Assignment # 3

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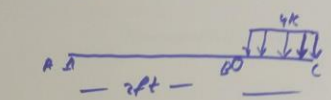
Section A

Subject Structure Analysis

Date 13/12/2020

Question 1



Required:-

Slop (θ_C) = ?

Displacement (Δ_C) = ?

Now draw M/EI diagram

So,

$\circlearrowleft \sum M_A = 0$

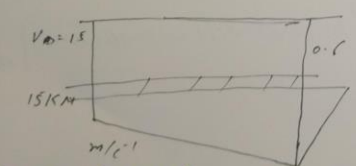
$-V_B \times 30 + (4 \times 15) \times 37.5 = 0$

$V_B = 75K$

$\circlearrowleft \sum M_B = 0$

$V_A \times 30 + (4 \times 15) \times 1.5 = 0$

$\Rightarrow V_A = -15K$



For Displacement

$t_{C/A} = D_C + D'$

$D_C = t_{C/A} - D'$

By proportionality of triangles

$\frac{D'}{4B} = \frac{t_{B/A}}{8B}$ ... (10)

$D' = 3/2\ t_{B/A}$

$D_C = t_{C/A} - 3/2\ t_{B/A}$ — (11)

$A = -\frac{1990625}{2} \times \left(\frac{67500}{EI}\right) \times 3/2$

$D_C = -\frac{2953125}{E_1}\ K - ft^2$

=) For slope at point B.

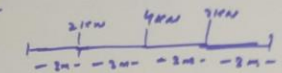
$D_{/B} = \frac{D_C}{15}$

$= \frac{\left(\frac{2953125}{E_1}\right)}{15}$

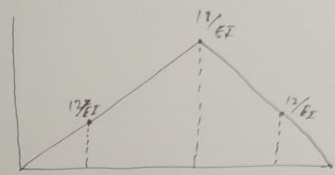
$D_B = \frac{196875}{E_1}\ K - ft^2$

=) Slope of the free end i.e point C now equal to zero

Question # 2



Solution



Exactic Curve :-

$$\Delta_{B/C} = \frac{1}{2}\left(\frac{12}{EI}\right)(3) + \left(\frac{18}{EI}\right)(3) + \frac{1}{2}\left(\frac{6}{EI}\right)(3)$$

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

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

$\Delta_{A/C} = 0.0525$ rad

$\Delta_{B/C} = 0.0525$ radius

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

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

$t_{B/C} = 0.202$ m

So $D_C = KM/C = 0.202$ m

$D_C = 202$ mm Ans