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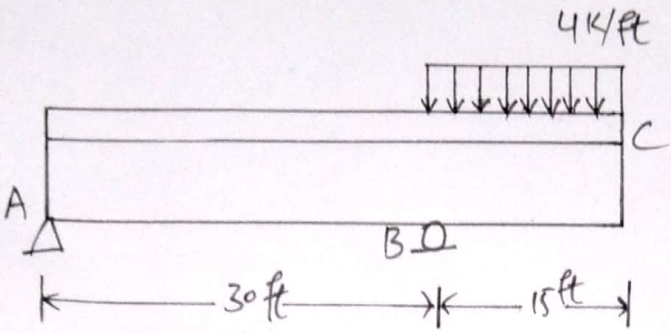
Section : A

Semester : 12 (Batch-14)

Assignment : 03

Submitted To: Engr. Amjad Islam

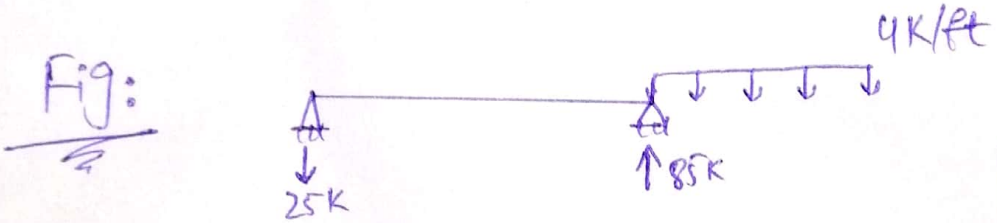
Q1:-



Solve using Moment Area Theorm?

Sol:- Finding out SFD & BMD:

Fig:



↓- ↑+

$R_A + R_B = 60\ K$

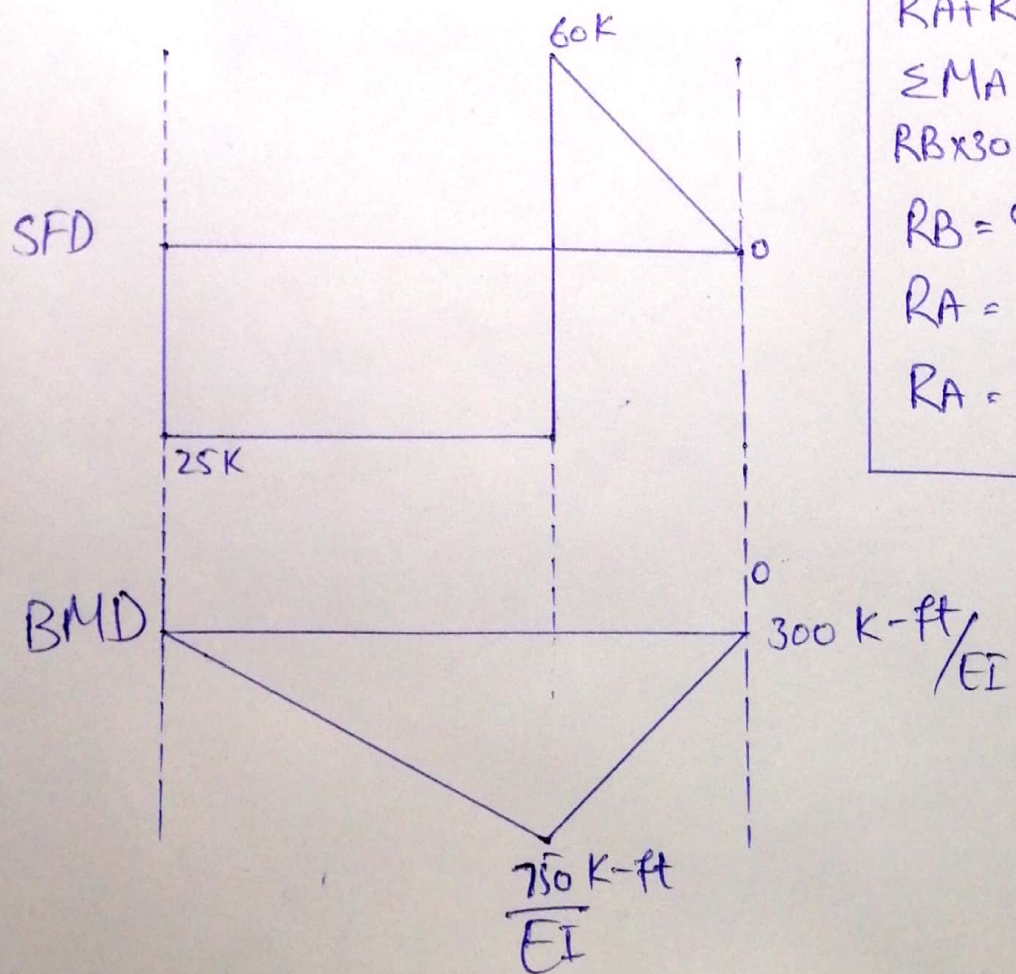
$\Sigma M_A = 0$ (↻+)

