

Name

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I-D

7751

Section

"C"

Department

Bs-civil.

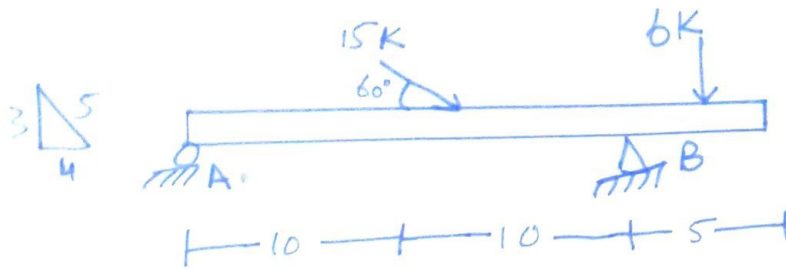
Subject

Structure  
Analysis.  
I

Submitted To

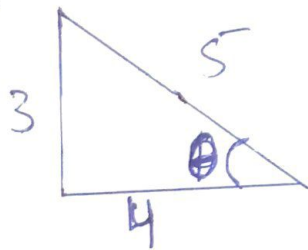
Engr. Muhammad Saqib.

QNO # 01



Solution:-

First of all we have to find the angle for the roller support.



$\therefore$  using Trigonometry

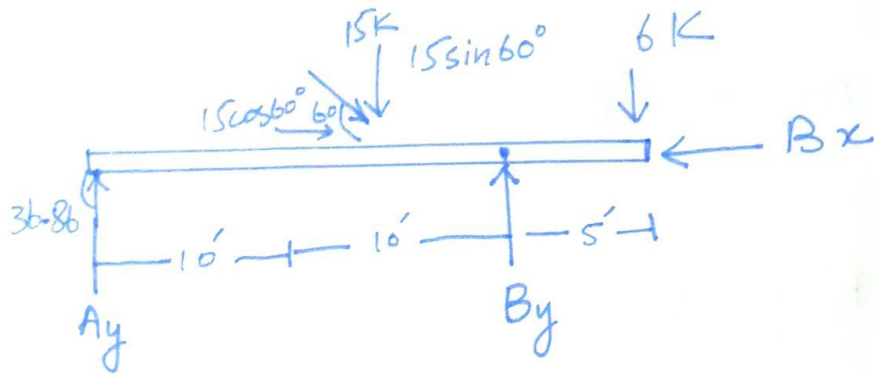
$$\sin \theta = P/H$$

$$\sin \theta = \frac{3}{5}$$

$$\theta = \sin^{-1} \left( \frac{3}{5} \right)$$

$$\theta = 36.86^\circ$$

So Now :-



$$1. \quad \sum F_x = 0 \quad \rightarrow \leftarrow$$

$$15 \cos 60 - B_x - A_y \sin 36.86^\circ = 0$$

$$7.5 - B_x - 0.599 A_y = 0 \rightarrow (1)$$

$$2. \quad \sum F_y = 0 \quad \uparrow + \downarrow -$$

$$A_y \cos 36.86^\circ + B_y - 6 \text{ k} - 15 \sin 60 = 0$$

$$0.80 A_y + B_y - 18.99 = 0$$

$$0.80 A_y + B_y = 18.99 \rightarrow (2)$$

$$3. \quad \sum M_B = 0 \quad \downarrow + \uparrow -$$

$$(A_y \cos 36.86 \times 20) - (15 \sin 60 \times 10) + 6 \times 25 = 0$$

$$16A_y - 190 + 15 = 0$$

$$16A_y - 175 = 0$$

$$A_y = \frac{175}{16}$$

$$A_y = 10.9375 \text{ K}$$

Put the  $A_y$  value in eq (2).

