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

Term-End Examination

June, 2012

BME-016 : ENGINEERING MECHANICS

Time : 3 hours *Maximum Marks : 70*

Note : *(i) Answer **any five** questions.*

(ii) Use of calculator is permitted.

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

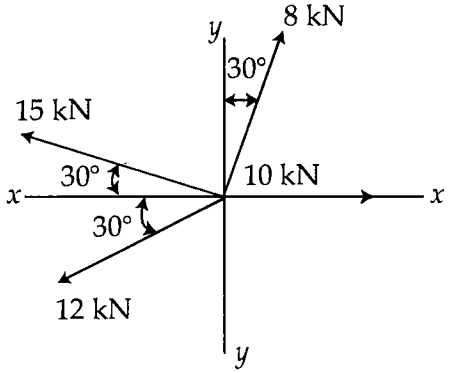

Fig. 1

(b) A cord tied at A and B carries a load of 10 kN at D and W at C as shown in the fig.2. Find the value of W so that part CD remains horizontal.

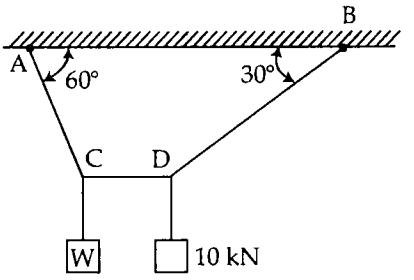

Fig. 2

2. (a) Find the effort required to lift load of 1 KN with the help of a screw jack. Also find the corresponding efficiency of the jack Take $\mu = 0.04$, Diameter of screw rod = 62.5mm Length of the handle = 300 mm, Pitch of the square threads = 12.5mm. 7+7

(b) For the block shown in the fig.3. Find the smallest value of P.

(i) Just to move the block up plane

(ii) Just to prevent the block moving down. Take co - efficient of static friction = 0.2.

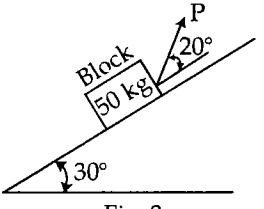

Fig. 3

3. (a) Find the centroid of a plane lamina shown in the fig. 4. 7+7

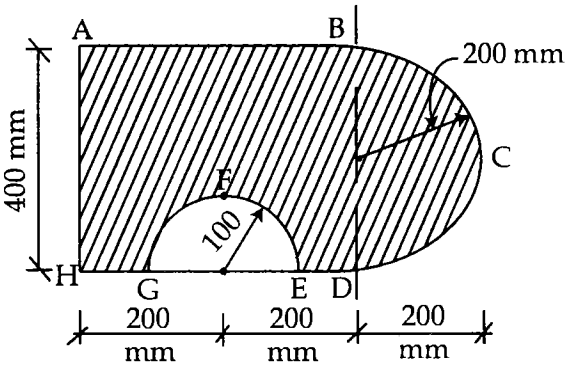

Fig. 4

(b) Find Moment of Inertia of a plane lamina shown in the fig. 5. about its horizontal axis. Also find the radius of gyration.

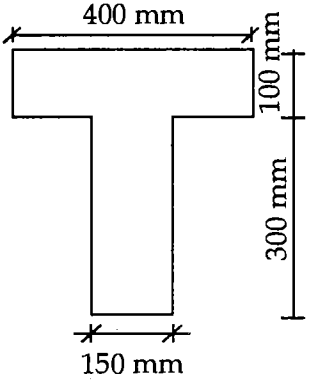

Fig. 5

4. (a) A load of 1200 N is to be lifted by 3 different systems of pulleys. If efficiency of each system is 70% and total 5 pulleys in each system, determine the effort required in the I, II and III systems of pulleys. **7+7**

(b) Find the nature and magnitude of forces in members of a truss shown in fig.6.

