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Name of Examination : **FY Winter 2021** - (Preview)
Course Code & Course Name : **CE151U - Engineering Mechanics**
Generated At : **18-05-2022 11:32:02**
Maximum Marks : **60** Duration : **3 Hrs**

Edit Print View Answer Key Close **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. *All questions are compulsory.*
2. *Illustrate your answer with suitable figures/sketches wherever necessary.*
3. *Assume suitable additional data; if required.*
4. *Use of logarithmic table, drawing instruments and non programmable calculators is allowed.*
5. *Figures to the right indicate full marks.*

1) Solve any three sub-questions

a) Explain types of forces and system of forces. [6]

b) Determine the resultant of four co-planer forces concurrent at the origin as shown in figure 1. [6]

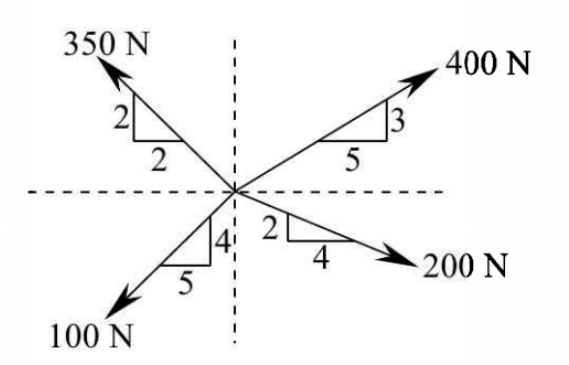

figure 1

c) A system of connected flexible cables shown in Figure 2 is supporting two vertical forces 300 N and 400 N at points B and D. Determine the forces in various segments of the cable. [6]

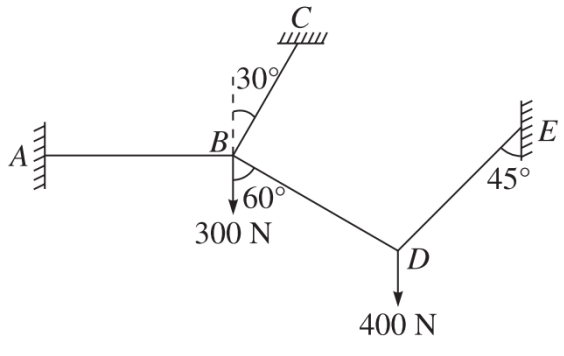

Figure 2

d) i. The pulley shown in Figure 3 is subjected to the belt forces P and Q. Using rectangular components, determine the magnitude and direction of the resultant force. [3]

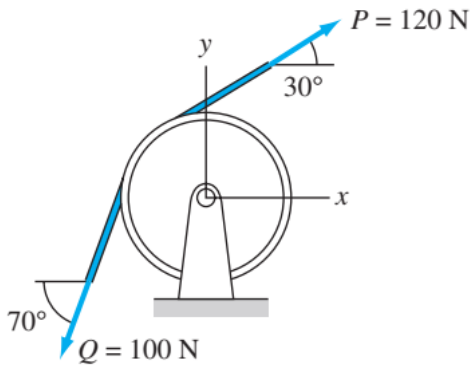

Figure 3

ii. A man opens the door by applying a force of 10 N at 10° to the direction of the y - axis as shown in figure 4. Determine the components of the force along the door and normal to the door. [3]

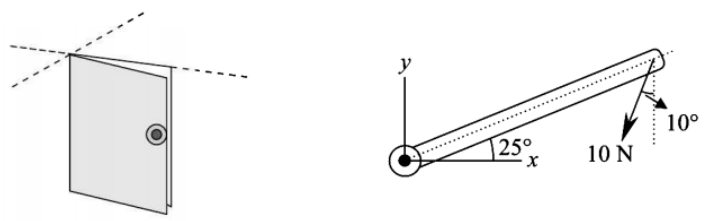

figure 4

2) Solve following sub-questions.

a) Determine the centroid of the Dam section shown in figure 5. [4]

