Question NO 1:-

Given Data:-

uniform load = 4K/ft

$E = 29 \times 10^3$ KSI

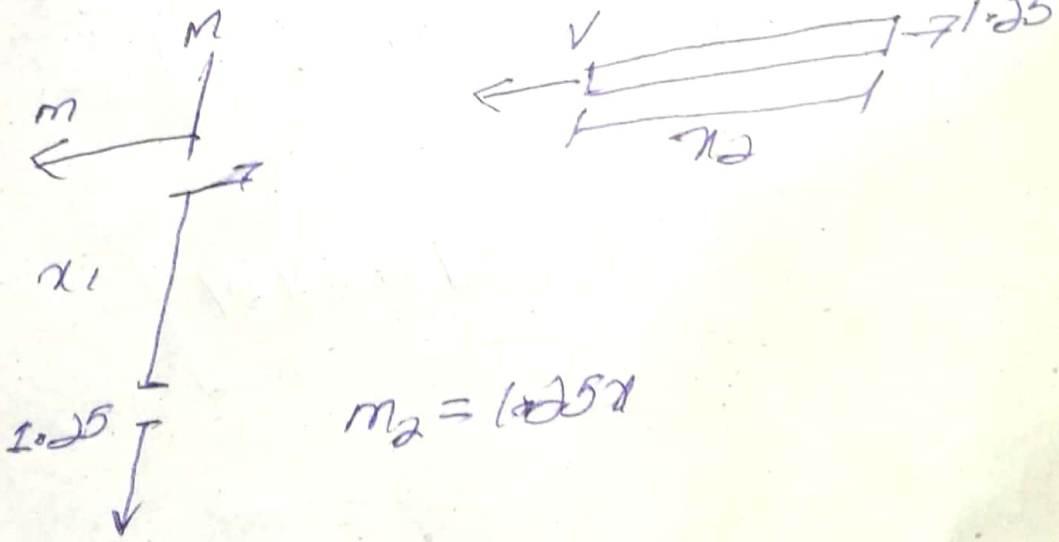
$I = 600\ in^4$

Required:-

vertical displacement

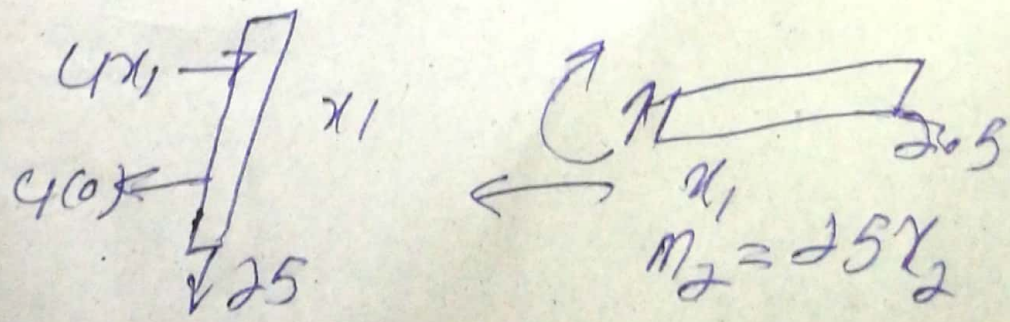
Solution:-

Now vertical moment



$m_2 = 1.25x$

real moment



$$m'' = \frac{40x_1 - \frac{1}{2}x_1(x_2)}{40x_1 - 2x_1^2}$$

Now By virtual work eq.

$$\Delta DC = \int_0^C \frac{mM}{E} dx$$

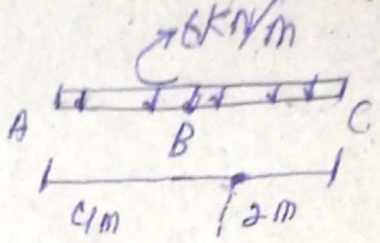
$$\Delta L = \int_0^{10} \frac{(x_1)(40x_2 - 2x^2)}{E} dx + \int_0^3 \frac{(1.25x_2)(.25x_2)}{E_1} dx$$

$$\Delta L = \frac{1}{EI}\left[\frac{40x^3}{3} - \frac{2x^3}{4}\right]_0^{10} + \left[\frac{(3(.25x_2^3)}{3}\right]_0^8$$

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

① Given data

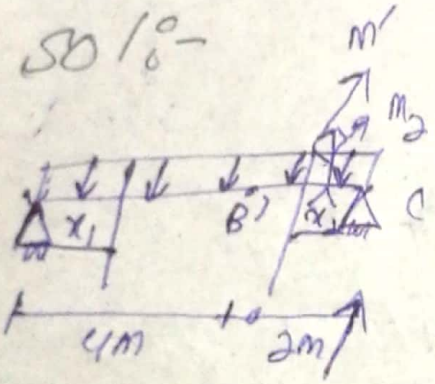
Q NO 2



Required:-

slope and displacement at point (B)

