NAME : Arif Farooq

ID : 7919

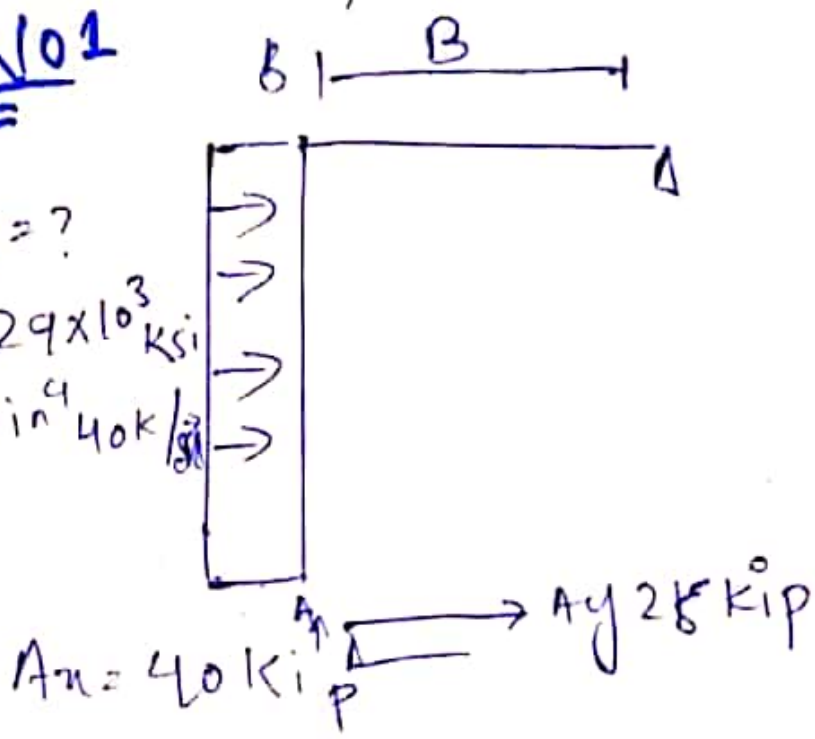
PAPER : Structure

Section :- A

Submitted to : Amjid Islam

(1)

Qn 01



Solve:- Finding reaction

↳ $\sum M_A \Rightarrow -4(0)(5) + C_y(8) = 0$

$C_y = 25$ kip

$\sum = 0\uparrow^+ \; 25 + A_y = 0$

$A_y = -25$ kips

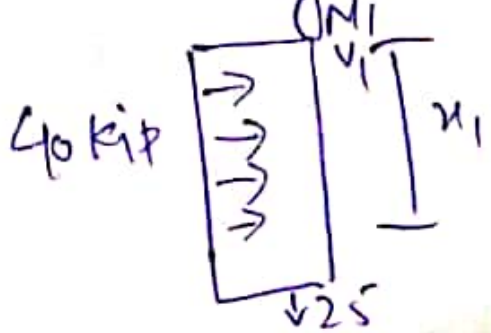
$\sum F_y = 0\uparrow^+ \; 25 + A_y = 0$

$A_y = -25$ kips

$\sum F_x = 0 \longrightarrow^+$

$40 - A_x = 0 \Rightarrow A_x = 40K$

— taking section



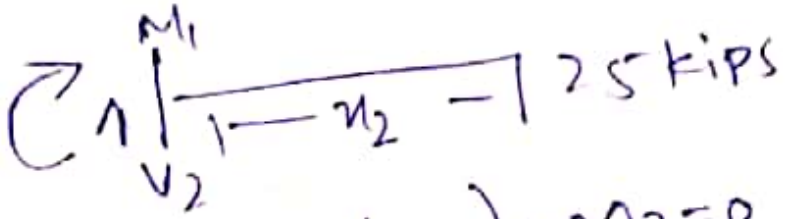
(2)

