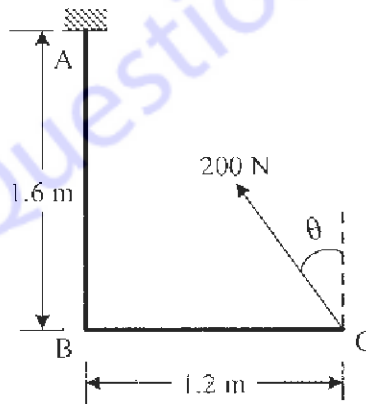
Time : 2 Hours]

[Max. Marks :50

*Instructions to the candidates:*

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figure to the right indicates full marks.
- 4) "Assume suitable data, if necessary and clearly state."
- 5) Use of nonprogrammable electronic pocket calculator is allowed.

- Q1)** a) The lever ABC fixed at A shown in Figure is subjected to a 200 N force at C at  $\theta = 30^\circ$ . Find the moment of this force about A. Also find the value of  $\theta$  for which the moment about A is Zero. [6]

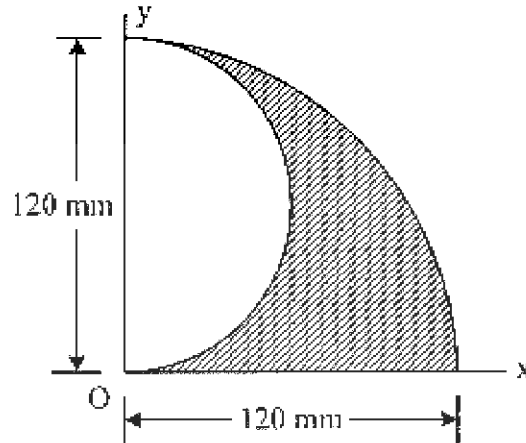


- b) The motion of particle is defined by,  $x = t^3 - 6t^2 + 9t + 5$ , where x expressed in meter and t in seconds. Determine the time at which velocity becomes Zero. Also determine velocity and acceleration at  $t = 5$ s. [6]

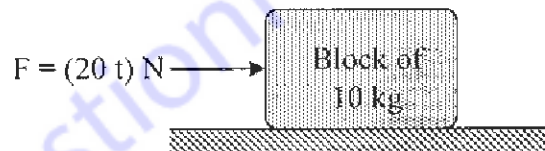
**OR**

**P.T.O.**

- Q2) a)** Locate the centroid of the plane area as shown in Figure with respect to origin O. [6]

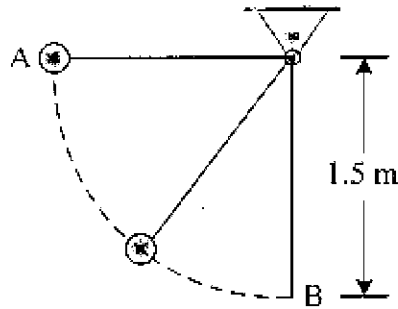


- b) The 10kg block is subjected to the force shown in Figure determine its velocity when  $t = 2s$  if  $v = 0$  when  $t = 0$ . [6]



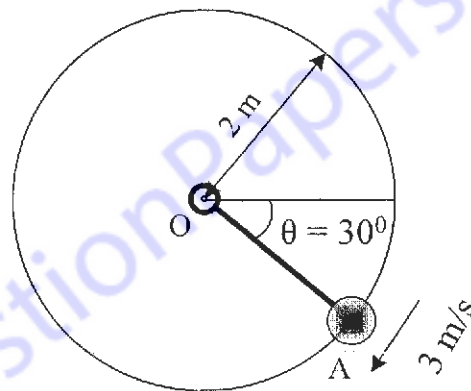
- Q3) a)** A motorist is traveling on a curved section of highway of radius 762m at the speed of 96 kmph. The motorist suddenly applies the brakes, causing the automobile to slow down at a constant rate. Knowing that after 8s the speed has been reduced to 72 kmph, determine the acceleration of the automobile immediately after the brakes have been applied. [6]

- b) The 2kg pendulum bob is released from rest when it is at A as shown in Figure. Determine the speed of the bob when it passes through its lowest position B. [6]



