Department of Civil Engineering
NATIONAL INSTITUTE OF TECHNOLOGY CALICUT
Mid-Sem Exam, 1 Nov 2023

Name:_____
Roll. No:_____
Sl. No:_____ S_1 $C_1/C_2/C_3/C_4$

CE1001E Engineering Mechanics

Duration: 2 hours | Maximum Marks: [30]

Note: Answer all questions; Provide neat sketches; Assume missing data; Read questions carefully

1. (a) Determine the moment of the four forces about point *A* shown in Fig. 1a. [4]

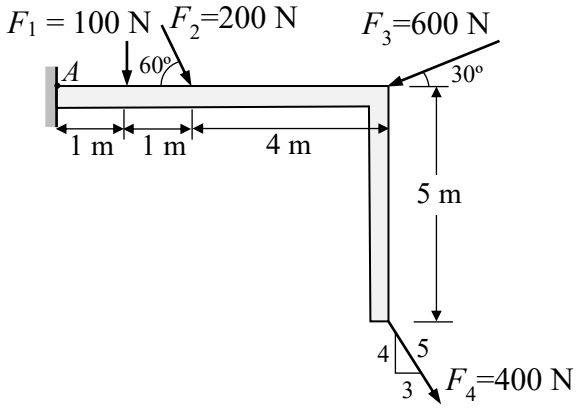

Figure 1a

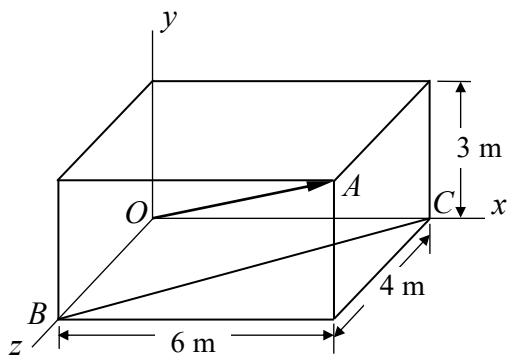

Figure 1b

(b) A 100 N force acts along the line connecting points *O* and *A* in Fig. 1b. What moment does this force exert about the axis connecting points *B* and *C*? [4]

2. Replace the system of forces acting on the rivets (the black dots) on the plate as shown in Fig. 2 by the simplest resultant. Give the intercept of this force with the *x*-axis. [8]

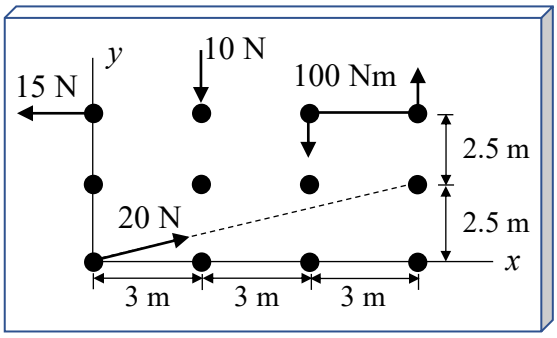

Figure 2

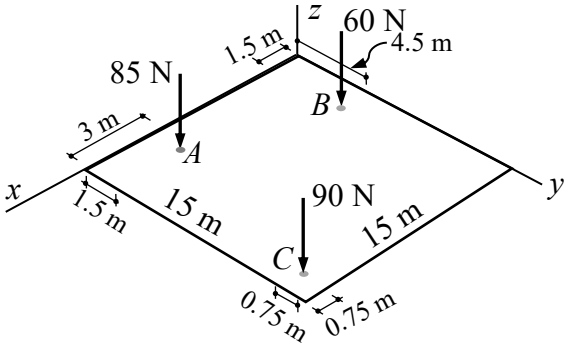

Figure 3

3. Three children are standing on a 15×15 m raft. The weights of children at points *A* (12,1.5) m, *B* (1.5, 4.5) m and *C* (14.25,14.25) m are 85 N, 60 N and 90 N respectively in the *xy* plane as denoted by arrows in Fig. 3. If a fourth child *D* of weight W_D climbs onto the raft, determine where she should stand if the other three children remain in the positions shown and the line of action of the resultant of the four weights is to pass through the centre of the raft. [5]

4. What is the simplest resultant for the forces shown acting on the beam *AB* in Fig. 4. [3]

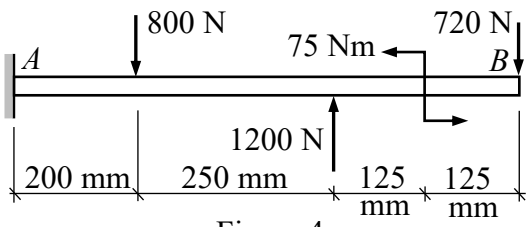

Figure 4

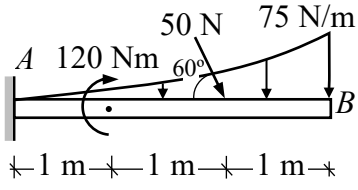

Figure 5a

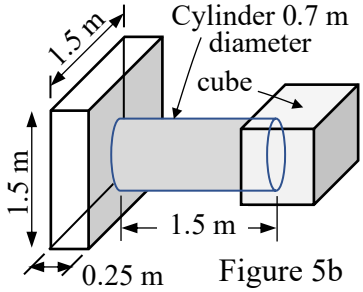

Figure 5b

5. (a) Determine the magnitude, direction and line of action of the simplest resultant of the coplanar force system acting on the beam shown in Fig. 5a. [4]

(b) Find the total weight and centre of gravity $\bar{x}$ of the composite body shown in Fig. 5b along its axis from the left end. The cube is of 0.9 m sides. The specific weight of the material is $\gamma = 48\ \text{kN/m}^3$. [4]

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