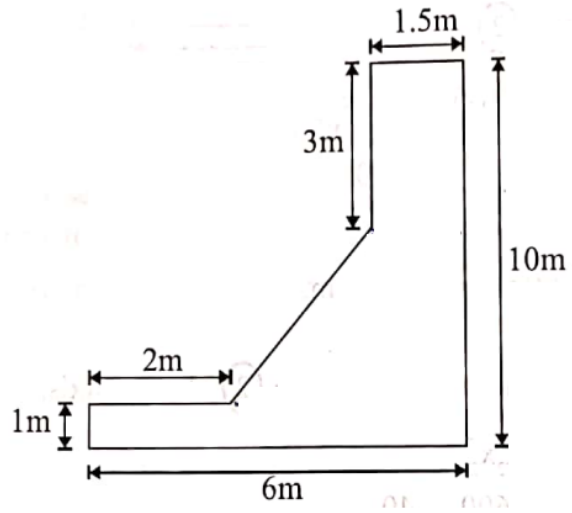

Figure 5

b) Determine the centroid of the shaded area shown in Figure 6. [5]

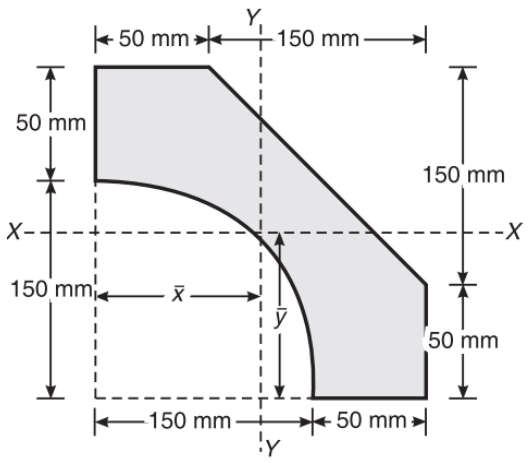

Figure 6

OR

c) Determine moment of inertia about centroidal axes of shaded area shown in figure 7. [5]

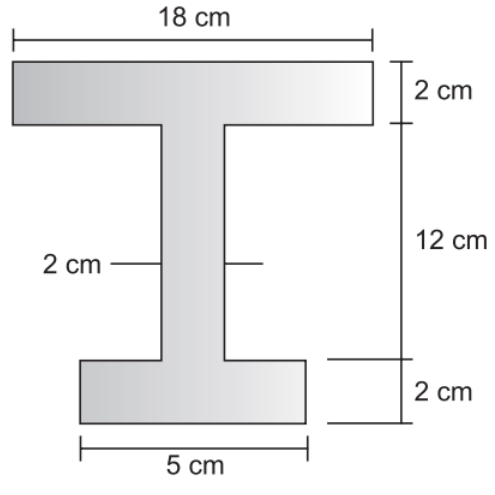

Figure 7

3) Solve all sub-questions.

a) Find the forces in all the members of the symmetric truss, shown in Figure 8. [8]

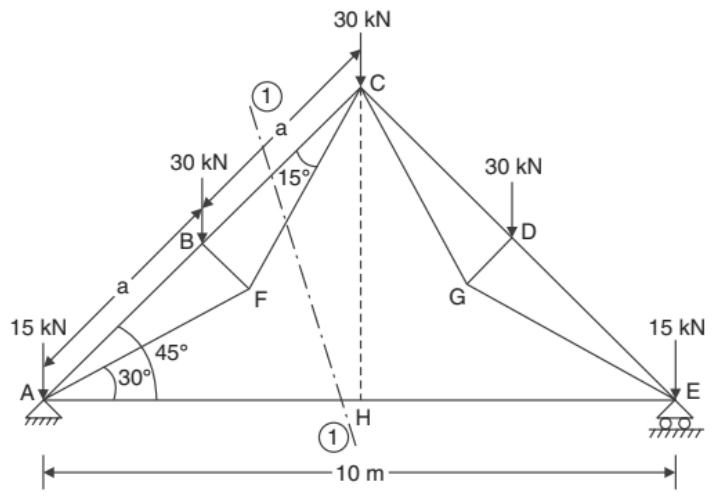

Figure 8

b) A block over laying a 10° wedge on a horizontal floor and leaning against a vertical wall and weighing 1500 N is to be raised by applying a horizontal force to the wedge. Assuming co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force to be applied to raise the block. [8]