$$0.80(10.9375) + B_y = 18.99$$

$$8.75 + B_y = 18.99$$

$$B_y = 18.99 - 8.75$$

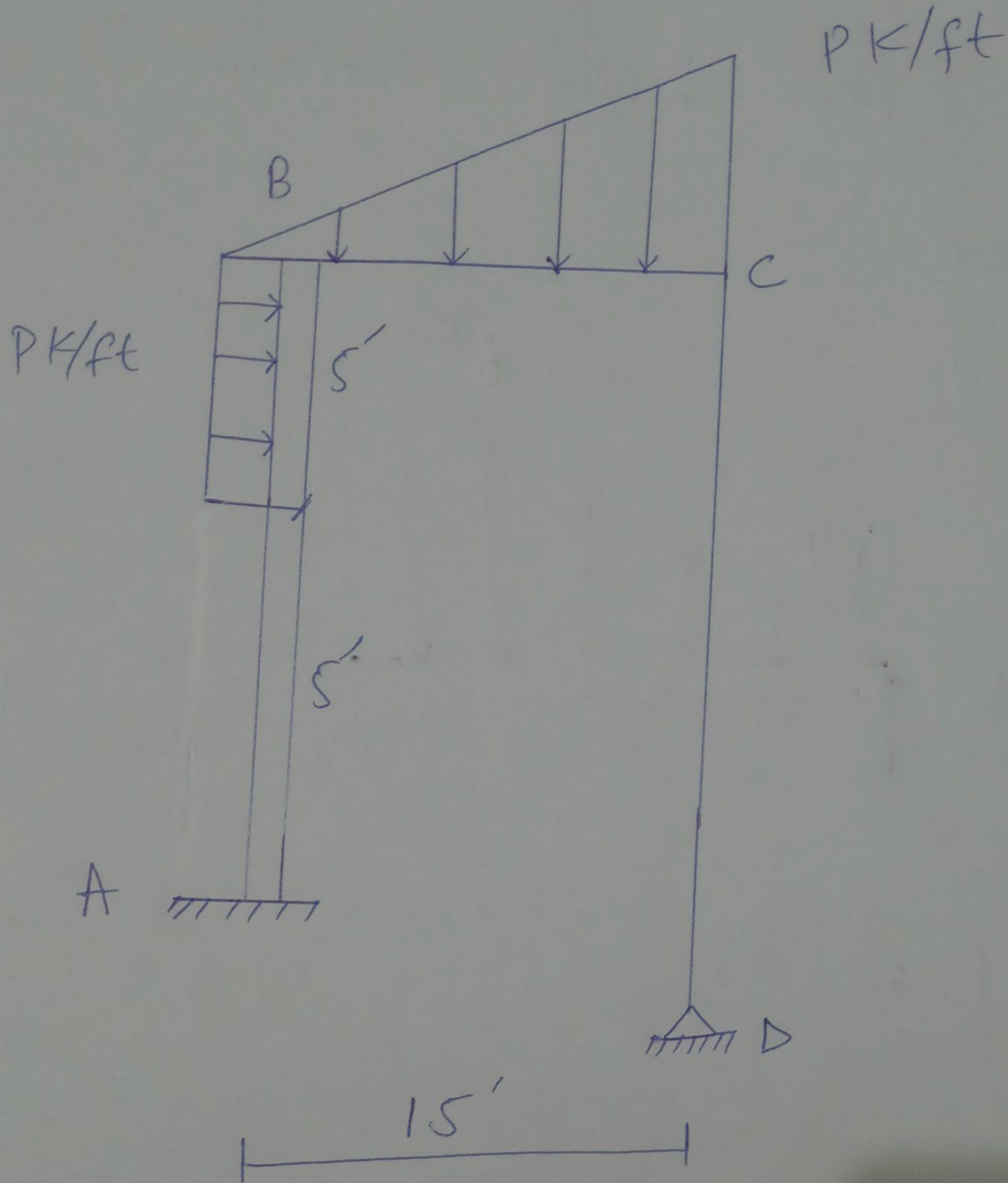
$$B_y = 10.25 \text{ K}$$

Put the value  $A_y$  in equation (1)

