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BME-016

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BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING) B.Tech. (AEROSPACE ENGINEERING)

Term-End Examination

December, 2011

BME-016 : ENGINEERING MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any five** questions. Use of scientific calculator is **permitted**.*

1. (a) Find the magnitude and direction of the resultant force for the force system shown in fig.1 **7+7**

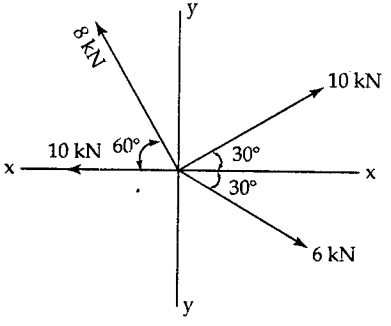

Fig. 1

(b) Find the support reactions for the beam shown in fig.2

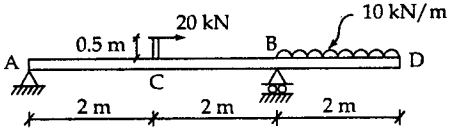

Fig. 2

2. (a) Find the minimum value of horizontal force P to be applied to the lower block to hold the system under equilibrium as shown in fig.3 **7+7**

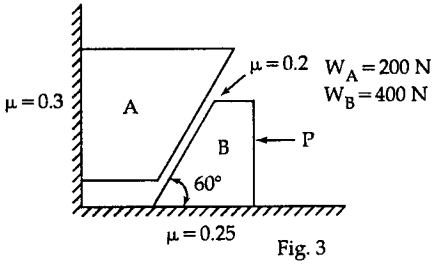

Fig. 3

(b) For a lifting machine 14 N effort is required to raise a load of 700 N with efficiency 40%, and 21 N effort is required to lift a load of 1400 N. Determine the law of machine. Find the effort required to lift a load of 1000 N. Also find the maximum mechanical advantage and the maximum efficiency.

3. (a) Find the c.g. of a thin uniform wire bent as shown in fig. 4. 7+7

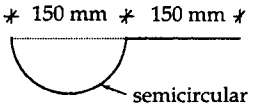

Fig. 4

(b) Find the moment of inertia of a plate shown in the fig.5 about horizontal centroidal axis.

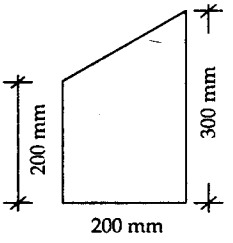

Fig. 5

4. (a) A ladder weighing 100 N rests as shown in fig.6. Find the minimum angle α at which ladder will start slipping. The static friction Co-efficients at A and B are 0.2 and 0.3 respectively. 7+7

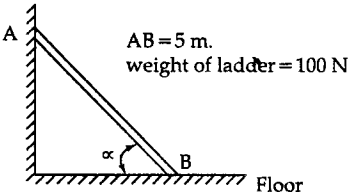

Fig. 6

(b) Find the forces in all members for the truss shown in fig. 7.

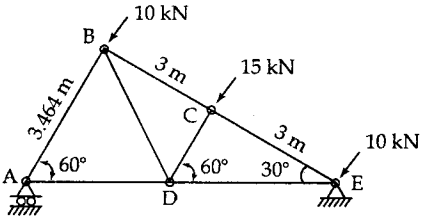

Fig. 7

5. (a) A mass of 12 kg moving with a velocity of 10 m/s along x-direction strikes with another mass of 5 kg moving at velocity 6 m/s in the same direction. Find the velocities of masses after impact takes e = 0.6. **7+7**

(b) The compound pulley system has a mass of 40 kg and a radius of gyration of 450 mm. Determine the tension in each cord and the angular acceleration of the pulleys when the masses are released. Ref. fig. 8.

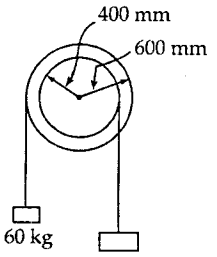

Fig. 8

6. (a) For the truss shown in the fig.9, mark the zero force members and find the forces in the rest of the members. 7+7

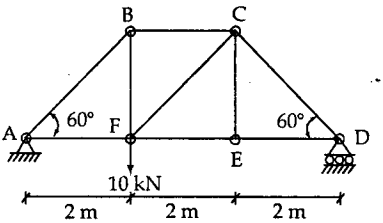

Fig. 9

(b) For the frame shown in fig.10 determine the magnitudes of all pin reactions.

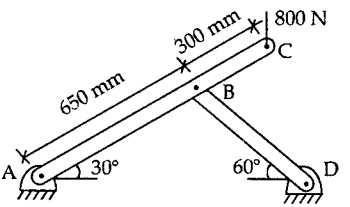

Fig. 10

7. (a) For the system shown in fig.11, find the acceleration of Block B and tension in the rope. Neglect friction of pulley. Mass of Block A and B are 12 kg and 6 kg respectively. The co-efficient of friction between Block A and floor is 0.30. 7+7

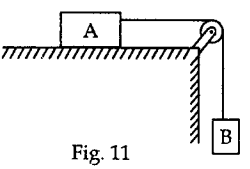

Fig. 11

(b) A car is traversing a circular track at a speed of 120 km/h. Determine the minimum radius of curvature of the track so that car is not to skid out ward. The angle of banking is 25° and co-efficient of friction between tyre and track is 0.6.

8. (a) Find the accelerations of Block A and B as shown in the fig.12, if system is released from the rest. Neglect friction and inertia of the pulleys. 7+7

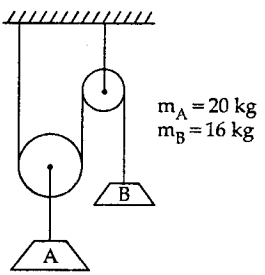

Fig. 12

(b) A projectile is fired from the edge of a 150 m high cliff with an initial velocity of 180m/s at an angle of elevation of 30° with horizontal. Neglecting air resistance, find

(i) The horizontal distance from the gun to the point where the projectile strikes the ground, and

(ii) The greatest elevation above the ground reached by the projectile.

9. (a) Find the surface area and volume of the solid shown in fig.13 using pappu-Guldinus theorems. **10+4**

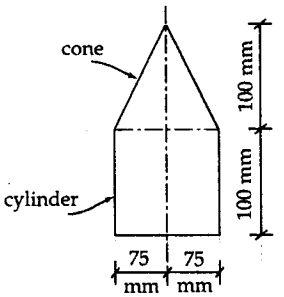

Fig. 13

(b) Explain

(i) Radius of gyration

(ii) Product of Inertia