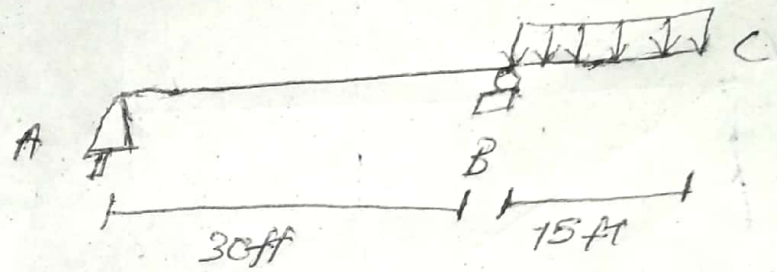
Assignment NO 3. (4)

Determine the slop and displa cement at C. EI is constt use the moment area theorems



Sol:-

$+\circlearrowleft \Sigma M_A = 0$

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

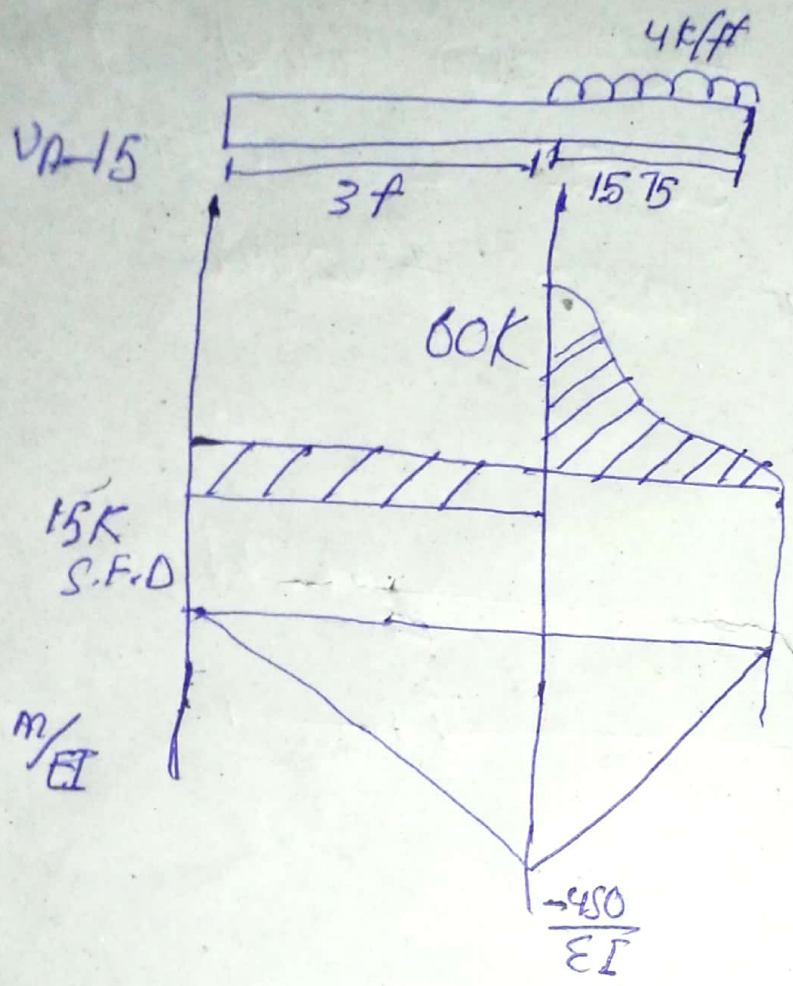
$V_B = 75K$

$V_B = 7.5K$

$\circlearrowright \Sigma M_B = 0$

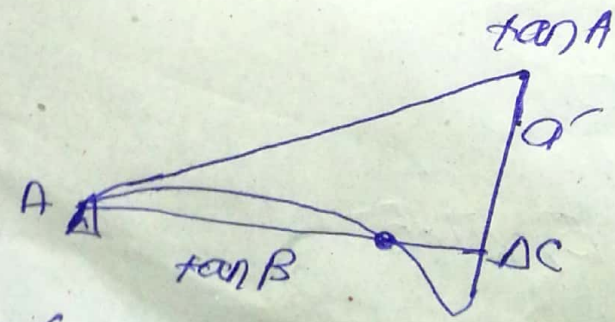
$V_A \times 30 + (4 \times 15) \times 7.5 = 0$

$V_A = -15K$.