$$7.5 - B_x - 0.599(10.9375) = 0$$

$$B_x = 0.937 \text{ K}$$

QNO # 2



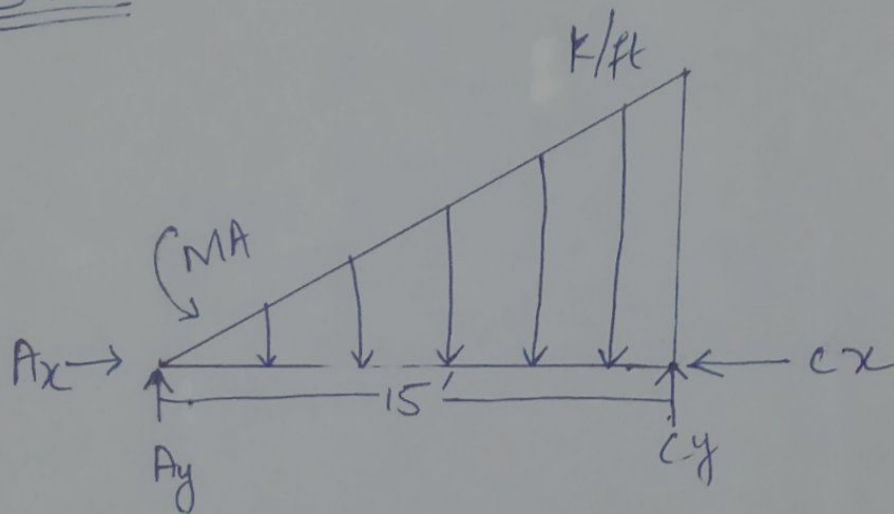
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$$P = 1$$

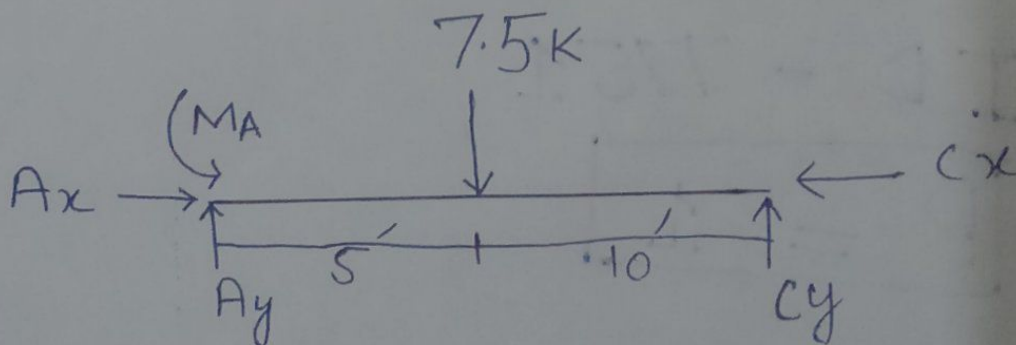
# Solution :-

⇒ Free body Diagram :-

UVL



F.B.D :-



$$\text{Area} = \frac{1}{2} b \cdot h$$

$$= \frac{1}{2} (15) \cdot (1) = 7.5 \text{ kips}$$

$$\begin{aligned}\text{Distance} &= \frac{1}{3}(b) \\ &= \frac{1}{3}(15) \\ &= 5'\end{aligned}$$

$$\rightarrow \sum F_x = 0 \quad \begin{matrix} \rightarrow + \\ \leftarrow - \end{matrix}$$

$$A_x - C_x = 0 \rightarrow (a)$$

Now

$$\sum F_y = 0 \quad \begin{matrix} \uparrow + \\ \downarrow - \end{matrix}$$

$$A_y + C_y - 7.5 =$$

$$A_y + C_y = 7.5 \text{ k} \rightarrow (1)$$

$$\rightarrow \sum M_A = 0 \quad \begin{matrix} \uparrow + \\ \downarrow - \end{matrix}$$

