Total No. of Questions : 6]

SEAT No. :

P1114

[Total No. of Pages : 5

[4456] - 10
F.E. (Semester - II)
ENGINEERING MECHANICS
(2008 Course)

Time : 2 Hours] *[Max. Marks : 50*

Instructions to the candidates :

1) ***Attempt Q. 1 or Q. 2, Q. 3 or Q. 4 and Q. 5 or Q. 6***
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 cell phone is prohibited in the examination hall.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) Find the magnitude of the resultant and its location of the following forces acting at a point O as shown in **Fig.1 a**. **[6]**

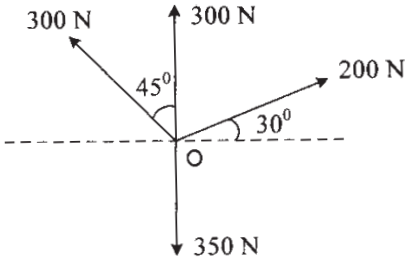


Fig. 1 a

b) A Particle starts with an initial velocity of 2.5 m/s and uniformly decelerates at the rate 0.5 m/s^2. Determine the displacement and velocity at t = 2s. **[6]**

OR

Q2) a) Determine the position of centroid of the trapezoidal plate as shown in **Fig.2 a**. with respect to origin O. **[6]**

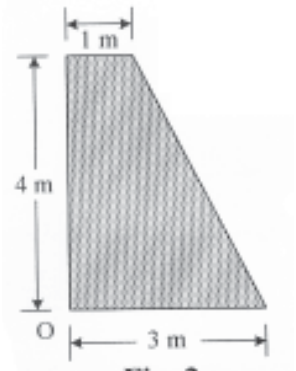


Fig. 2 a

P.T.O.

b) A block of weights 100 N move along a rough horizontal plane under the action of force 100 N applied to the block as shown in **Fig.2 b**. The coefficient of static friction between block and plane is $\mu_s = 0.5$. Determine the acceleration of the block using Newton's second law of motion. **[6]**

Fig. 2 b

Q3) a) A square foundation supports four loads as shown in **Fig.3 a**. Determine magnitude, direction and point of application of resultant of four forces.**[6]**

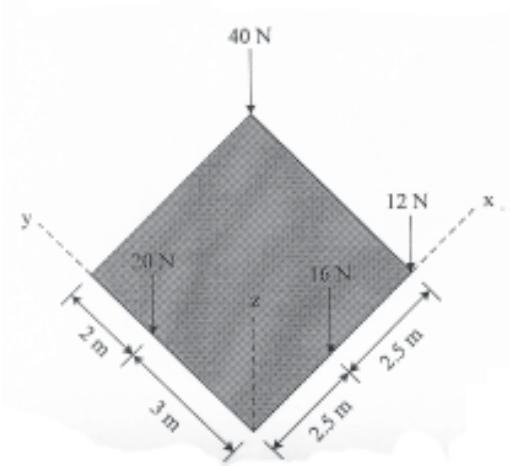


Fig. 3 a

b) A sphere of weight 100 N and a radius of 200mm as shown in **Fig.3 b**. Determine the reaction at the points of contact. **[7]**

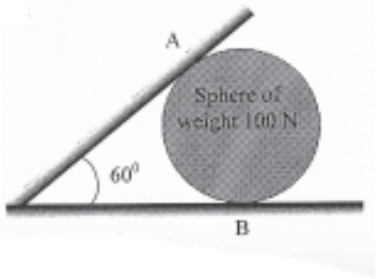


Fig. 3 b

c) A particle is projected at an angle of 30° to the horizontal with a velocity of 100 m/s. Determine the radius of curvature at the highest point of trajectory. **[6]**

OR

Q4) a) Determine the support reaction at A and D for beam AD loaded and supported as shown in **Fig.4.a**. **[7]**

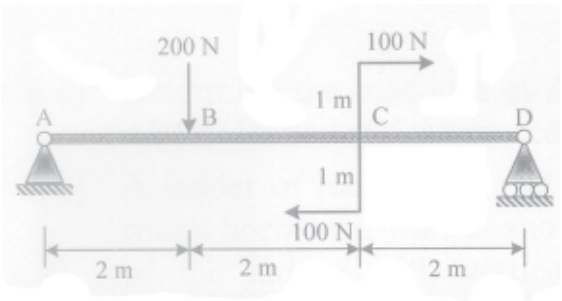
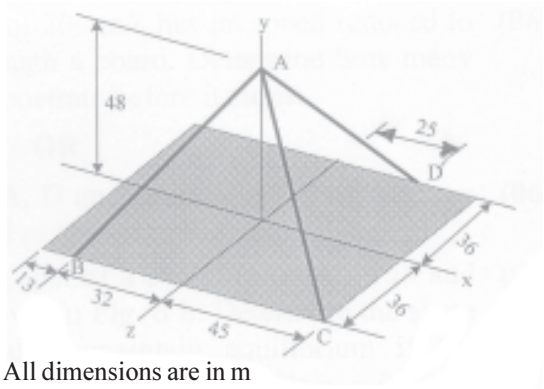


