

Code No: R21011

R10

SET - 1

II B. Tech I Semester Supplementary Examinations, Oct/Nov- 2017
MECHANICS OF MATERIALS
(Civil Engineering)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

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1. a) Determine the magnitudes of  $F_1$  and  $F_2$  for the following system of forces which are in equilibrium as shown in Figure 1.

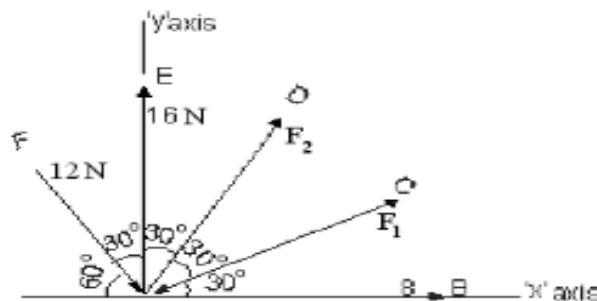


Figure 1

- b) Find the magnitude of 2 forces such that if they act at right angles, their resultant is  $\sqrt{10}$  N, but if they act at  $60^\circ$ , their resultant is  $\sqrt{13}$  N.
2. A block overlying a  $10^\circ$  wedge on a horizontal floor and leaning against a vertical wall and weighing 1500N is to be raised by applying a horizontal force to the wedge. Assuming the coefficient of friction to be 0.3, determine the minimum horizontal force to be applied to raise the block as shown in the Figure 2.

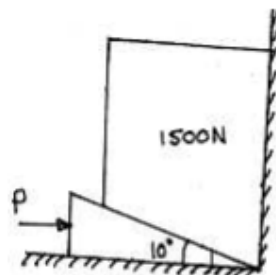


Figure-2

3. Two parallel shafts 6 metres apart are provided with 300 mm and 400 mm diameter pulleys and are connected by means of a cross belt. The direction of rotation of the follower pulley is to be reversed by changing over to an open belt drive. How much length of the belt has to be reduced?

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4. Determine the centroid of the section shown in Figure 4.

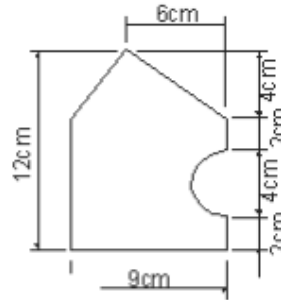


Figure 4

5. A rectangular block of size 50 mm × 100 mm × 80 mm is subjected to the following axial loads.  
500 kN (tensile) on 100 mm × 80 mm faces  
900 kN (tensile) on 50 mm × 80 mm faces  
1000kN (Compressive) on 500 mm × 100 mm faces.  
Taking the poisson's ratio as 0.3, find the change in volume of the block.  
If  $E = 200\text{GPa}$ , find the modulus of rigidity and the bulk modulus.
6. Construct S. F. D & B. M. D for the S. S beam shown in Figure 6.

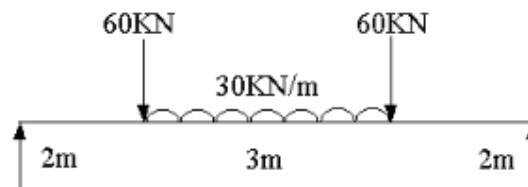


Figure-6

7. a) Compare the weight of two beams of the same material and equal strength. One beam is of solid circular cross section, while the other beam is of hollow circular section, the internal diameter being 0.8 times the external diameter.  
b) Find the section modulus for a rectangular cross section of 200mm × 350mm.
8. A beam of square section is used as a beam with one diagonal horizontal. The beam is subjected to a shear force  $F$  at a section. Find the maximum shear in the cross section of the beam and draw the shear distribution diagram for the section.