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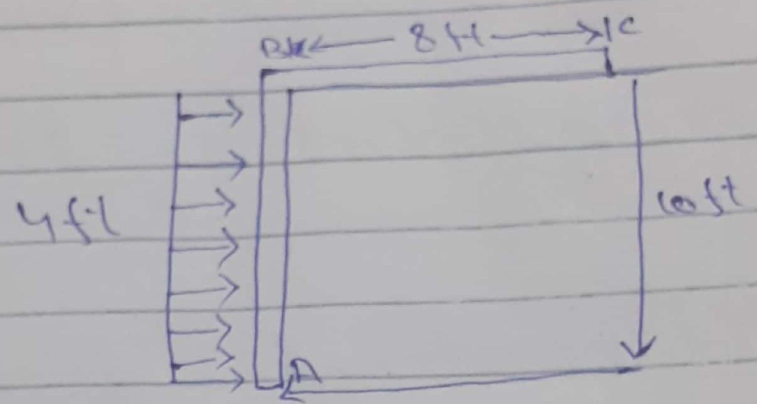
ID 7938

Seaction B

Paper structure Anglysis

Q No 1

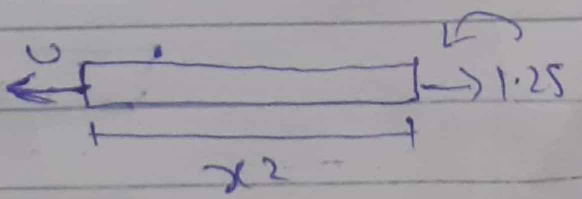
Given

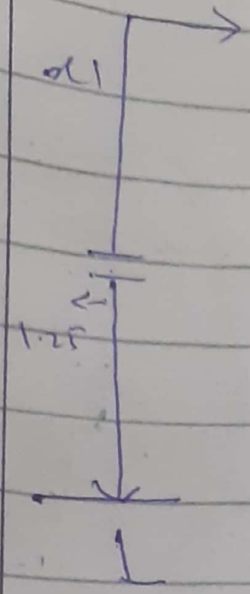


uniform load = 4klft
E = 29×10^3 ksi
I = 6000 in^4

Requried

Now vertical moment

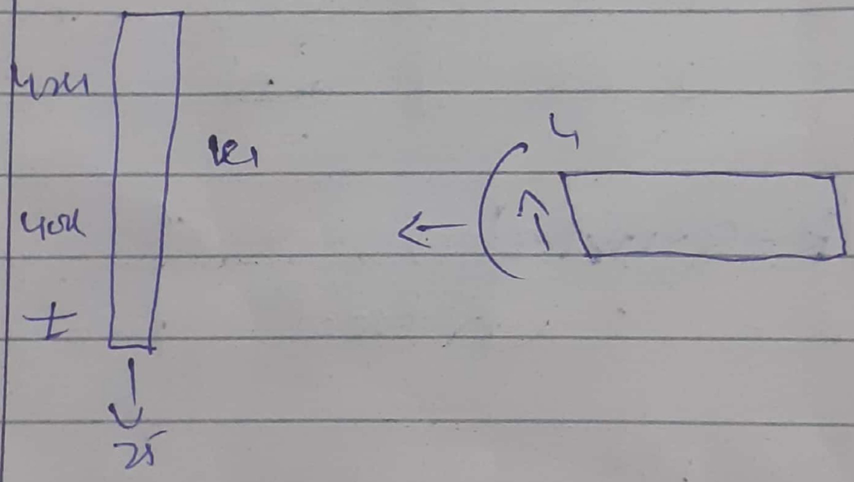




$m_{12} = x_1$

$m_{12} = 1.25x$

Real moment



$m_1 = 1.25x_2$

$m_2 = 25$

$m_1 = 40x_1 - \frac{1}{2} x_1 (x_2)$

$40x_1 - 2x_1^2$

(3)

Now by virtical work equation

$$\Delta_{DC} = \int_0^c \frac{m \cdot M dx}{E}$$

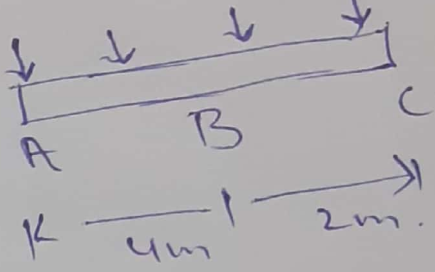
$$\Delta L = \int_0^{10} (1x_1)\left(\frac{40x_2 - 2x^2}{E}\right) dx + \int_0^8 \frac{(1.25x_2)(25x_2)\,dx}{EI}$$

$$\Delta L = \frac{1}{EI}\left|\frac{42x^3}{3} - \frac{2x^3}{4}\right|_0^{10} + \left|\frac{(31.25x_2^3}{3}\right|_0^8$$

$$\boxed{\Delta L = 10649.6018\ \text{inch}}$$

Q No 2:

Given Data:

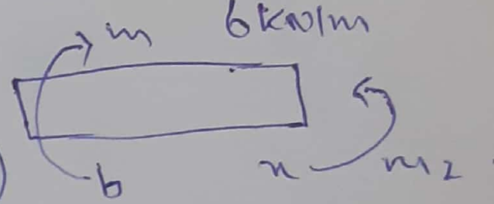


$E = 200 GPa$

$I = 60 \times 10^6 mm^4$

Required:

slop & displacement = ?



$m' - m_2 = \frac{1}{2}(x_2)(6 + x_1)$

$m_1 = m + \frac{6x_2 + x_1 x_2}{2}$

$m = -m' + 3x^2 + x_2^2/2$

taking P. Derivative with respec to m.