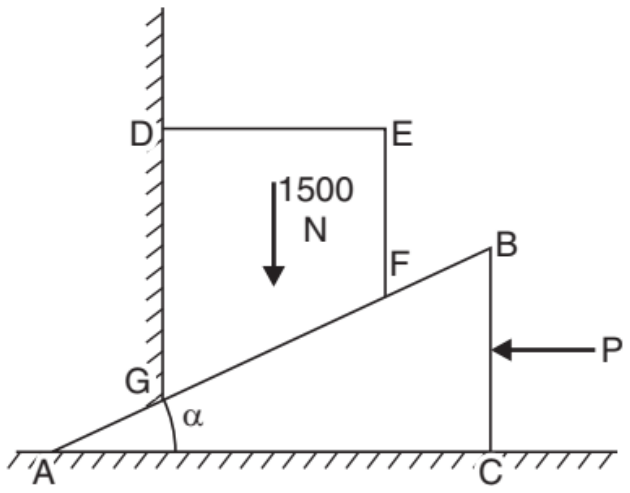

Figure 9

4) Solve all sub-questions.

a) State and explain principle of virtual work and newton's second law of motion [4]

b) A roller of radius r = 300 mm and weighing 2000 N is to be pulled over a curb of height 150 mm, as shown in figure 10 by applying a horizontal force F applied to the end of a string wound around the circumference of the roller. Find the magnitude of force F required to start the roller move over the curb. What is the least pull F through the centre of the wheel to just turn the roller over the curb? [7]

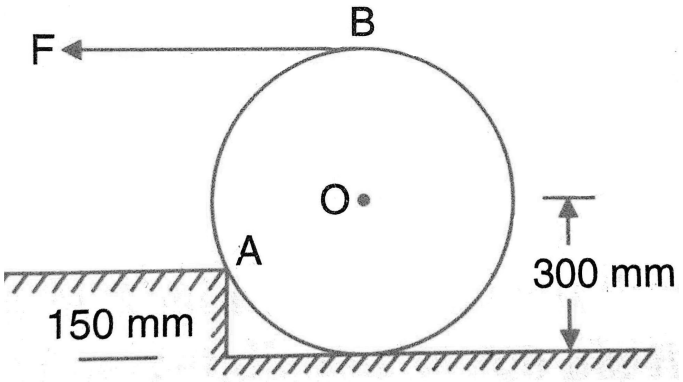

figure 10

c) The bar shown in figure 11 is subjected to a tensile load of 160 kN. If the stress in the middle portion is limited to 150 MPa, determine the diameter of the middle portion if the total elongation of the bar is to be 0.2 mm. Young's modulus is given as equal to 2.1×10^5 MPa. [6]

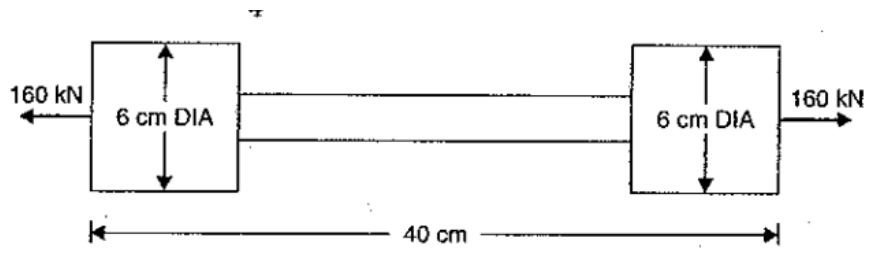

figure 11

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