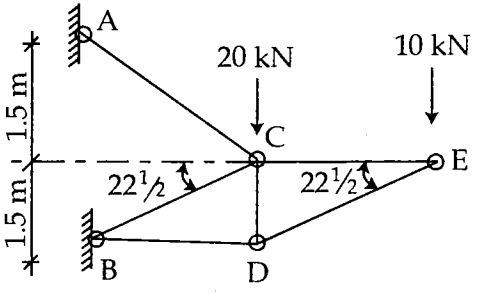

Fig. 6

5. (a) A uniform bar of 1.2 m length and of mass 5 kg is hinged at O. The bar is released from its horizontal position OA. Determine the angular velocity of bar when it is at an angle 30° and 90° with respect to OA. Ref fig.7. **7+7**

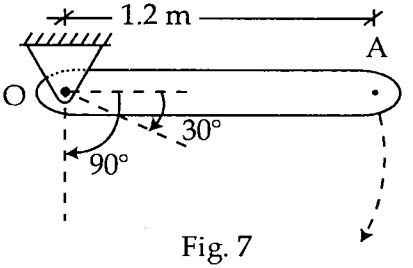

Fig. 7

(b) A hammer of mass 400 kg falls through a height of 3 m on a peg of negligible mass. Find the depth of the penetration of the peg in the ground if average resistance of the ground is 40 KN per mm. Assume that impact between hammer and peg is perfectly elastic.

6. (a) Find the forces in the members CE, CD and AC of the truss shown in the fig .8. Use method of section. **7+7**

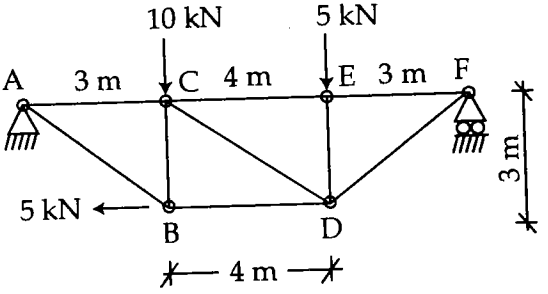

Fig. 8

(b) Find the support reactions for a beam shown in fig. 9.

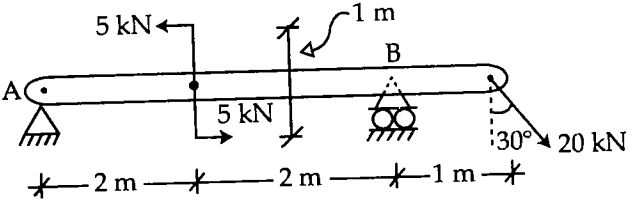

Fig. 9

7. (a) Find the accelerations of block A and B shown in the fig. 10. if system is released from rest. The contact surfaces are smooth and pulley is frictionless. Take mass of blocks A and B 10 kg and 15 kg respectively. **7+7**

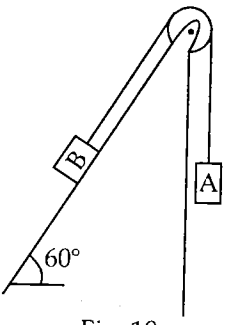

Fig. 10

(b) Determine the maximum speed at which a car of weight 0.75 KN can make a horizontal turn around a circular curve of radius 300 m that is banked at 10° with the horizontal. The co -efficient of static friction between the tyre and the road is 0.5.

8. (a) Determine the tensions in the strings and accelerations of blocks A and B weighing 150 N and 50 N connected by a string and a frictionless and weightless pulley as shown in fig.11. 7+7

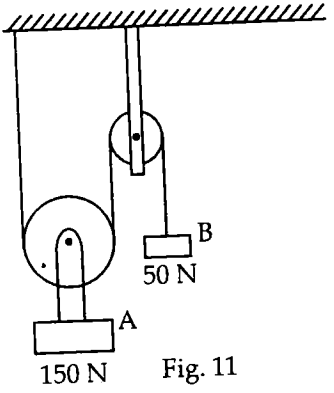

Fig. 11

(b) A particle is projected at an angle of 60° with the horizontal. The horizontal range of particle is 5 kilometres. Find

(i) The velocity of projection and

(ii) The maximum height attained by the projectile.

9. (a) Find the M.I. of the lamina shown in the fig.12 about its horizontal centroidal axis. **10+4**

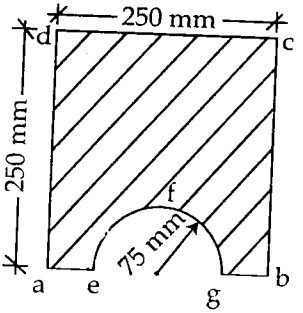

Fig. 12

(b) Explain

(i) Pappu - Guldinas IInd theorem

(ii) Couple and its characteristics.