

Name = Zahoor

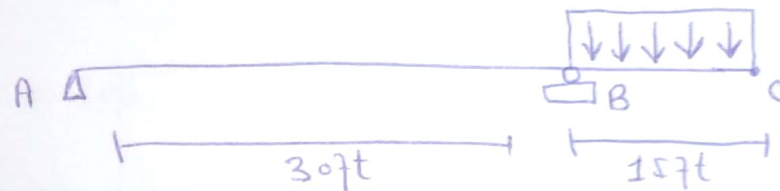
ID# 7902

Section = A

Assignment # 03

Q# 1:-

Determine the slope and Displacement at C. EI is constant Use the moment Area theorems-

Solution:-

$$\uparrow \sum M_A = 0$$

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

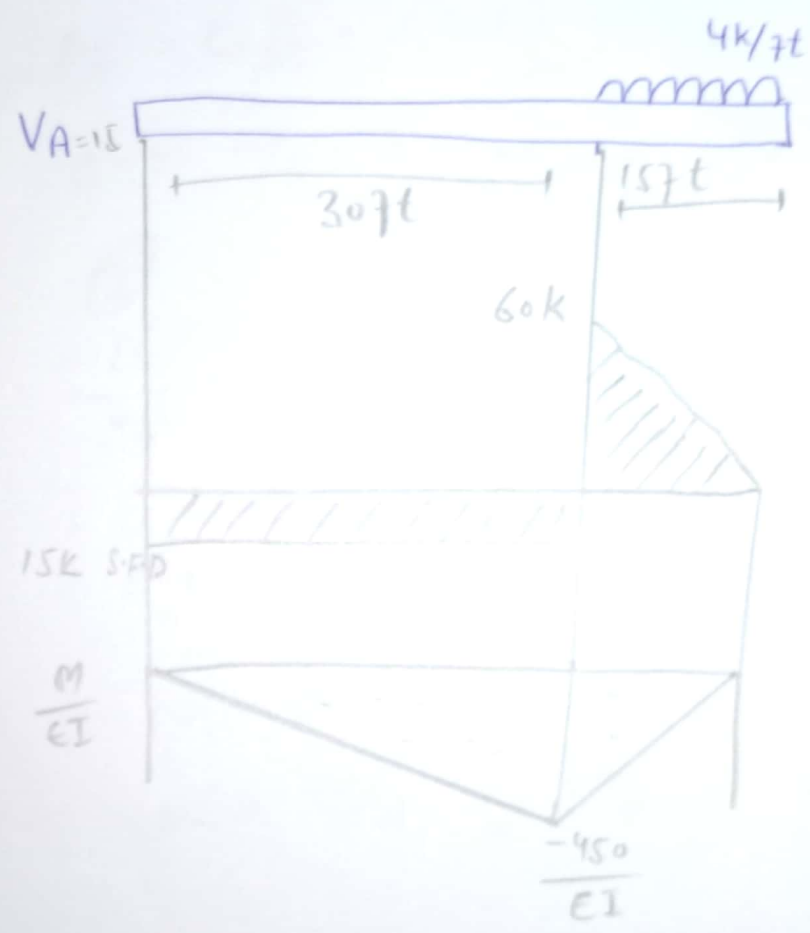
$$V_B = 75 \text{ k}$$

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$$\downarrow \sum M_B = 0$$

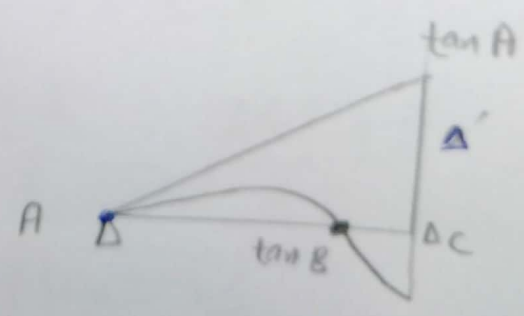
$$V_A \times 30 + (4 \times 15) \times 75 = 0$$

$$V_A = -15k$$



Thus M/EI consist of Triangle and Parabola Segment-

For Displacement:-



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

$$\Delta C = t_{C/A} - \Delta' \rightarrow \textcircled{1}$$

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$$\frac{\Delta'}{45} = \frac{t_{C/A}}{30}$$

$$\Delta' = \frac{3}{4} t_{C/A}$$

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$$\Delta C = t_{C/A} - \frac{3}{4} t_{C/A}$$