$R_B \times 30 - (60 \times 425)$

$R_B = 85\ K$

$R_A = 60 - 85$

$R_A = -25$



Using the M/EI diagram & the elastic curves as shown in the figure a & b.

$$\textcircled{2}\ t_{C/A} = \left[\left(\frac{1}{3}\times 15\right)\left(\frac{-750}{EI}\right)\right] + \left[\frac{1}{2}\times 30\,(-750)\right]$$

$$\textcircled{1}\ t_{C/A} = \frac{15000\ K\text{-}ft^2}{EI}$$

$$|t_{B/A}| = \left[\frac{1}{2}\times 750\times 30\right]\left[\frac{1}{3}(30)\right] = \frac{112500\ K\text{-}ft^3}{EI}$$

$$|t_{C/A}| = \left[\frac{1}{2}\left(\frac{750}{EI}\right)(30)\right]\left[15+\frac{1}{3}(30)\right] + \left[\frac{1}{3}\times 15\times(750)\right]$$

$$\left[4/3\,(15)\right]$$

$$= \frac{356250}{EI}\ K\text{-}ft^3$$

Then $\Delta' = 45/30\,(t_{B/A}) = 45/30\left(\frac{112500}{EI}\right) = \frac{168750\ K\text{-}ft^3}{EI}$

$$\theta_A = \frac{|t_{B/A}|}{t_{AB}} = \frac{112500}{30} = \frac{3750\ K\text{-}ft^2}{EI}$$

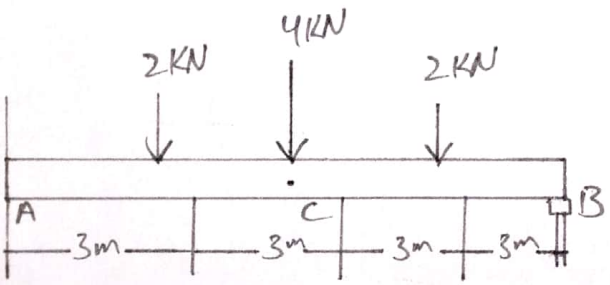
$$+\circlearrowleft \quad \theta_C = \theta_A + \theta_{C/A}$$

$$\theta_C = \frac{3750}{EI} + \frac{15000}{EI} = \frac{18750}{EI} \ K\text{-ft}^2$$

$$\Delta_C = |t_{C/A}| - \Delta' = \frac{356250}{EI} - \frac{168750}{EI}$$

$$\Delta_C = \frac{187500}{EI} \ K\text{-ft}^3$$

Q2:-

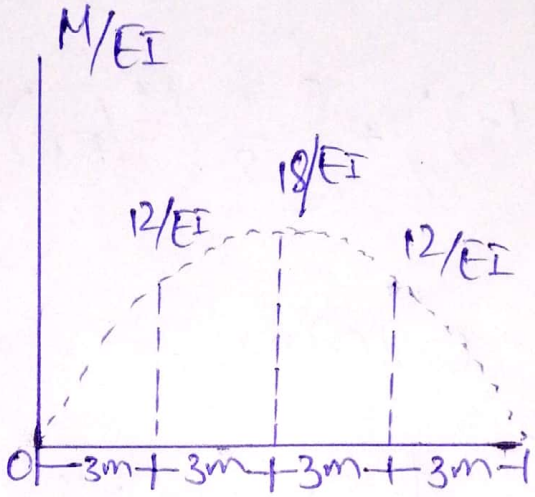


Given:- $E = 200\ GPa$, $I = 6 \times 10^6\ mm$

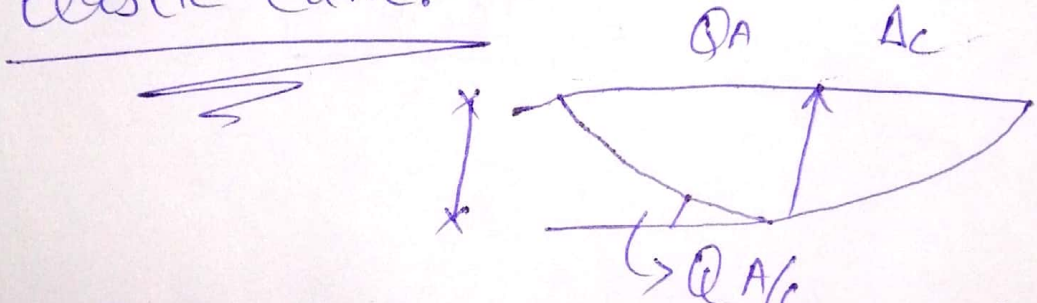
Determine slope at Point "A" and displacement at "C" using Moment area Theorem.

Sol:- (i) Finding out M/EI Digram & elastic Curve.

Moment Digram :-



Elastic curve:-



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

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

$$\theta_{A/C} = \frac{63}{EI} \Rightarrow \frac{63}{(200\times10^{6})(6\times10^{6})(1000)^{-4}}$$

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

$$\boxed{\theta_A = 0.0525 \text{ rad}}$$

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

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

$$\Rightarrow \quad 0.202\,m$$

So: $\Delta_C = t_{A/C} = 0.202\,m$

$$= \boxed{202\,mm}$$