Sol:-



18KN+0.1667 18-0.1667

$R_1 + R_2 = 0$

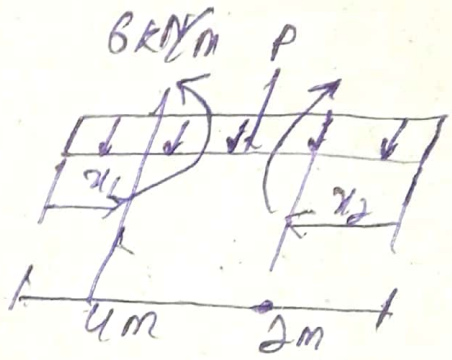
$\Sigma M_A = 0$ (+

$1 + R_2(6) = 0$

$= 0.16667$ put in (1)

$R_1 + (-0.1667) = 0$

$R_1 = 0.1667$ KN



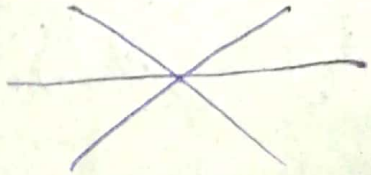
$R_1 + R_2 = 0$

$-(1)(4) + R_2(6) = 0$

$R_1 = 0.6667$ KN

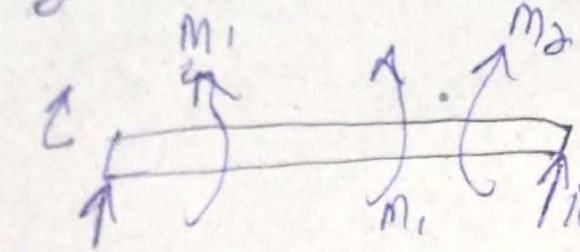
$R_2 = 1 - 0.6667$ KN

$R_2 = 0.333$ KN



$M_1 = (18 + 0.16667 M_r) x_1 - 2x_1^2$

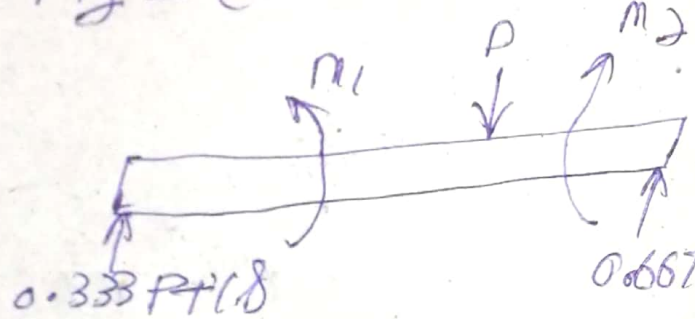
$M_2 = (18 - 0.1667 M_r) x_2 - 2x_2^2$



$18 + 0.1667$

$M_1 = (0.333P + 18) x_1 - 2x_1^2$

$M_2 = (0.667P + 18) x_2 - 2x_2^2$



The displacement function show in Fig (a) above

$\frac{\partial M_1}{\partial M_a} = 0.1667 x_1$ and $\frac{\partial M_2}{\partial M} = 0.1667 x_2$. Set $M_r = 0$ the

$M_1 = (18 + 0.1667(0)) x_1 - 2x_1^2$

$M_1 = (18x_1 - 2x_1^2)$

$M_2 = (18x_2 - 2x_2^2)$

$\therefore \Theta B = \int_0^2 M \left(\frac{\partial M}{\partial M_a}\right) \frac{\partial x}{EI} = \int_0^4 \frac{(18x_1 - 2x_1^2)(0.1667 x_1) \partial x_1}{E_1}$

$$\Delta B = \int_0^a M\left(\frac{\partial M}{\partial P}\right)\frac{dx}{EI}$$

$$\Delta B = \int_0^a \frac{(30x\,x_1 - 9x_1^2)(0.333x_1)dx}{EI} + \int_0^2$$

$$\frac{+(30x_2 - 9x_2^2)(0.6667\,x_2)\,dx}{EI}$$

$$\Delta B = \frac{218.5}{EI} = \frac{218.5}{(200\times10^9)(0.0006}$$

$$= 0.018\text{m} \quad \text{or}$$

$$= 18\text{mm}$$

QNO:-
(3)

Given Data:-

W_0 = uniform load = 400 lb/ft

h = 10ft

L = 15ft

Required

equation of curve and force in cable.