Fig. 4 a

b) A rectangular plate is supported by three cables at A as shown in **Fig.4.b**. Knowing that the tension in cable AD is 120 N, determine the weight of the plate. **[6]**



All dimensions are in m

Fig. 4 b

c) The small ball of mass m and its supporting wire AB become a simple pendulum when the horizontal cord BC is severed. Determine the ratio k of the tension T in the supporting wire immediately after the cord is cut to that in the wire before the cord is cut. Refer **Fig.4 c**. **[6]**

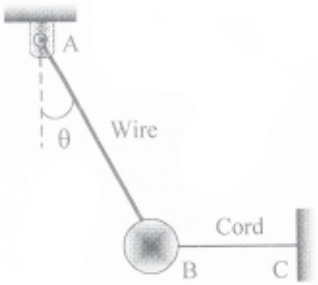


Fig. 4 c

Q5) a) A plane truss is loaded and supported as shown in **Fig.5 a**. Determine the magnitude and nature of forces in all the members. **[7]**

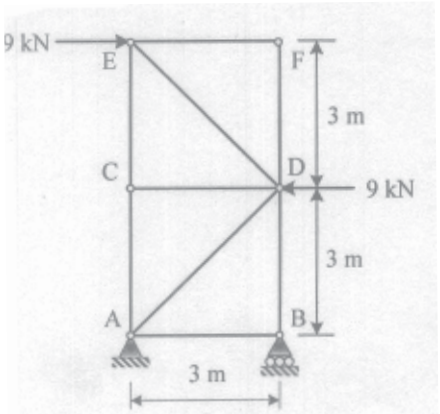


Fig. 5 a

b) A flat belt passes on the two drums as shown in **Fig.5 b**. Determine the value of force P to lift the block of mass 100 kg upward. **[6]**

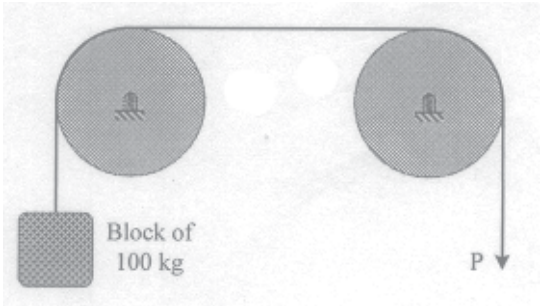


Fig. 5 b

c) A bullet moving at a speed of 300 m/s has its speed reduced to 270 m/s when it passes through a board. Determine how many such boards the bullet will penetrate before it stops. **[6]**

OR

Q6) a) Determine the reactions at A, D and tension in BC of the rope ABCD loaded and supported as shown in **Fig.6.a**. **[6]**

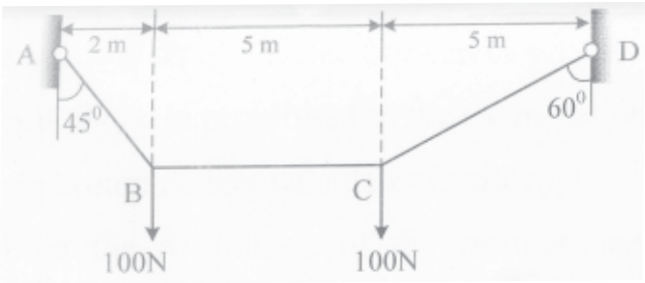


Fig.6 a

b) A ladder of length 6 m rest against a smooth vertical wall and rough horizontal wall as shown in **Fig.6 b**. Determine the slope of the ladder with vertical to maintain equilibrium if the coefficient of static friction at all contact surfaces is $\mu s = 0.25$. **[7]**

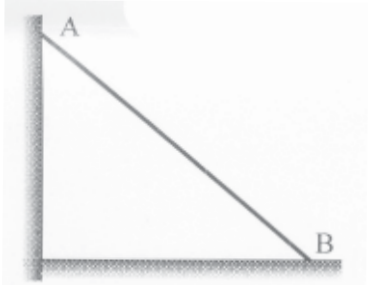


Fig. 6 b

c) Determine the velocities of the two balls shown in **Fig.6 c**. after impact. Take weight of ball A is 20 N, weight of ball B is 10 N and coefficient of restitution is 0.6. **[6]**

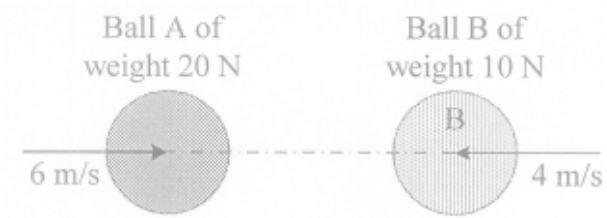


Fig. 6 c

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