⇒ Real moment

$(+\circlearrowleft \sum M_1 = 0$

$-40(x_1) - 4x_1(x_1/2) + (x_1 = 0$

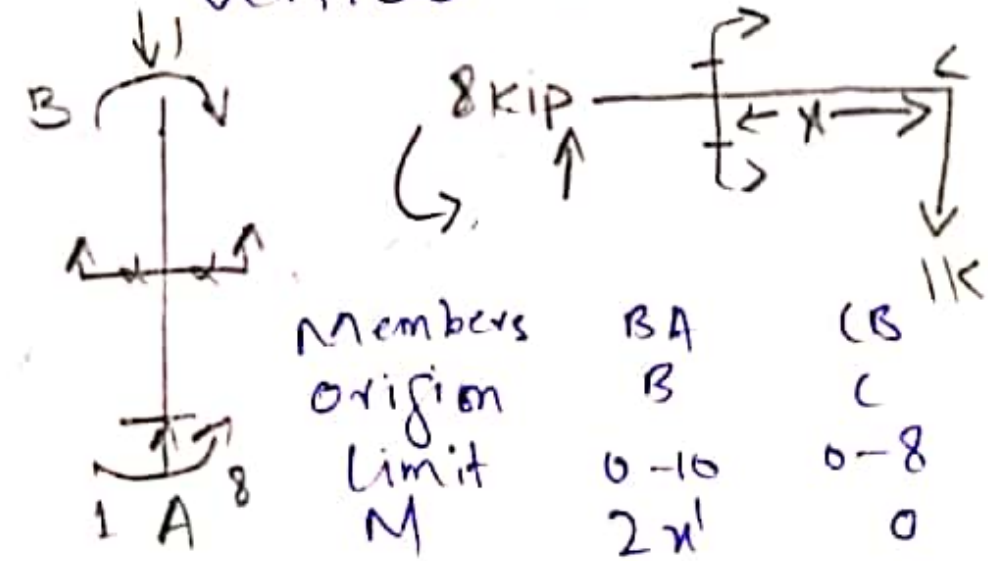
$M_1 = 40x_1 - 2x_1^2$



$-25(x_2) + M_2 = 0$

$M_2 = 25x_2 = \text{kips}$

Now vertical movements.



Members	BA	CB
origion	B	C
Limit	0-10	0-8
M	$2x'$	0
m	8	x

By vertual work method

$1 \cdot 0 = \int_0^{10} \frac{(2x^2)(8)}{EI} dx \int_0^{8} \frac{(0)(w}{EI}$

$$\Delta = 16 \frac{x^3}{3} \Big|_0^3 + 0$$

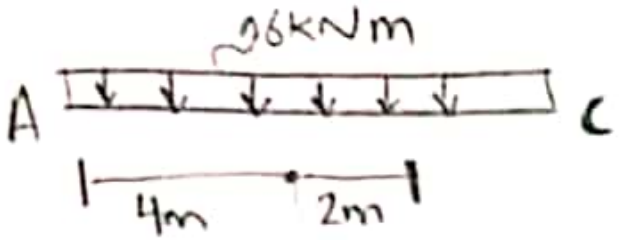
$$\Delta = \frac{16 \times 1000}{3} / EI$$

$$\Delta = \frac{6333.33}{EI} = \frac{533.33}{29 \times 10^3 \times 600}$$

$$\Delta = 3.66 \times 10^{-4} \text{ in}$$

Q No 2:-

Given data :-

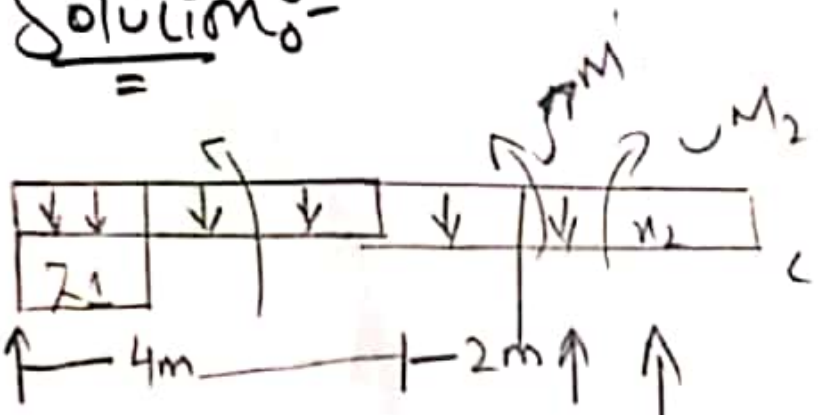


Required :-

Slope and displacement at point B

Solution :-

(a)



18KN + 0.1667 18 - 0.1667

$R_1 + R_2 = 0$ — (1)

