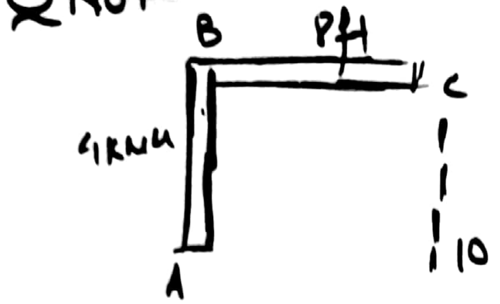
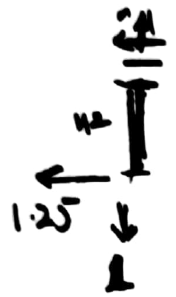
Q NO 1



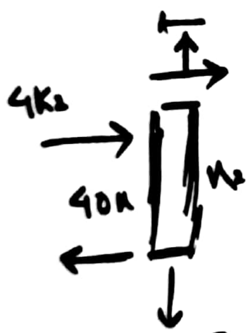
⇒ virtual moment

$m_2 = x^2$



$m_1 = 1.25x$

⇒ Real moment



$$m = \boxed{40x_1 - 2x_2^2}$$

$$1\,\Delta C_h = \int_0^L \frac{m\,m}{E}\,dx$$

$$= \int_0^{10} \frac{(1x_1)(40x_1 - 2x^2)}{E}\,dx + \int_0^{8} \frac{(1.25x_2)(25x_2)}{E_1}\,dx_2$$

$$\Delta I = \frac{1}{EI}\left(\frac{40x^3}{3} - \frac{2x^4}{4}\right)\Big|_0^{10} + \left(\frac{31.25x_2^3}{3}\Big|_0^8\right)\frac{1}{EI}$$

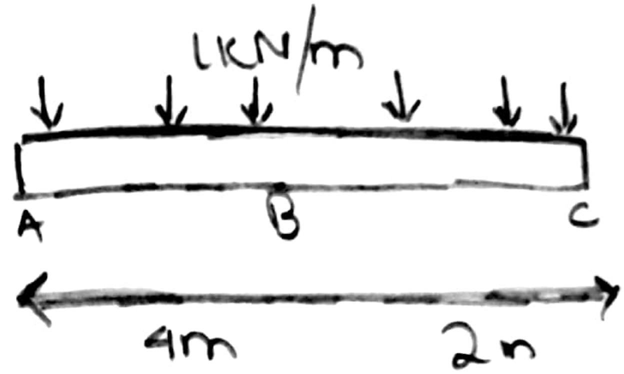
$$\boxed{\Delta L = 10649.60184}$$

Que No 2:

Sol: Given that.

$E = 200\ GPa$

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



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

$$m_2 = m' + \frac{6x_2 + x^2}{2}$$

$$m = -m' + \frac{6x_2 + x^2}{2}$$

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

Taking partial derivative with respect to m.

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

⊙ $\Delta B = \int_0^2 m\left(\frac{\partial m}{\partial P}\right)\frac{dx}{E}$

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

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

Put the value of EI and I.

$\frac{-3x^2}{2(200)(60\times10^6)}\Big|_0^6 + \frac{-3x^4}{4000(60\times10^6)}\Big|_0^4$

$= \frac{-216\ KNH^3}{4.8N6^0} + \frac{-614.4\ KN\ ft^3}{4.8N0^{11}}$

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

$\boxed{\Delta B = 5.78\times10^{-10}\ \text{inch}}$ displacement

Slope: ∂p

$m + \frac{1}{r}(6x_1) = 0$

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

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

$m_1 - m_2 - \frac{1}{2}(x_2)(6 + x_2)$

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

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

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

$= \int_0^6 \frac{-3x^2(4x)}{E1} \int_0^{10} (-2 + 6x^2) \frac{x^2}{2} dx$

Slope ⓐ

$$m + \frac{1}{2}(6x_1) = 0$$

$$m = -\frac{1}{2}x(6x_1) = 3x_2$$

Now we take partial derivative w.r.t m'

