ASSIGNMENT :- 03

CONJUGATE BEAMS

ID :- 7965

SECTION :- "B"

SUBJECT :- STRUCTURAL ANALYSIS

SUBMITTED TO :- SIR AMJAD ISLAM

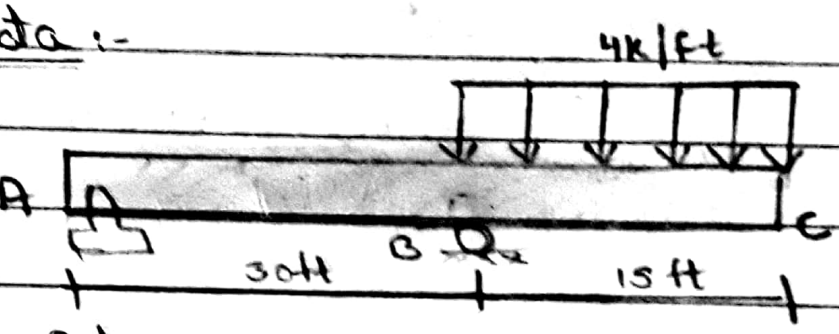
DEPARTMENT :- BE (CIVIL)

DATE :- 13- JULY 2020

QUESTION NO: 7

Determine the slope at point --- use the moment Area theorem:

Given Data :-



Required Data :-

We have to find the slope

Solution :-

As we know that

$\Sigma M_A = 0 +\circlearrowleft$

$(f_B \times 30) - (x \times 37.5) = 0$

$f_B = 75k$

Now $\Sigma f_y = 0 + \uparrow$

$f_A + 75k - 60k = 0$

$f_A = -15k$

Now $\theta_{t/A} = \frac{1}{2}\left(-\frac{750 k.ft}{EI}\right)(45 ft)$

$= \frac{33750 k.ft^2}{2EI}$

$$= \frac{16875}{EI} \text{ k.ft}^2$$

$$(t_{B/A}) = \left[\frac{1}{2}\left(\frac{750 \text{ k.ft}}{EI}\right) 30\text{ft}\right]\left[\frac{1}{3}(30\text{ft})\right]$$

$$= \frac{112500}{EI} \text{ kft}^3$$

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

$$+ \left[\frac{1}{2}\left(\frac{750 \text{ kft}}{EI}\right)(15\text{ ft})\right]\left[\frac{2}{3}(15\text{ ft})\right]$$

$$= \frac{281250 \text{ k.ft}^3}{EI} + \frac{56250 \text{ k.ft}^3}{EI}$$

$$= \frac{337500 \text{ kft}^3}{EI}$$

Then, $\Delta' = 45/30\ (t_{B/A})$

$$= \frac{45}{30}\left(\frac{112500 \text{ k.ft}^3}{EI}\right)$$

$$= \frac{168750 \text{ k.ft}^3}{EI}$$

$$\theta_A = \frac{|t_{an B/A}|}{t_{AB}} = \frac{112500}{30ft}\,|EI$$

$$= \frac{3750}{EI}\ k\cdot ft^3$$

$$+\circlearrowleft \quad \theta_c = \theta_A + \theta_{c/A}$$

$$\theta_c = -\frac{3750}{EI}\ k\cdot ft^2 + \frac{16875}{EI}\ k\cdot ft^2$$

$$\theta_c = \frac{13125\ k\cdot ft^2}{EI}$$

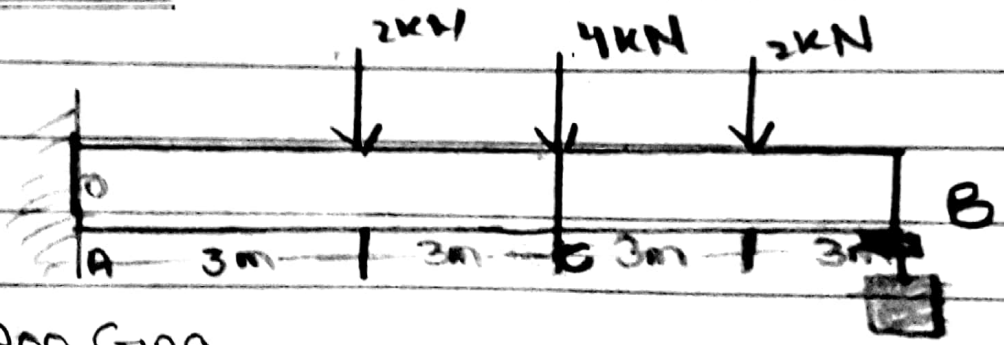
$$\Delta_c = |t_{c/A}| - \Delta' = \frac{337500\ kft^3}{EI} - \frac{168750\ kft^3}{EI}$$

$$\Delta_c = \frac{168750\ k\cdot ft^3}{EI}$$

Question No :- 02

Determine the slope at point ------
.... Taking $E = 200$ Gpa, $I = 6 \times 10^6\ mm^4$.

Given Data :-



$E = 200$ Gpa
$I = 6 \times 10^6 mm^4$

solution :-

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

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

$$\theta_{A/C} = \frac{63}{(200 \times 10^6)(6 \times 10^6)(1/1000)^4}$$

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

$$t_{AIC} = \frac{1}{2}\left(\frac{12}{EI} \times 3\right)\left(\frac{2\times 3}{3}\right) + \left(\frac{12}{EI} \times 3\right)\left(3 + 1/2 \times 3\right)$$

$$+ \frac{1}{2}\left(\frac{6}{EI} \times 3\right)\left(3 + 2/3 * 3\right)$$

$$t_{AIC} = 0.202\ m$$

$$\Delta_c = t_{AIC} = 0.202\ m$$

$$\Delta_c = 202\ mm$$

Result :-

$$\Delta_c = 202\ mm$$