Thus m/EI consist of triangle and parabolic segment

For displacement:-



$t_{A/} = \Delta C + D \rightarrow (1)$.

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

$$\Delta = \frac{3}{5} t_{B/A}$$

eq(i).

$$DC = t_{C/A} - \frac{3}{2} + \frac{3}{4}$$

$t_{C/a}$:

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

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

$$\frac{t_C}{a} = \frac{168750}{EI} - \frac{25312.5}{EI}$$

$$t_{C/a} = -194062.5/EI.$$

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For $t_{B/A}$:-

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

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

$$DC = -\frac{19486.5}{2} - \left(\frac{67500}{EI}\right) \times \frac{3}{2}.$$

$$DC = -\frac{295312.5}{EI} \text{ K.ft}^3.$$

For slope ε At B.

$$\theta B = \frac{DC}{15}$$

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

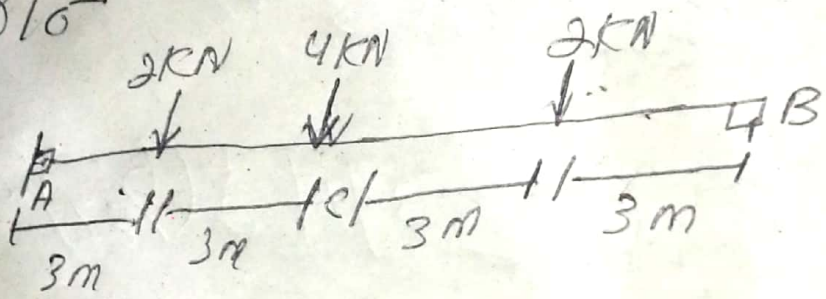
$$\theta B = \frac{19687.5}{EI} \text{ K/ft}^3$$

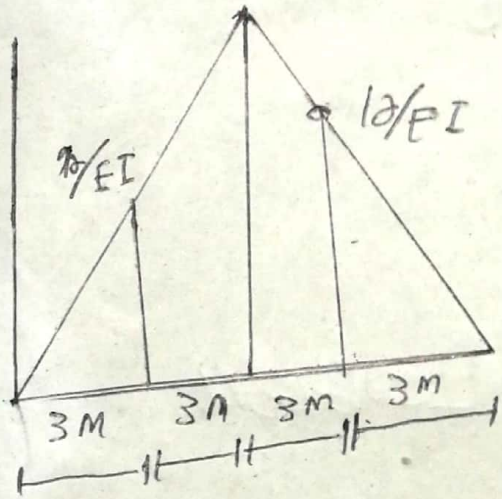
Slope of force end at point C is nearby equal to 2080

Question · 2 ·

Determine the slope at A and displacement at C of the beam in fig moment area theorem Take $E = 200\ GPa$, $I = 6(10^6)\ mm^4$

Solution





$$\theta_{A/C} = \tfrac{1}{2}\left(\tfrac{12}{EI}\right)(3) + \left(\tfrac{12}{EI}\right)(3) + \tfrac{1}{2}\left(\tfrac{6}{EI}\right)(3)$$

$$\theta_{A/C} = \left(\tfrac{18}{EI}\right) + \left(\tfrac{36}{EI}\right) + \left(\tfrac{9}{EI}\right)$$

$\theta_{A/C} = \frac{63}{EI}$

$= \frac{63}{(200\times10^6)(6\times10^6)(1000)^{-4}}$

$\theta_{A/C} = 0.0525 \text{ rad}$

$\theta_A = 0.0525 \text{ rad}$

$t_{A/C} = \left[\frac{1}{2}\left(\frac{12}{EI}\right)(3)\right]\left(\frac{2}{3}(3)\right)$

$+\left[\frac{12}{EI}(3)\right]\left(3+\frac{1}{2}(3)\right)+\left[\frac{1}{2}\left(\frac{6}{EI}\right)(3)\right]$

$\left(3+\frac{2}{3}(3)\right)$

$= 0.202 \text{ m}$

So

$\Delta_C = t_{A/C} = 0.202 \text{ m}$

$= 202 \text{ mm}$