OR

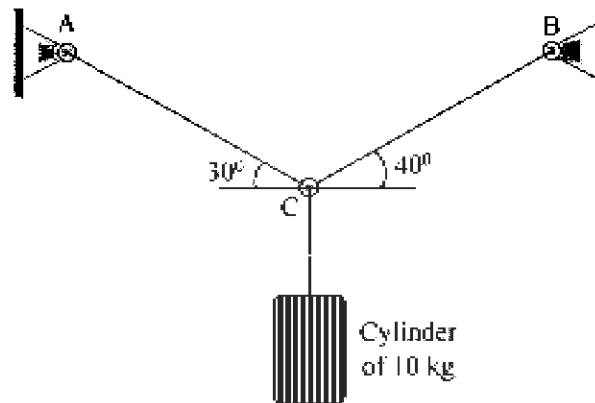
- Q4) a)** If the 10kg ball has a velocity of 3 m/s when it is at the position A as shown in Figure along the vertical path, determine the tension in the cord and the tangential component of acceleration of ball at this position. [6]



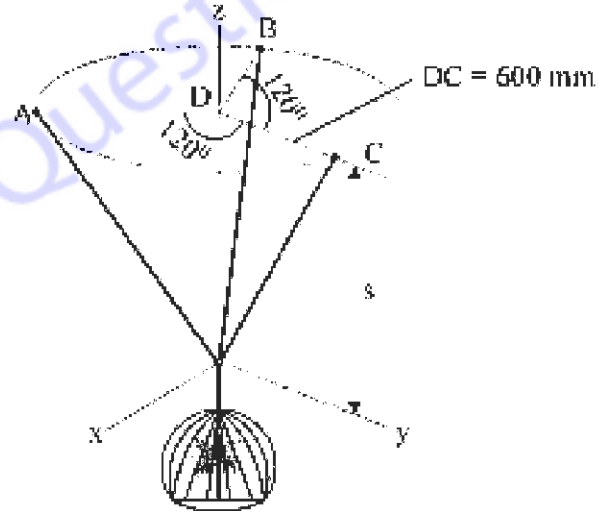
- b) Determine the coefficient of restitution  $e$  between two identical balls A and B. The velocities of balls A and B before and after impact are shown in Figure. [6]



- Q5) a)** Determine the tension developed in wires CA and CB required for equilibrium of the 10kg cylinder as shown in Figure. [6]

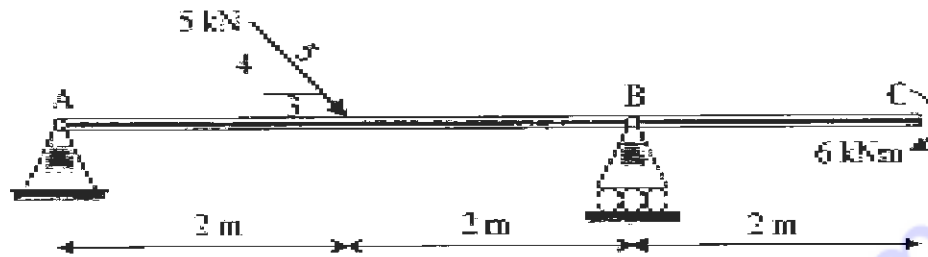


- b) The 10kg lamp shown in Figure is suspended from three equal length cords. Determine its smallest vertical distance  $s$  from the ceiling if the force developed in any cord is not allowed to exceed 50N. [7]