$$(7.5 \times 5) - C_y \times 15 = 0$$

$$(37.5) - C_y \times 15 = 0$$

$$C_y = \frac{37.5}{15}$$

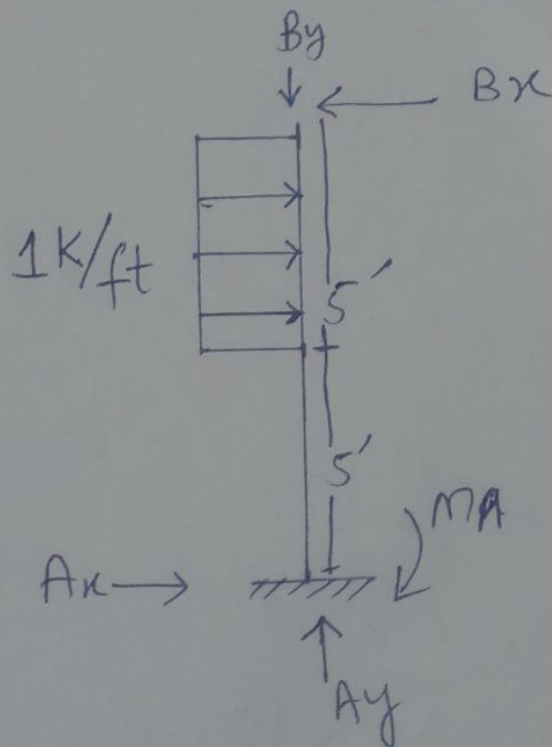
$$C_y = 2.5 \text{ K}$$

Putting the values in equation (1).

$$A_y - 2.5 = 7.5 \text{ K}$$

$$A_y = 7.5 + 2.5$$

$$A_y = 10$$





$$\rightarrow \sum f_x = 0 \rightarrow \leftarrow$$

$$Ax + (1 \times 5) - Bx = 0$$

$$(Ax - Bx) = -(1 \times 5)$$

$$Ax - Bx = -5 \rightarrow \textcircled{1}$$

$$\rightarrow \sum f_y = 0 \uparrow \downarrow$$

$$Ay - By = 0 \rightarrow \textcircled{2}$$

$$\rightarrow \sum MA = 0 \uparrow \downarrow$$

$$(1 \times 5)(2.5 \times 5) - Bx \times 10 = 0$$

$$5 \times 7.5 - Bx \times 10 = 0$$

$$37.5 - Bx \times 10 = 0$$

$$\frac{Bx \times 10}{10} = \frac{37.5}{10}$$

$$\boxed{Bx = 3.75k}$$

Put value of  $B_x$  in eq (1)

$$A_x - B_x = -5$$

$$A_x - 3.75 = -5$$

$$\boxed{A_x = 1.25 \text{ k}}$$

Put the value of  $A_y$  in eq (2)

$$10 - B_y = 0$$

$$\boxed{B_y = 10}$$

Put the value of  $A_x$  in eq (a)

$$A_x - C_x = 0$$

$$1.25 - C_x = 0$$

$$C_x = 1.25 \text{ k}$$

Since D is hange and in the  
Projection of point C thus

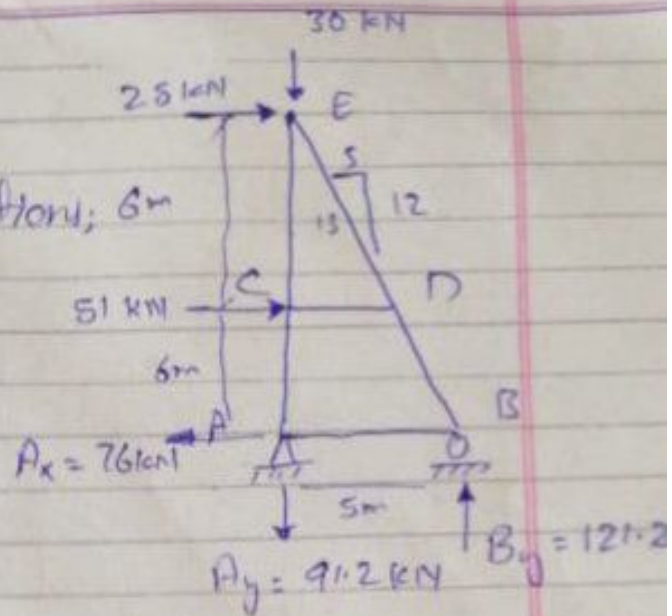
$$D_x = 1.25 K$$

$$D_y = 2.5 K$$

$$ID = 51$$

Solution:

