

Name

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Section

A

Subject

Structure I

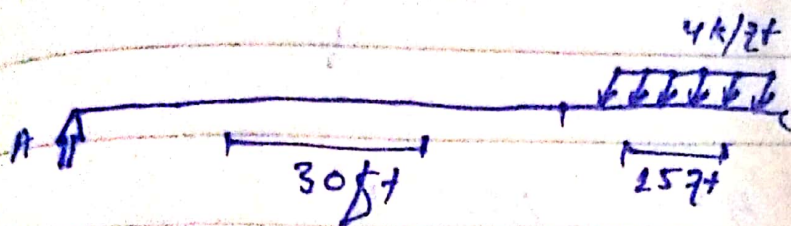
Dpt

Civil Engineering

Date

13 July 2020

Determine the slope and displacement at C. EI is constant use the moment area theorems.



Solution

$$\uparrow \sum M_A = 0$$

$$-V_B \times 30 + (4 \times 15) \times 3.75 = 0$$

$$V_B = 75 \text{ k}$$

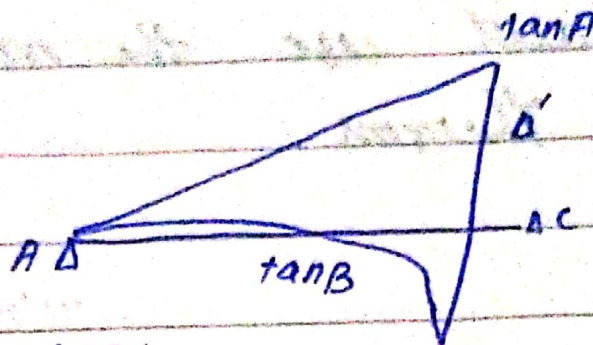
$$V_B = 75 \text{ k}$$

$$\downarrow \sum M_B = 0$$

$$V_A \times 30 + (4 \times 15) \times 7.5 = 0$$

$$V_A = -15 \text{ k}$$

For Displacement



$$t_{C/A} = \Delta C + D'$$

$$\Delta C = t_{C/A} - D' \rightarrow \textcircled{i}$$

$$\frac{D'}{45} = \frac{t_{B/A}}{30}$$

$$D' = \frac{3}{3} t_{B/A}$$

eg \textcircled{i}

$$\Delta C = t_{C/A} - \frac{3}{3} t_{B/A}$$

$t_{C/A}$

$$t_{C/A} = \left[\frac{-450}{EI} \times 30 \times \frac{1}{2} \right] \times \left[15 + \frac{1}{3} \times 30 \right]$$

$$+ \left[\frac{3}{4} \times 15 \right] \times \left[\frac{1}{3} \times \frac{450}{EI} \times 15 \right]$$

$$\frac{1C}{a} = \frac{168750}{EI} - \frac{25312.5}{EI}$$

For $1B/a$

$$TB/a = \left[\frac{-450}{EI} \times \frac{30}{2} \right] \times \left[\frac{1}{3} \times 30 \right]$$

$$TB/a = -67500/EI$$

$$DC = \frac{-19406.5}{2} - \left(\frac{67500}{EI} \right) \times \frac{3}{2}$$

$$DC = \frac{-29531.25}{EI} \text{ k.ft}^2$$

For Slope at B

$$\theta_B = \frac{DC}{15} = \left(\frac{29531.25}{EI} \right) / 15$$

$$\theta_B = \frac{196875}{EI} \text{ k./ft}^2$$

Slope of the free end at point C. it nearly equal to zero.