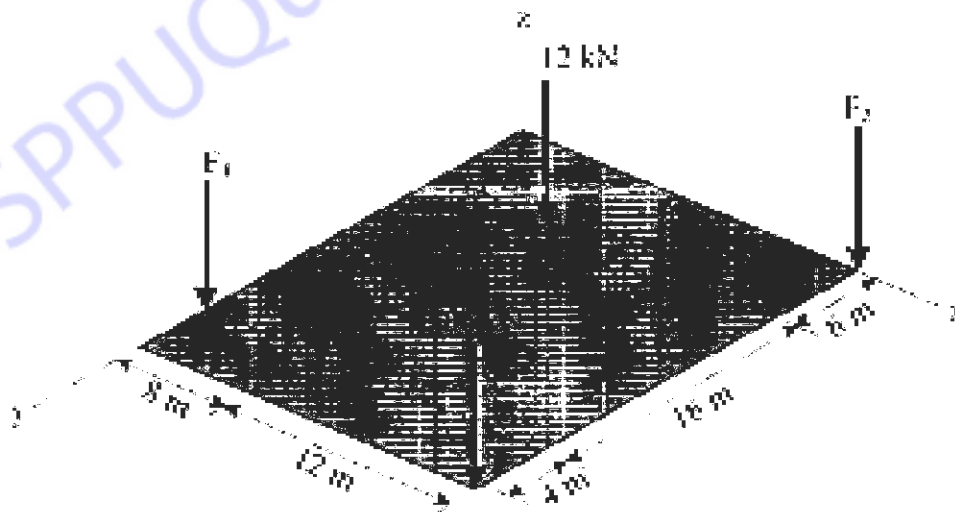


**OR**

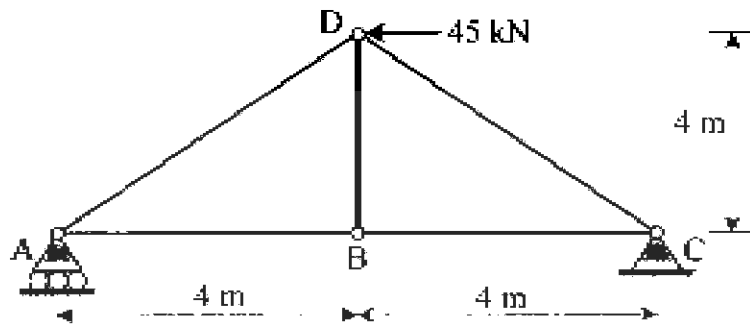
- Q6** a) Determine the horizontal and vertical components of reaction at the supports for the beam as shown in Figure. [7]



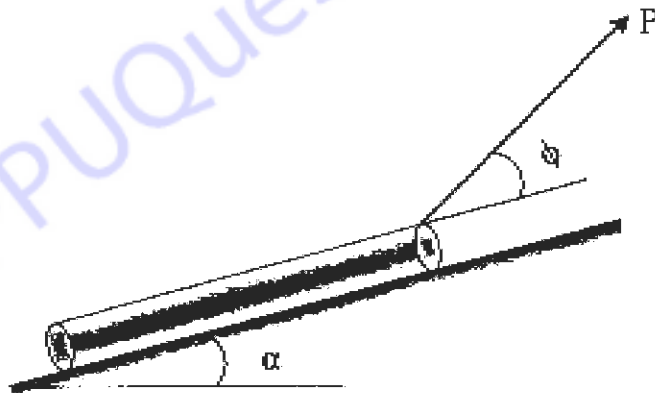
- b) The building slab is subjected to four parallel column loading shown in Figure. Determine  $F_1$  and  $F_2$  if the resultant force acts through point (12m, 10m). [6]



- Q7 a) Determine the forces in each member of the truss shown in Figure. State if the members are in tension or compression. [6]

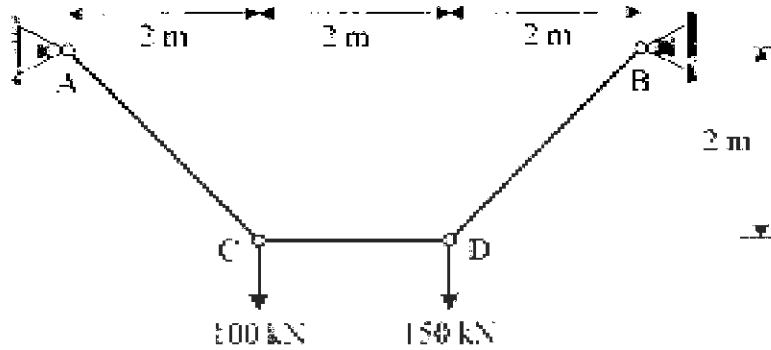


- b) The pipe of weight  $W$  is to be pulled up the inclined plane of slope  $\alpha$  using a force  $P$  shown in Figure. If  $P$  acts at an angle  $\phi$ , show that for limiting condition  $P = \sin(\alpha + \phi) / \cos(\phi - \theta)$  where  $\theta$  is the angle of static friction  $\theta = \tan^{-1} \mu_s$  [7]



OR

- Q8) a)** For the cable AB as shown in Figure, find the reaction at supports and tension in each segment. [7]



- b) Determine the maximum horizontal force  $P$  that can be applied to the 12kg hoop without causing it to rotate as shown in Figure. The coefficient of static friction between the hoop and the surfaces at A and B is,  $\mu_s = 0.2$ . Take  $r = 300\text{mm}$ . [6]