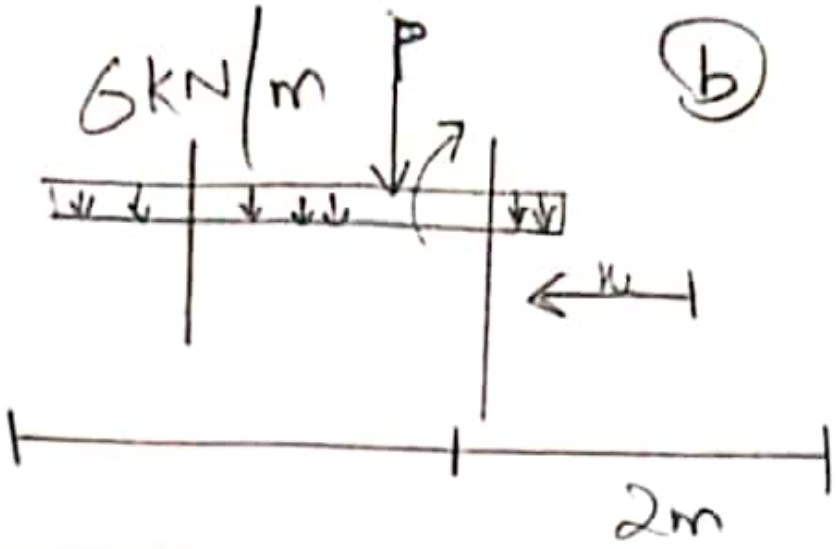
$\sum M_A = 0$ ↺ +

$1 + R_2 = (6) = 0$

$\Rightarrow -0.166667$ put in (1)

$R_1 + (-0.1667) = 0$

$R_1 = 0.16667\ KN$



$R_1 + R_2 = 1$

↳ $\sum MA = 0$

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

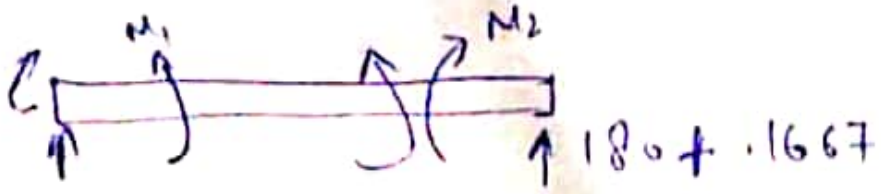
$R_1 = 0.6667\ KN$

$R_2 = 1 - 0.6667\ KN$

$R_2 = 0.333 KN.$

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

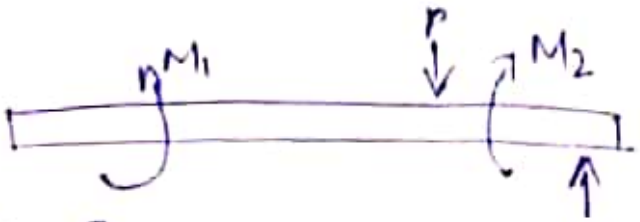
$M_2 = (18 - 0.1667M)x_2 - 2x_2^2$



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

$\rightarrow M_2 = (0.667P + 18)$

$x_2 - 2x_1^2$



The displacement function shown in the figure "a" above.

$\frac{\partial M_1}{\partial M'} = 0.1667 x_1$ and $\frac{\partial M_2}{\partial M'}$

$= 0.1667 x_2$ Set M'=0 then

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

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

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

$$\theta_B = \int_0^2 M\left(\frac{\partial M}{\partial m}\right)\frac{dx}{0} = \int_0^4 \frac{(18x_1 - 2x_1^2)(0.1667x_1)\,dx_1}{EI}$$

$$\int_0^2 \frac{(18x_2 - 2x_2^2)(0.1667x_2)\,dx_2}{EI}$$

$$\theta B = \frac{42.65}{EI} + \frac{6.66}{EI}$$

$$\theta B = \frac{49.31}{EI}$$

$$\theta B = \frac{49.31}{(200 \times 10^6\ kpa)(0.00006)}$$

$$\theta B = 0.4111\ rad$$

→ For the displacement fuctions are show in figure.

$\frac{\partial M_1}{\partial MP} = 0.333 x_1$ and $\frac{\partial M_2}{\partial P} = 0.666 x_2$ also set $P = 0$

⇒ then $M_1 = (18x_1 - 2x_1^2)$ KNm

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

thus:

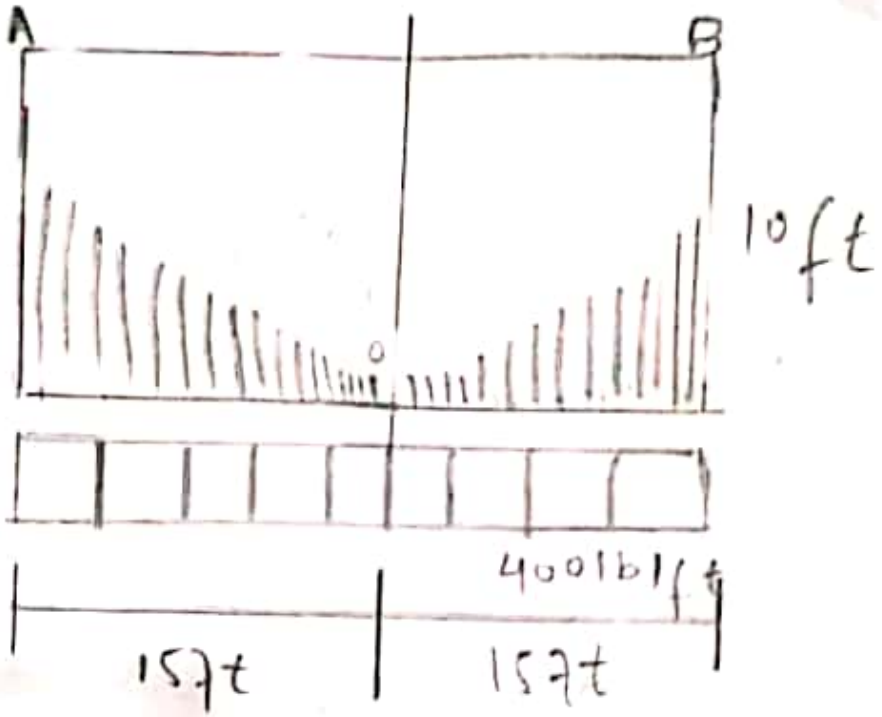
$$= \int_0^6 M \left(\frac{\partial M}{\partial P}\right) \frac{dx}{EI}$$

$$AB = \int_0^4 \frac{(30x x_1 - 2x_1^2)(0.333 x_1)\,dx}{EI} + \int_0^2 \frac{(30x_2 - 2x_2^2)(0.6667 x_2)\,dx}{EP}$$

$$\Delta B = \frac{218.5}{EI} \Rightarrow \frac{218.5}{(200\times10^{6})(0.000506}$$

$$= \boxed{0.018m \doteq 18mm}$$

Q No 3:-



Solution:-

From Eq

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

$$y = 0.0444 x^2$$

From Eq α:-

$$T_0 = F_u = \frac{W_0 l^2}{2h} = \frac{400(15)^2}{2(10)}$$

T_o = 4500 lb ÷ing by 1000

T_o = 4.5K

From Eq :-

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

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

$$= \sqrt{20250000 + 90000}$$

$$= \sqrt{20250000 (400 \times 15)^2}$$

= 7500 lb ÷ing by 1000

$T_B = T_{max}$ = 7.5K

Also From Eq 5.11

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

$$= 400(15) \sqrt{1 + \left(\frac{15}{20}\right)^2}$$

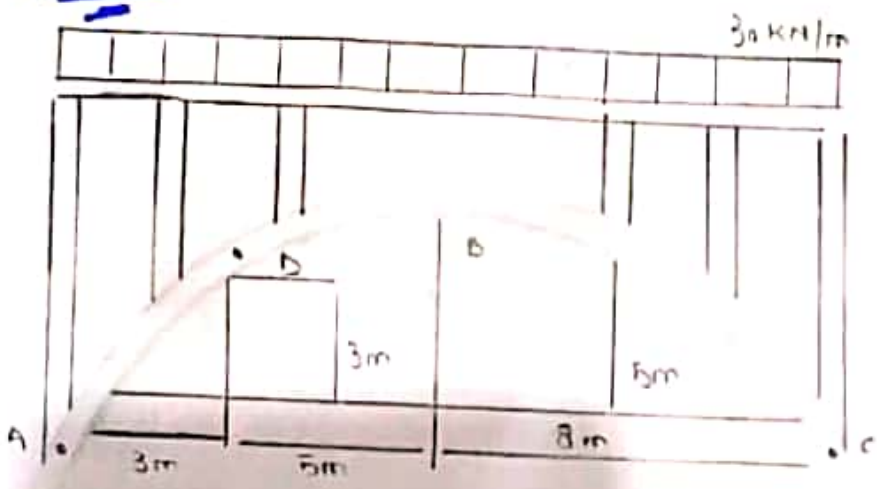
$$= 6000 \sqrt{1 + \frac{225}{400}}$$

$\Rightarrow$ 6000 (1.25)

$\Rightarrow$ 7500 lb ÷ing by 1000

$T_B = T_{max} = 7.5$ kg. Ans.

Q.No 04



Solution:-

$\Rightarrow$ Member AB;

$\curvearrowright + \sum M_A = 0$

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

$\Rightarrow$ Member BC:-

$\curvearrowright + \sum M_C = 0$

$$-B_2(5) + By(8) + 240(4) = 0$$

⇒ **Solving :-**

$$B_C = 192\ kN,\ By = 0$$

⇒ **Segment BD :-**

↳ $\{M_D = 0$

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

$$M_D = 9\ kN\cdot m \quad \text{Ans}$$