$t_{C/A}$

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

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

$$t_{C/A} = \frac{168750}{EI} - \frac{25312.5}{EI}$$

$$t_{C/A} = -194062.5/EI$$

For $t_{B/A}$ =

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

$$(t_{B/A} = -67500/EI)$$

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

$$\Delta C = \frac{-295312.5}{EI} \quad k \cdot t^3$$

For slope at B

$$\theta_B = \frac{\Delta C}{15}$$

$$= \left(\frac{295312.5}{EI} \right) / 15$$

$$\theta_B = \frac{19687.5}{EI} \quad k/t^3$$

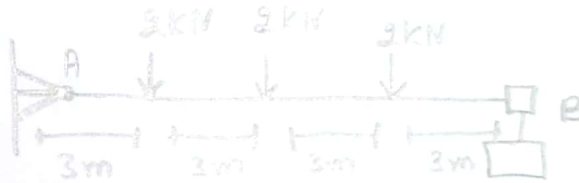
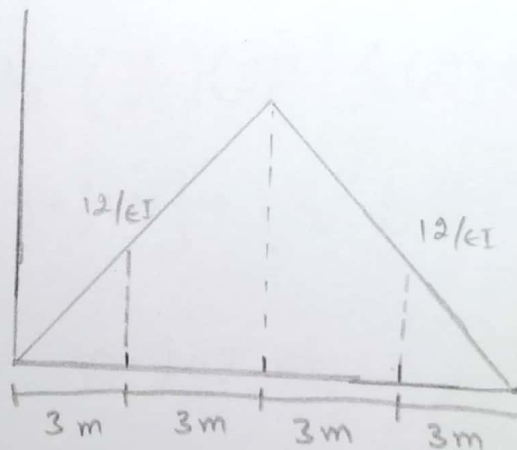
Slope of the Free end at Point c

is nearly equal to Zero

Q#2:-

Determine the slope at A and displacement at C of the Beam in the figure moment Area Theorem-

Take $E = 200 \text{ GPa}$, $I = 60(10^6) \text{ mm}^4$

Given:-Solution:-

$$\odot \frac{A}{c} = \frac{1}{2} \left(\frac{12}{EI} \right) (3) + \left(\frac{12}{EI} \right) 3 + \frac{1}{2} \left(\frac{6}{EI} \right) (3)$$

$$\odot \frac{A}{c} = \frac{18}{EI} + \frac{36}{EI} + \frac{9}{EI}$$

$$\odot \frac{A}{c} = \frac{63}{EI}$$

$$\Rightarrow \frac{63}{(200 \times 10^6)(6 \times 10^6)(1000)^{-4}}$$

$$\odot \frac{A}{c} = 0.0525 \text{ rad}$$

$$\boxed{\odot A = 0.0525 \text{ rad}}$$

$$\begin{aligned} t_{A/c} &= \left[\frac{1}{2} \left(\frac{12}{EI} \right) (3) \right] \left[\frac{2}{3} (3) \right] + \left[\frac{12}{EI} (3) \right] \\ &\quad \left(3 + \frac{1}{2} (3) \right) + \left[\frac{1}{2} \left(\frac{6}{EI} \right) (3) \right] \left(3 + \frac{2}{3} (3) \right) \\ &= 0.202 \text{ m} \end{aligned}$$

$$\text{So } \Delta C = t_{A/c} = 0.202 \text{ m}$$

$$\boxed{\Delta C = 202 \text{ mm}} \quad \underline{\underline{\text{Ans}}}$$