First we find reactions; 6m



$$\sum M_A = 0 \downarrow$$

$$30 \times (51 \times 6) + (25 \times 12) - B_y \times 5 = 0$$

$$B_y = 121.2 \text{ kN}$$

$$\sum F_y \uparrow = 0$$

$$-30 - A_y + 121.2 = 0$$

$$A_y = 91.2 \text{ kN}$$

$$\sum F_x \rightarrow = 0$$

$$25 + 51 - A_x = 0$$

$$A_x = 76 \text{ kN}$$

Also:

$$\tan \theta = \frac{12}{5}$$

$$\theta = \tan^{-1}(12/5)$$

$$\theta = 67.38^\circ$$

## Joint B:

$$\sum F_y \uparrow = 0$$

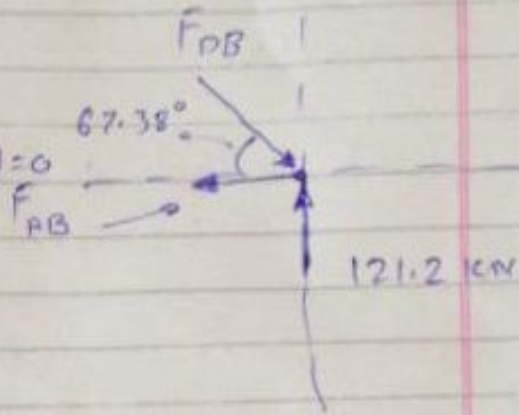
$$121.2 - F_{DB} \sin(67.38^\circ) = 0$$

$$F_{DB} = 131.3 \text{ kN}$$

$$\sum F_x \rightarrow = 0$$

$$-F_{AB} + 131.3 \cos(67.38^\circ) = 0$$

$$F_{AB} = 50.5 \text{ kN}$$



## Joint A:

$$\sum F_x (\rightarrow) = 0$$

$$-76 - 50.5 + F_{AD} \sin(22.62^\circ) = 0$$

$$F_{AD} = \frac{76 + 50.5}{\sin(22.62^\circ)}$$

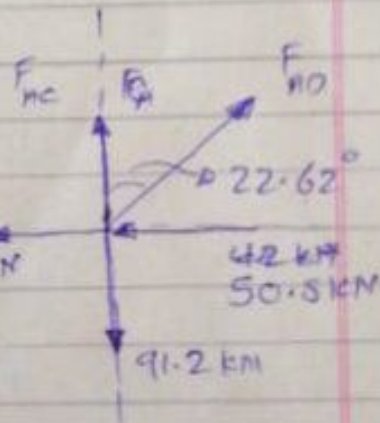
$$F_{AD} = 328.89 \text{ kN}$$

$$\sum F_y \uparrow = 0$$

$$F_{AC} - 91.2 + 328.89 \cos(22.62^\circ) = 0$$

$$F_{AC} = -212.39 \text{ kN}$$

$$F_{AC} = 212.39 \text{ kN} \quad \swarrow +$$



Joint C:

$$\sum F_x (\rightarrow) = 0$$

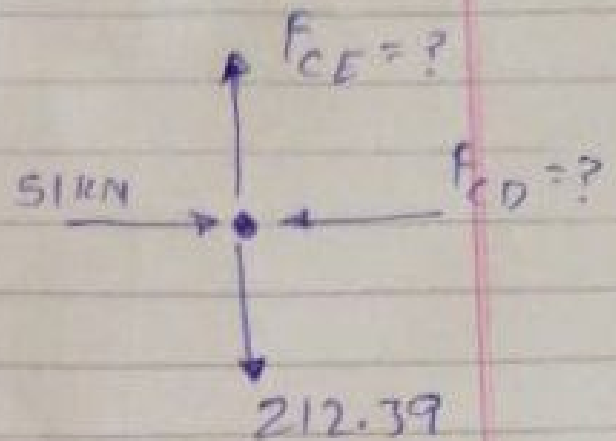
$$51 - F_{CD} = 0$$

$$F_{CD} = 51 \text{ kN}$$

$$\sum F_y (\uparrow) = 0$$

$$F_{CE} - 212.39 = 0$$

$$F_{CE} = 212.39 \text{ kN}$$



Joint E:

$$\sum F_y (\uparrow) = 0$$

$$-30 + 212.39 - F_{ED} \cos(22.61) = 0 \quad 212.39 \text{ kN}$$

$$F_{ED} = \frac{212.39 - 30}{\cos(22.61)}$$

$$F_{ED} = 197.57 \text{ kN}$$