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

$$m' - m^2 - \frac{1}{2}(x^2)(6 + x^2)$$

$$m = -m' + \frac{6x^2 + x^2}{2}$$

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

$$\frac{\partial m_2}{\partial m'} = -1$$

$$\int_0^6 \frac{-3x^2(0)}{EI} dx + \int_0^{6} \left(-1 + 6x^2 + \frac{x^2}{2}\right) dx$$

$$0 + \left(-x + \frac{6x^3}{3} + \frac{x^2}{6}\right.$$

2 No

Given data:

$$= 0 + \left(-x + \frac{8x^3}{3} + \frac{x^2}{8}\right)\Big|_1^{10} \left(\frac{4}{EI}\right)$$

$$\frac{1}{200(80\times10^{6})}\left(-x \frac{8x^2}{x} + \frac{x^5}{8}\right)\Big|_0^{10}$$

$$\boxed{\delta = 4.125\times10^{-7}\,\text{inch}}$$

Q NO 3

Given data:

uniform load = 400 lb/ft

$h = 10\,ft$

$L = 15\,ft$

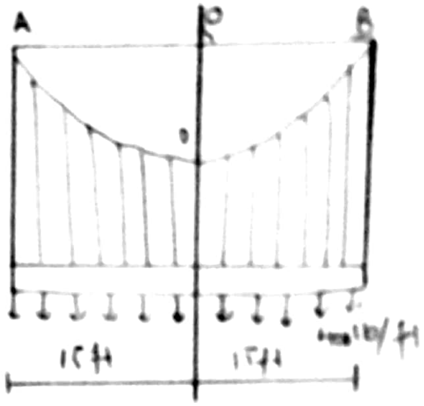
Required:-

equation of curve and force in cable = ?

Solution:-

we know that

$$y = \frac{h}{L^2}x^2$$



Putting the values

$$y = \frac{10}{(15)^2}x^2 = 0.044x^2$$

$$T_0 = F_H = \frac{w_o L^2}{2h} = \frac{400(15)^2}{2\times10}$$

$$T_0 = 4500\,lb = 4.5\,K$$

$$T_B = T_{max} = \sqrt{(F_H)^2 + (w_o L)^2} = \sqrt{(4500)^2 + (400\times15)^2}$$

$$T_{max} = 7500\,lb = 7.5\,K$$

NOW "T_{max}" By another equation

$$T_B = T_{max} = w_o L\sqrt{1+\left(\frac{L}{2h}\right)^2} = 400\times15\sqrt{1+\left(\frac{15}{2\times10}\right)^2}$$

$$\boxed{T_{max} = 7500\,lb = 7.5\,K}$$

QNO 4:

Given data: 30 kN/m

Required:

Internal moment at D = ?

Solution:

Dividing into two members AB and BC.

AB

$\circlearrowright + \Sigma M_A = 0 \quad B_x(5) \; B_y(8) - 240(4) = 0$ — (a)

BC

$\circlearrowright + \Sigma M_C = 0 \quad -B_x(5) + B_y(8) + 240(4) = 0 \rightarrow$ (b)

Adding eq (a) & (b)

$$B_x(5) + B_y(8) - 240(4) = 0$$
$$-B_x(5) + B_y(8) + 240(4) = 0$$
$$0 + 2B_y(8) + 0 = 0$$

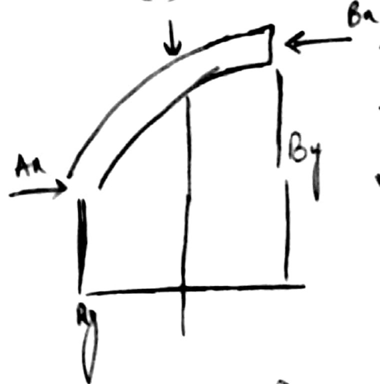
$2B_y(5) = 0$

$B_y = 0\,kN$

equ (B)

$$-B_x(5) + 0(8) + 960 = 0$$
$$B_x(5) = 960$$
$$\frac{B_x\cancel{(5)}}{\cancel{(5)}} = \frac{960}{5}$$

$= \boxed{B_x = 192\,kN}$



"Now at segment DB"

$$\curvearrowright + \sum M_D = 0$$

$$192(3) - 150(2.5) - M_D = 0$$

$$384 - 375 - M_D = 0$$

$$9 - M_D = 0$$

$$\Rightarrow M_D = 9 \text{ Kn.m}$$