

Class: 3/4 B Tech (Civil)

QUIZ 2

October 15, 2011

Maximum Marks: 15

F Slot

Time: 60 minutes

Answer all questions.

1. Analyse the portal frame shown in Fig. 1 by the moment distribution or slope deflection method, taking advantage of the anti-symmetric response, and **draw the bending moment diagram.** (4 marks)
2. In a two-bar truss, the displacement transformation is given by $\begin{Bmatrix} D_*^1 \\ D_*^2 \end{Bmatrix} = \begin{bmatrix} 10 & 5 \\ 4 & 6 \end{bmatrix} \begin{Bmatrix} D_1 \\ D_2 \end{Bmatrix}$. Find the bar forces N_1 and N_2 caused by joint loads, $F_1 = +40$ kN and $F_2 = -80$ kN. (3 marks)
3. Consider the two-bar axial system in Fig.2. Apply the reduced element stiffness method to **find the deflection at B** due to a temperature rise of 50°C in AB. Assume $EA = 4000$ kN and $\alpha = 10 \times 10^{-5}$ per $^\circ\text{C}$. (4 marks)
4. **Generate the 3×3 stiffness matrix k_{AA}** (using any approach) for the truss ABC with a spring support at D, with the three active global coordinates as labelled in Fig. 3. Assume the three truss members to have an axial stiffness of 40 kN/mm and the spring to have a stiffness of 8 kN/mm. (4 marks)

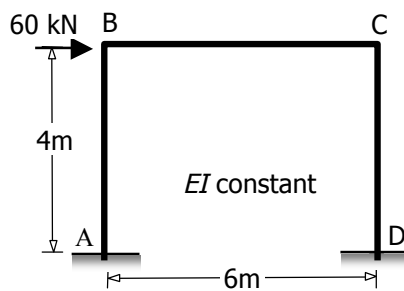


Fig. 1

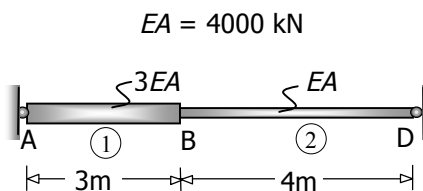


Fig. 2

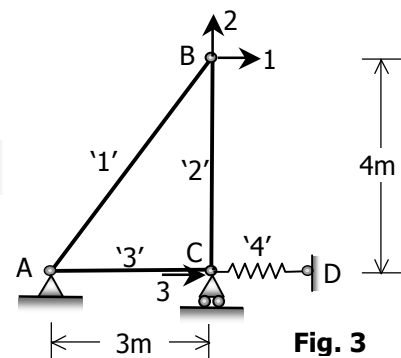


Fig. 3

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