$\frac{\partial m_2}{\partial p} = -x$

$\Delta B = \int_0^2 m\left(\frac{\partial m}{\partial p}\right)\frac{dm}{E}$

$$= \int_0^6 \frac{-3x^2(-x)\,dx}{EI} + \int_0^4 \frac{-3x^2(-x)\,dx}{EI}$$

$$\Delta B = \frac{-3x^2}{4EI}\Big|_0^6 + \frac{-3x^4}{4EI}\Big|_0^4$$

Putting the value of EI

$$= \frac{3x^2}{2(280)(60\times10^6)}\Big|_0^6 + \frac{-3x^4}{(4000)(60\times10^6)}\Big|_0^4$$

$$\frac{216\ kN\ ft^3}{4.8\times10^{10}} + \frac{-614.4\ kN\ ft^3}{4.8\times10^{10}}$$

$$= -4.5\times10^{-9} + (-1.28\times10^{-8})$$

$$\boxed{\Delta B = 5.76\times10^{-10}\ \text{inch}}$$ Displacement

Slope:

$$M + \frac{1}{2}x(6x_1) = 0.$$

$$m = -\frac{1}{2}x(6x_2) = -3x^2.$$

So;

$$\frac{\partial m_1}{\partial m_1} = 0$$

$$m_1 - m_2 - 1/2 (x_2)(6 + x_2)$$

$$m = -m' + 6x_2 - x_2^2$$

$$m = -m' + 3x^2 + x_2^2/2$$

$$\frac{\partial m_2}{\partial m_1} = -1$$

$$= \int_0^6 \frac{-3x^2 \, dx}{E \cdot I} + \int_6^{10} \left(-2 + 6x^2 + \frac{x^2}{2}\right) dx$$

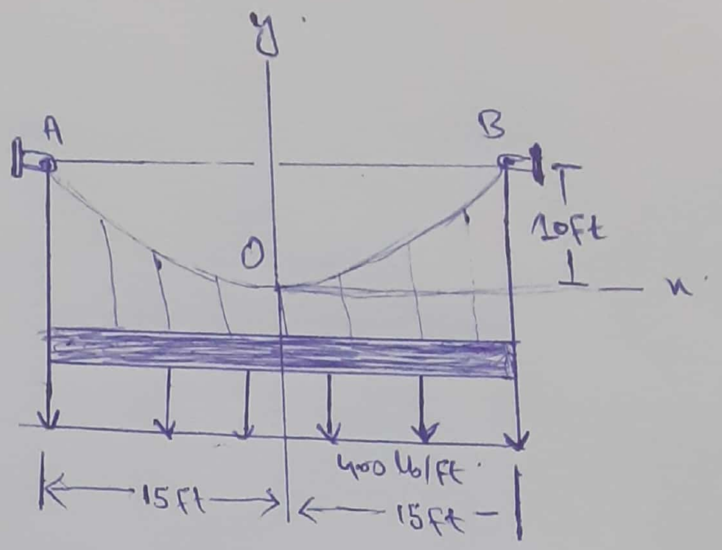
$$= 0 + \left(-x + \frac{6x^3}{3} + \frac{x^3}{6}\right)\Bigg|_0^{10} \left(\frac{1}{EI}\right)$$

$$= \frac{1}{200 \times (60 \times 10^6)} \left(-x + \frac{6x^3}{3} + \frac{x^3}{6}\right)\Bigg|_0^{10}$$

$$\boxed{Q = 4.125 \times 10^{-7} \text{ inch}}$$ Ans

Q4:

Given:



Sol:

$$y = \frac{h}{l^2} \cdot x^2$$

$$= \frac{10}{(15)^2} \cdot x^2$$

$$y = 0.044x^2$$

Draw we know that

$$T_0 = F_B = \frac{w_0 l^2}{2h} = \frac{(400)(15^2)}{2(10)}$$

$$= 4500 lb$$

$$\Rightarrow 4.500k$$

$$T_B = T_{max} = \sqrt{(F_H)^2 + (w_0 L)^2}$$

$$= \sqrt{(4500)^2 + [(400)(15)]^2}$$

7500lb.

$= 7.50k$ Ans

Now

$$T_B = T_{max} = w_o L \sqrt{1+\left(\frac{L}{2h}\right)^2}$$

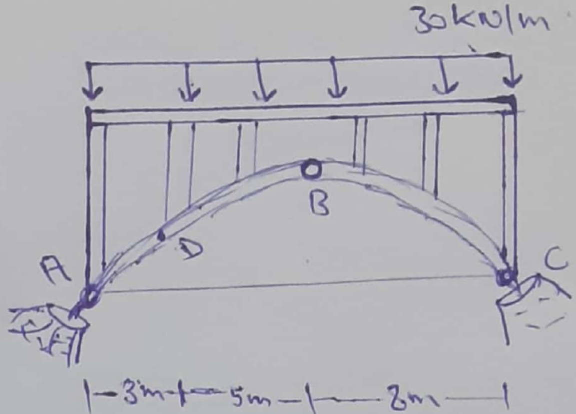
$$= 400(15)\sqrt{1+\left(\frac{15}{2(10)}\right)^2}$$

$= 7500lb.$

$= \boxed{7.500k \text{ Ans}}$

Q:(4)

Given:



Member AB:

$\circlearrowright + \Sigma M_A = 0$

$\Rightarrow B_x(5) + B_y(8) + 240(4) = 0$

Member BC;

$\circlearrowright + \Sigma M_C = 0$

$= -B_x(5) + B_y(8) + 240(4) = 0$

Solving:

$B_x = 192\,kN$, $B_y = 0$

~~Segment BD:~~

Segment BD:

$$\circlearrowleft + \Sigma M_D = 0;$$

$$192(2) - 150(2.5) - M_D = 0$$

$$M_D = 9\,kN \cdot m$$