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BME-016

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

Term-End Examination

December, 2012

BME-016 : ENGINEERING MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *Answer **any five** questions, **allowed** calculators.*

1. (a) A system of four forces acting on a body is as shown in fig. 1. Determine the resultant. 7

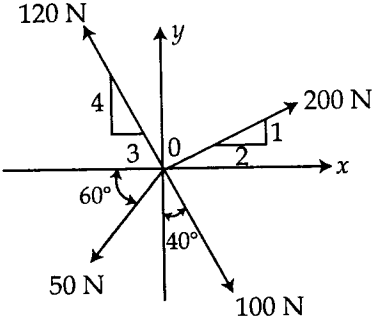


Fig. 1

(b) Two smooth spheres each of radius 100 mm and weighing 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contacts A, B, C and D as shown in fig (2). 7

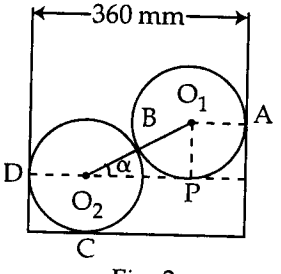


Fig. 2

2. (a) Determine the reactions at A, B and D of the system shown in fig (3). Neglect the self - weight of the members. 7

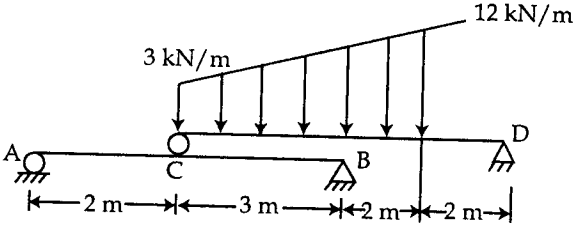


Fig. 3

(b) Find the forces in all the members of the truss shown in fig (4). Tabulate the results 7

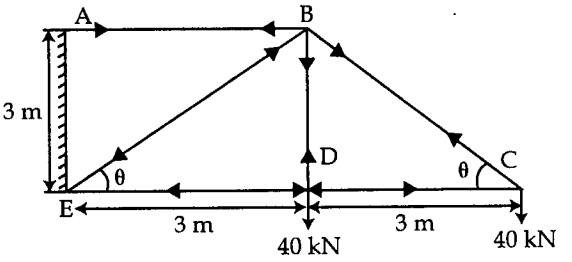


Fig. 4

3. (a) Two blocks A and B connected by a horizontal rod and frictionless hinges are supported on two rough planes as shown below fig 5. The coefficient of friction are 0.3 (A) and 0.4(B). If block B weighs 100 N. What is the smallest weight of block A. So that the system is in equilibrium. 7

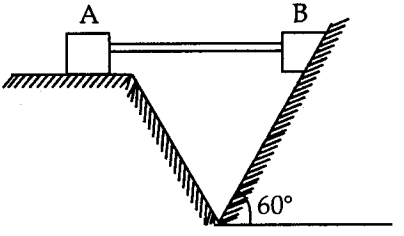


Fig. 5

(b) A simply supported beam, AB of span 6 m is loaded as shown in figure 6. 7

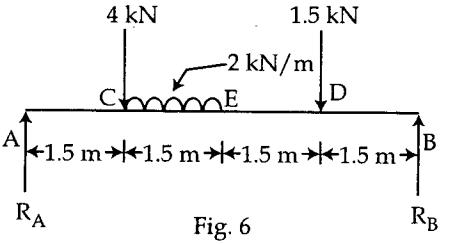


Fig. 6

Determine the reactions R_A and R_B.

4. (a) Determine the coordinates x_c and y_c of the centre of a 100 mm diameter circular hole cut in a thin plate so that this point will be the centroid of the remaining shaded area shown in fig 7 (All dimensions are in mm) 7

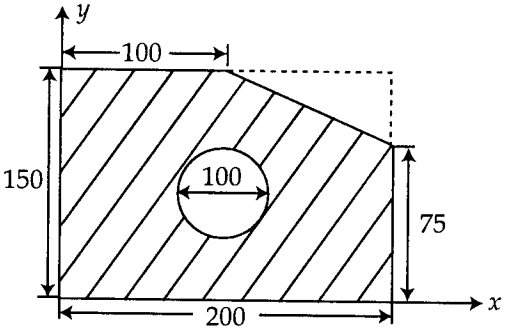
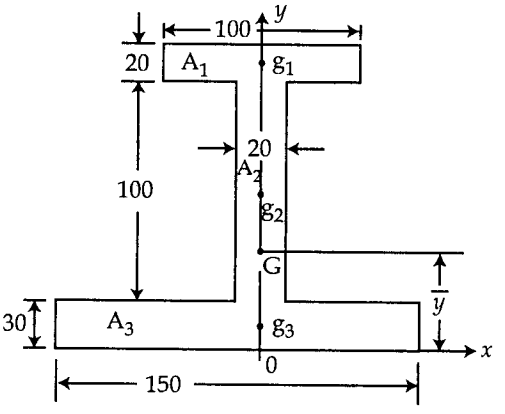


Fig. 7

(b) Locate the centroid of the I - section shown in figure 8. 7



(All dimensions are in mm)

Fig. 8

5. (a) A motor car takes 10 seconds to cover 30 meters and 12 seconds to cover 42 meters. Find the uniform acceleration of the car and its velocity at the end of 15 seconds. 7

(b) A particle, starting from rest, moves in a straight line, whose equation of motion is given by $S = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds. 7

6. (a) A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have 7

(i) equal Horizontal range,

(ii) equal maximum height and

(iii) equal time of flight.

(b) A wheel rotates for 5 seconds with a constant angular acceleration and describes during this time 100 radians. It then rotates with a constant angular velocity and during the next five seconds describes 80 radians. Find the initial angular velocity and acceleration. 7

7. (a) Find the amplitude and time - period of a particle moving with simple harmonic motion, which has a velocity of 9 m/s and 4 m/s at the distance of 2m and 3m respectively from the centre. 7

(b) An elevator cage of a mine shaft weighing 8 kN, when empty, is lifted or lowered by means of a wire rope. Once a man weighing 600 N, entered it and lowered with uniform acceleration such that when a distance of 187.5 m was covered, the velocity of the cage was 25 m/sec. Determine the tension in the rope and force exerted by the man on the floor of the cage. 7

8. (a) Determine the tension in the string and accelerations of blocks A and B weighing 1500 N and 500 N connected by an in extensible string as shown fig. 9. Assume pulley are frictionless and weightless. 7

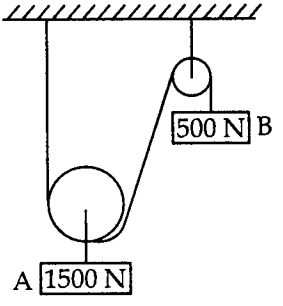


Fig. 9

(b) The composite pulley shown fig 10. weighs 800 N and has a radius of Gyration 0.6 m. The 2000 N and 4000 N blocks are attached to the pulley by in extensible strings using work energy principle determine the resulting velocity when distance moved by 4000 block is 2 m and hence determine the resulting acceleration. 7

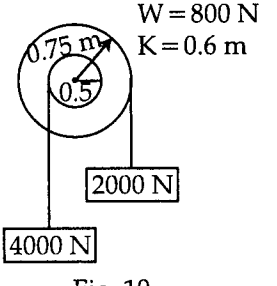


Fig. 10