B.ENGG (COSTRUCTION,1st yr 1st Semester ,Engineering Mechanics-I EXAMINATION. 2018

Time : 3 hours Answer any Eight [8] questions All questions carry equal marks Full Marks-100

1. a) Derive the relation of the vector components if the co-ordinate of the system rotate θ with respect to Z-axis?

b) From the above relation show that the dot product of two vectors remain same, after the rotation of co-ordinate.

2. Draw the shear force and bending moment diagram for the beam shown in fig below.

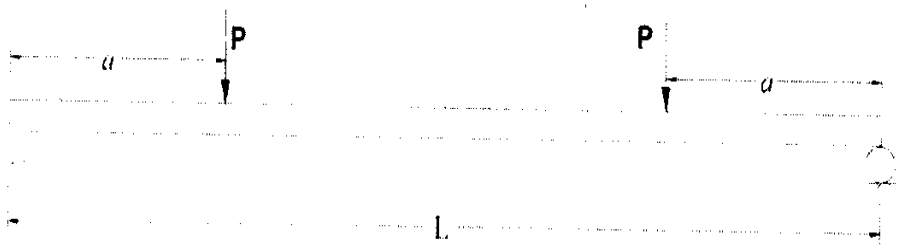


Fig-1

3. Draw the shear force and bending moment diagram of the following figure.

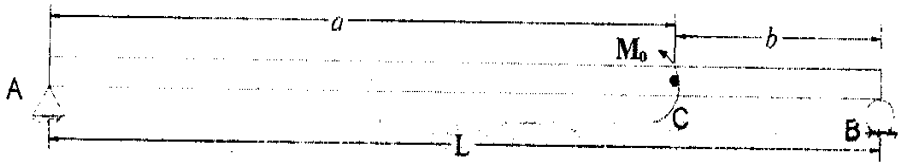


Fig-2

4.a) The 30-N force P is applied perpendicular to the portion BC of the bent bar. Determine the moment of P about point B and about point A. (Fig-3)

b) Using principle of virtual work determine the support reaction of the loaded beam (Fig-4)

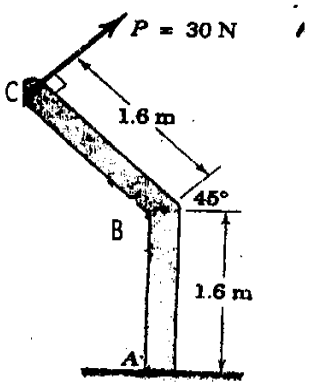


Fig-3

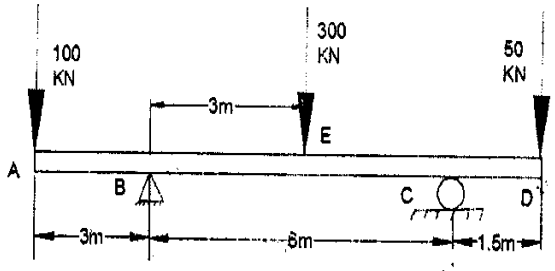


Fig-4

5.a) State and prove Lami's theorem.

b) Calculate the moment of the 250-N force on the handle of the monkey wrench about the center of the bolt.(Fig-5)

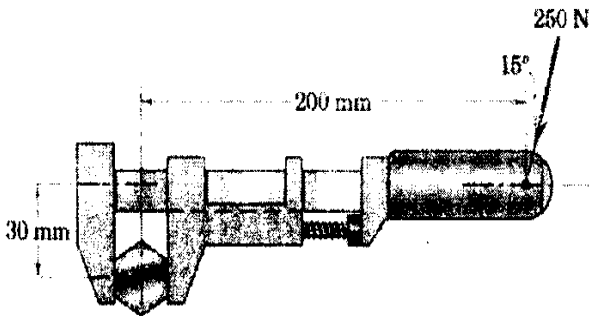


Fig-5

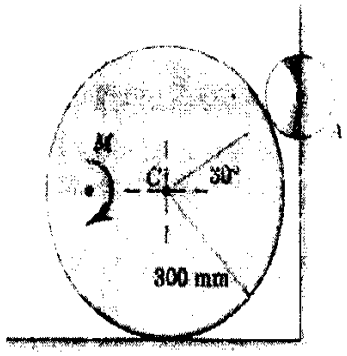


Fig-6

6.a) The 100-kg wheel rests on a rough surface and bears against the roller A when the couple $M$ is applied. If $M = 60$ N· m and the wheel does not slip, compute the reaction on the roller A. (Fig-6)

b) Determine the magnitude $Fs$ of the tensile spring force in order that the resultant of Fs and F is a vertical force. Determine the magnitude $R$ of this vertical resultant force.(Fig-7)

