

Question 2:

Determine the vertical movement of joint C, if the member FG is lengthened by 50 mm. (Virtual Work) 6 marks

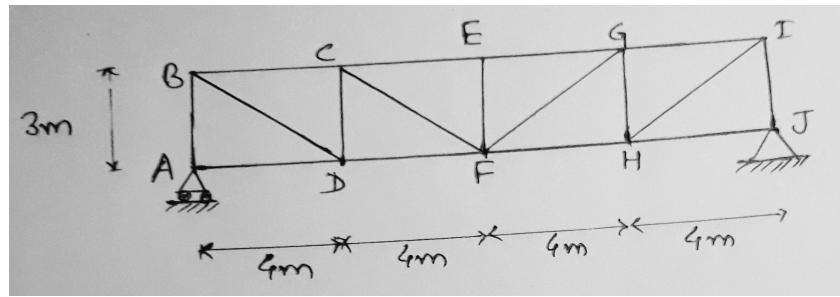


Fig-2

Solution:

Here, we observe that, $\delta_E = \delta_G$

(so that length of GE remains constant in this deformation), $\delta\theta$ or both sides is same.

Now, for obtaining $\delta\theta$,

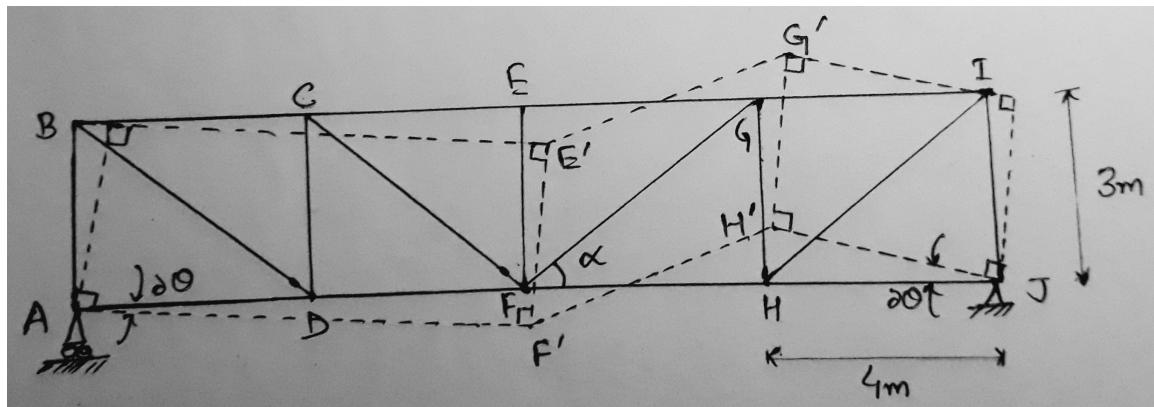


Fig-2(a)

Displacement of F along FG is

$$\delta_F = 2 \times 4 \times \sin \alpha \times \delta\theta = 8 \times \frac{3}{5} \times \delta\theta = \frac{24}{5} \delta\theta$$

Displacement of G along FG is

$$\delta_G = 2 \times 4 \times \sin \alpha \times \delta\theta = 8 \times \frac{3}{5} \times \delta\theta = \frac{24}{5} \delta\theta$$

Now,

$$\text{Change in length of FG} = \delta_F + \delta_G = \frac{24}{5} + \frac{24}{5} \delta\theta = \frac{48}{5} \delta\theta = 8$$

$$\Rightarrow \delta\theta = \frac{58}{12 \times 4}$$

$$\Rightarrow \delta_C = 4 \times \delta\theta = \frac{58}{12} = 20.833 \text{ mm.}$$