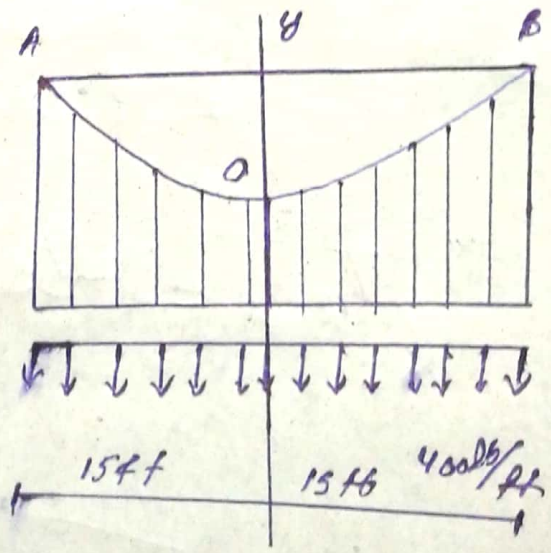
Sol:-

As we know than

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

Put values

$$y = \frac{10}{(15)^2} x^2 = 0.0444 x^2$$



$$T_o - F_H = \frac{W_o L^2}{2h} = \frac{400 \times (15)^2}{2 \times 10}$$

$$T_o = 4500 \text{ lb}$$

$$T_o = 4.5K$$

$$T_B = T_{Max} = \sqrt{(F_H)^2 + (W_o L)^2}$$

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

$$T_{max} = 7500 \text{ lb}$$

$$= 7.5K.$$

Now "T_{max}" By another equation

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

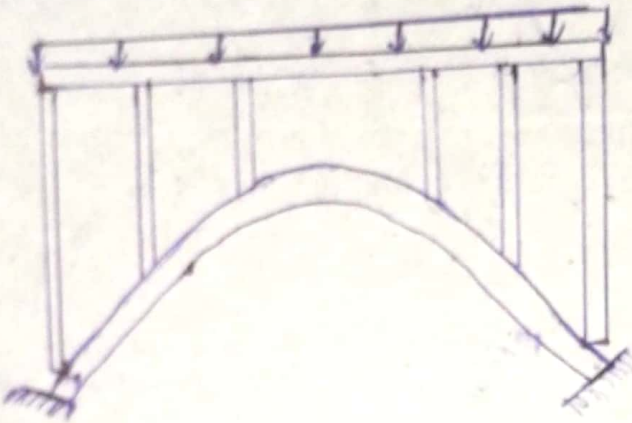
$$= 400 \times 15 \sqrt{1 + \left(\frac{15}{2 \times 10}\right)^2}$$

$$T_{max} = 7500 \text{ lb} = 7.5K.$$

Q NO Given Data:-

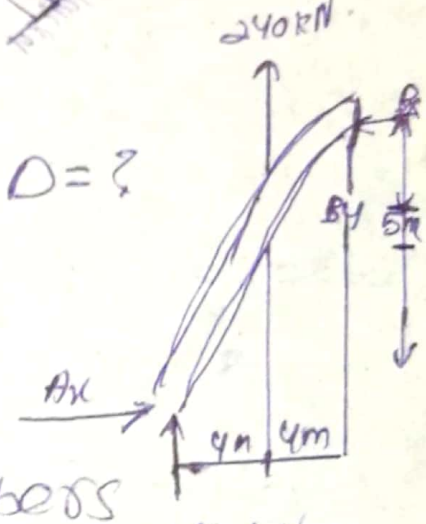
(4)

uniform load = 30 kN/m



Required :-

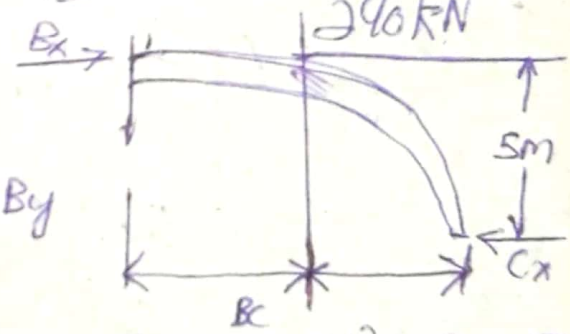
Internal moment at D = ?



Solution:-

Dividing into two members

AB and BC.



AB:

$\circlearrowleft + \Sigma M_A = 0 \quad B_x(5) + By(8) - 240(4) = 0 \rightarrow (1)$

Bc :-

$\circlearrowleft + \Sigma M = 0 \quad -Bx(5) + By(8) + 240(4) = 0 \rightarrow (2)$

Ad

adding eq(a) and (b)

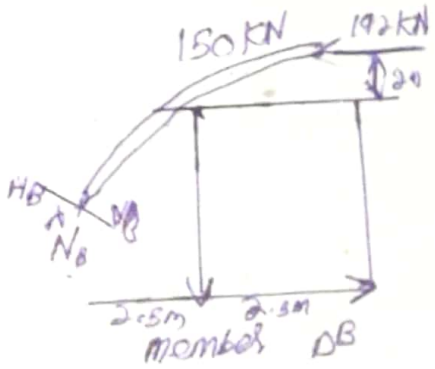
$$B_x(5) + B_y(8) - 240(4) = 0$$
$$-B_x(5) + B_y(8) + 240(4) = 0$$

$$0 + 2B_y(8) + 0 = 0$$

$$2B_y(8) = 0$$

$$\Rightarrow B_y = 0 \text{ KN}$$

Putting the value of (B_y) in eq (b)



$$eq(b) \Rightarrow -B_x(5) = 960$$

$$B_x(5) = 960$$

$$\frac{B_x(8)}{5} = \frac{960}{5}$$

$$B_x = 192 \text{ KN}$$

"Now at segment DB"

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

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

$$384 - 375 - M_D = 0.$$

$$9 - M_D = 0.$$

$$\Rightarrow M_D = 9\,KN.m.$$