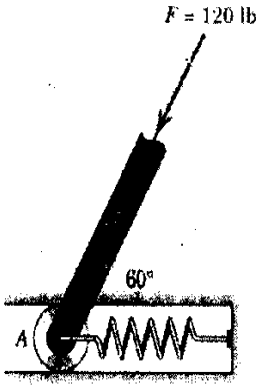


Fig-7

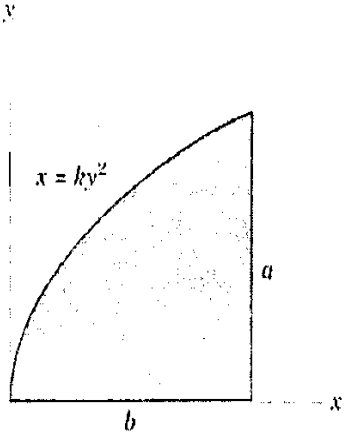


Fig-8

7. Determine the coordinates of the centroid of the shaded area.(Fig-8)

8. Determine the range of values which the mass $m_o$ may have so that the 100-kg block shown in the figure will neither start moving up the plane nor slip down the plane. The coefficient of static friction for the contact surfaces is 0.30.

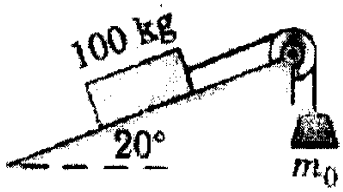


Fig-9

9 a) The uniform 15-m pole has a mass of 150 kg and is supported by its smooth ends against the vertical walls and by the tension T in the vertical cable. Compute the reactions at A and B.(Fig-10).

b) The pin at A can support a maximum force of 3.2 kN. What is the corresponding maximum load L which can be supported by the bracket? (Fig-11).

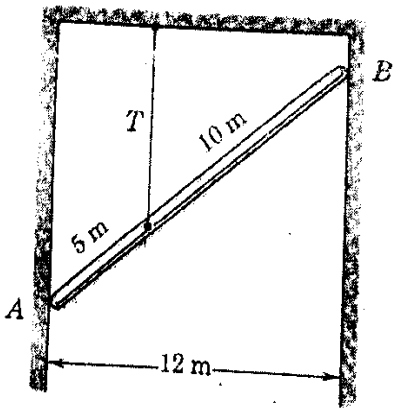


Fig-10

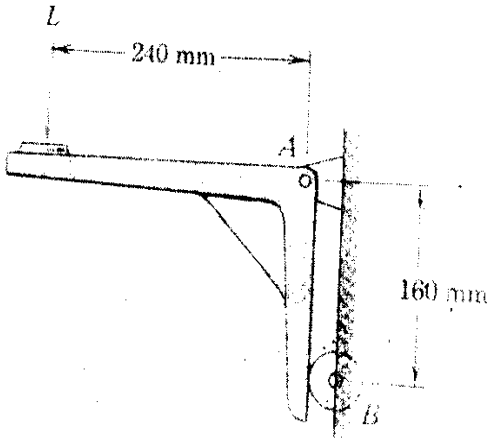


Fig-11

10. Determine the polar moments of inertia of the semicircular area about points A and *B*.(Fig-12)

11. Determine the force in each member of the loaded truss by method of joint ( Fig-13)

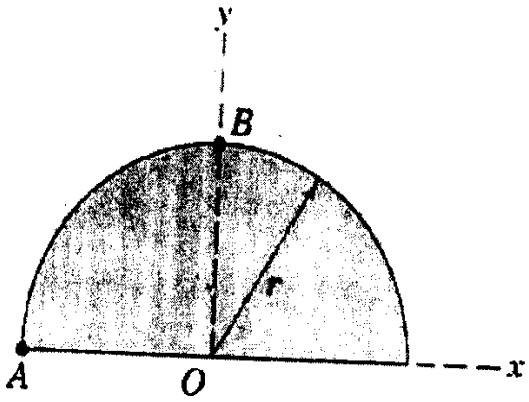


Fig-12

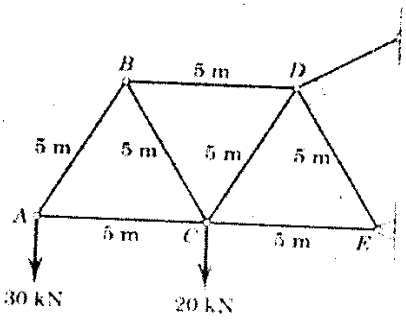


Fig-13