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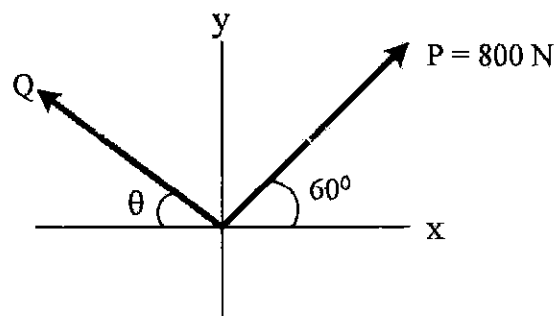
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**[5056]-19****F.E. (Common) EXAMINATION, 2016****ENGINEERING MECHANICS****(2015 PATTERN)****Time : Two Hours****Maximum Marks : 50**

- N.B. :-** (i) Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6.  
(ii) Neat diagram must be drawn wherever necessary.  
(iii) Figures to the right indicate full marks.  
(iv) Assume suitable data, if necessary and clearly state.  
(v) Use of cell phone is prohibited in the examination hall.  
(vi) Use of electronic pocket calculator is allowed.

1. (a) The resultant of two forces P and Q is 1400 N vertical. Determine the force Q and the corresponding angle  $\theta$  for the system of forces as shown in Fig. 1a. [4]

**Fig. 1 a**

P.T.O.

- (b) The system shown in Fig. 1b is initially at rest. Neglecting axle friction and mass of pulley, determine the acceleration of block. [4]

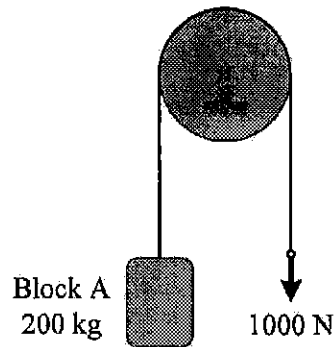


Fig. 1 b

- (c) A cricket ball shot by a batsman from a height of 2.0 m at an angle of  $30^\circ$  with the horizontal with a velocity of 20 m/s is caught by a fielder at a height of 0.8 m from the ground. Determine the distance between the batsman and fielder. [4]
- (d) A ball has a mass of 30 kg and is thrown upward with a speed of 15 m/s. Determine the time to attain maximum height using impulse momentum principle. Also find the maximum height. [4]

Or

2. (a) Determine the  $y$  coordinate of centroid of the shaded area as shown in Fig. 2a. [4]

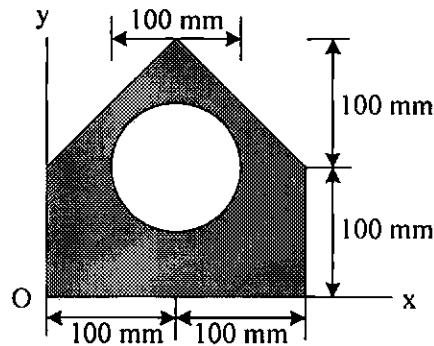


Fig. 2 a

- (b) If the crest of the hill has a radius of curvature  $\rho = 60$  m, determine the maximum constant speed at which the car can travel over it without leaving the surface of the road. The car has a weight of 17.5 kN. (Refer Fig. 2b). [4]

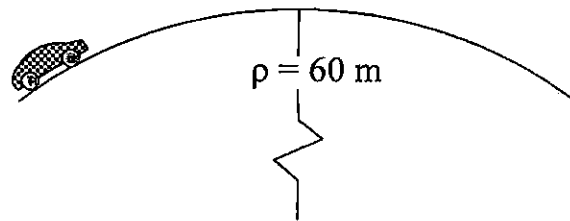
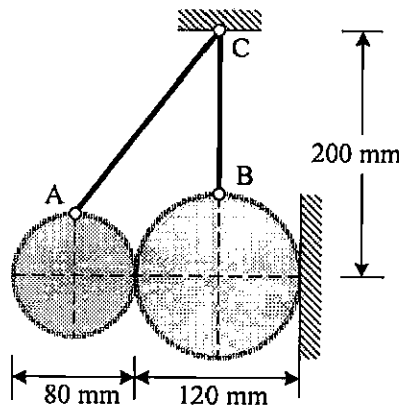


Fig. 2 b

- (c) A particle moves along a straight line with an acceleration  $a = (4t^3 - 2t)$ , where  $a$  is in  $\text{m/s}^2$  and  $t$  is in s. When  $t = 0$ , the particle is at 2 m to the left of origin and when  $t = 2$  s the particle is at 20 m to left of origin. Determine the position of particle at  $t = 4$  s. [4]

- (d) A woman having a mass of 70 kg stands in an elevator which has a downward acceleration of  $4 \text{ m/s}^2$  starting from rest. Determine work done by her weight and the work of the normal force which the floor exerts on her when the elevator descends 6 m. [4]

3. (a) Two spheres A and B of diameter 80 mm and 120 mm respectively are held in equilibrium by separate strings as shown in Fig. 3a. Sphere B rests against vertical wall. If masses of spheres A and B are 10 kg and 20 kg, determine the tension in the string and reactions at point of contact. [6]



**Fig. 3 a**

- (b) Four parallel bolting forces act on the rim of the circular cover plate as shown in Fig. 3b. If the resultant force 750 N is passing through (0.15 m, 0.1 m) from the origin O, determine

the magnitude of forces  $P_1$  and  $P_2$ .

[6]

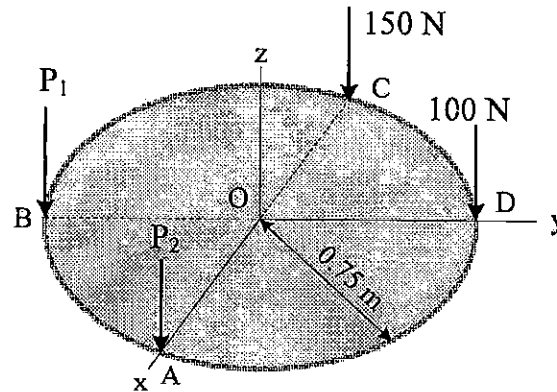


Fig. 3 b

- (c) Determine the support reaction for the beam loaded and supported as shown in Fig. 3c. [5]

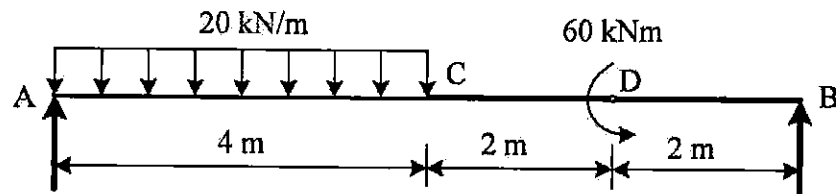


Fig. 3 c

Or

4. (a) Three cables are joined at the junction C as shown in Fig. 4a. Determine the tension in cable AC and BC caused by the weight of the 30 kg cylinder. [6]

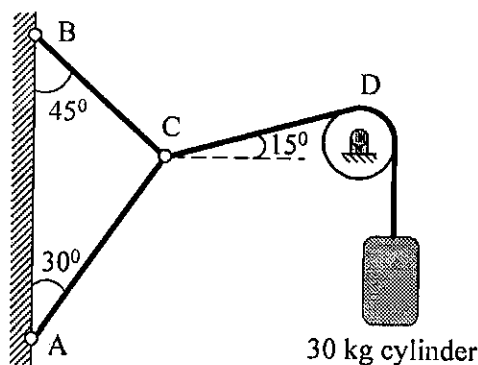


Fig. 4 a