

M. Kamran

ID : 7888

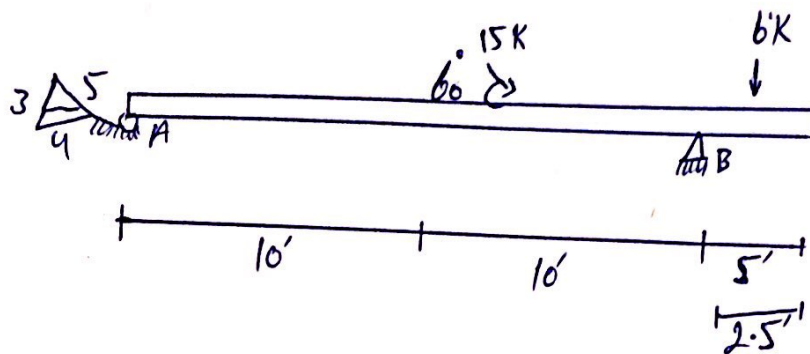
SUB:

Structure I

Inst:- M. SAQIB

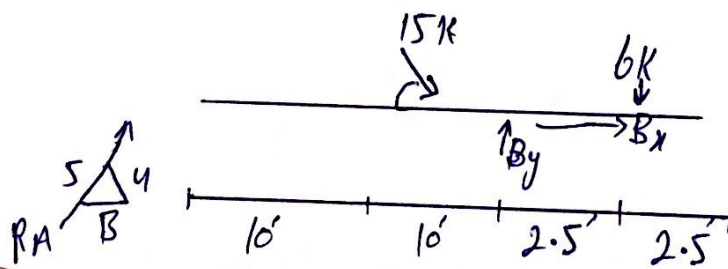
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## Question - 01



Solution :-

first we have to draw f.B.D



$$\sum M_B = 0$$

$$- \frac{4}{5} R_A (20) + 15 \sin (60) (10) - 6 (2.5) = 0$$

$$+ \frac{4}{5} R_A (20) = + 114.9$$

$$R_A = \frac{114.9}{20} \times \frac{5}{4}$$

$$R_A = 7.18 \text{ k} \nearrow$$

②

Now to find  $B_x$

$$\sum F_x = 0 \rightarrow +$$

$$\frac{3}{5} (7 \cdot 18) + 15 \cos(60) + B_x = 0$$

$$11.81 + B_x = 0$$

$$B_x = 11.81 \text{ k}$$

So the direction is opposite

Now

$$\sum F_y = 0 \uparrow +$$

$$\frac{4}{5} (7 \cdot 18) - 15 \sin(60) + B_y - 6 = 0$$

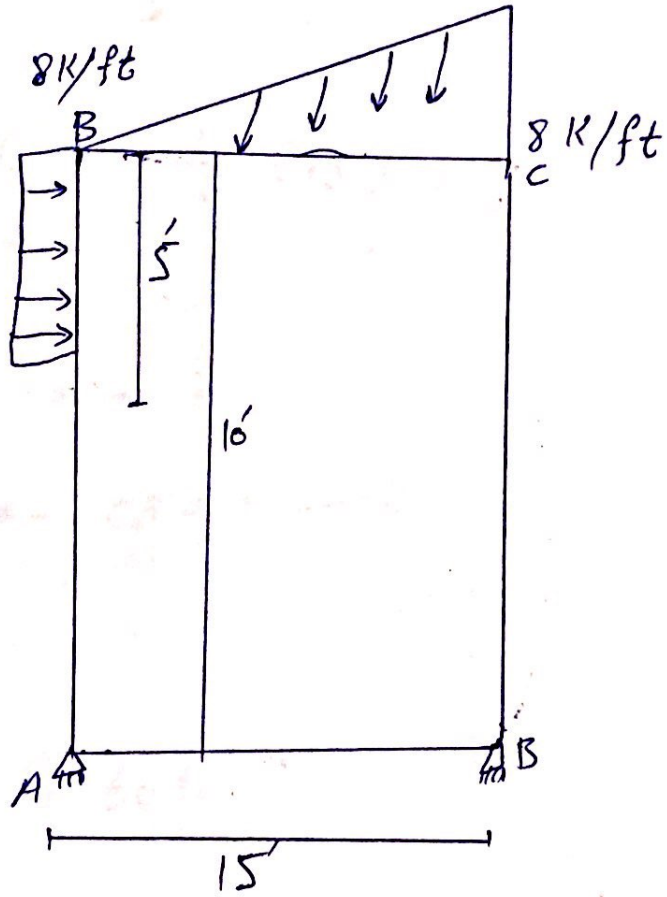
$$-7.246 + B_y = 6$$

$$B_y = 6 + 7.246$$

$$B_y = 13.25 \text{ k}$$

①

# QUESTION - 02.

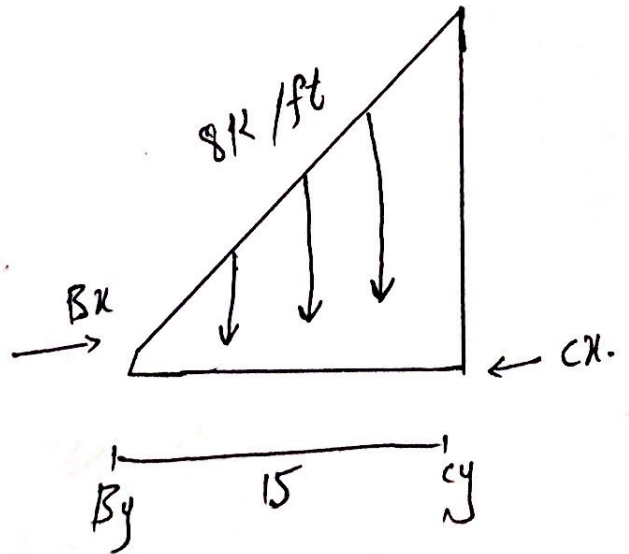


Solution :-

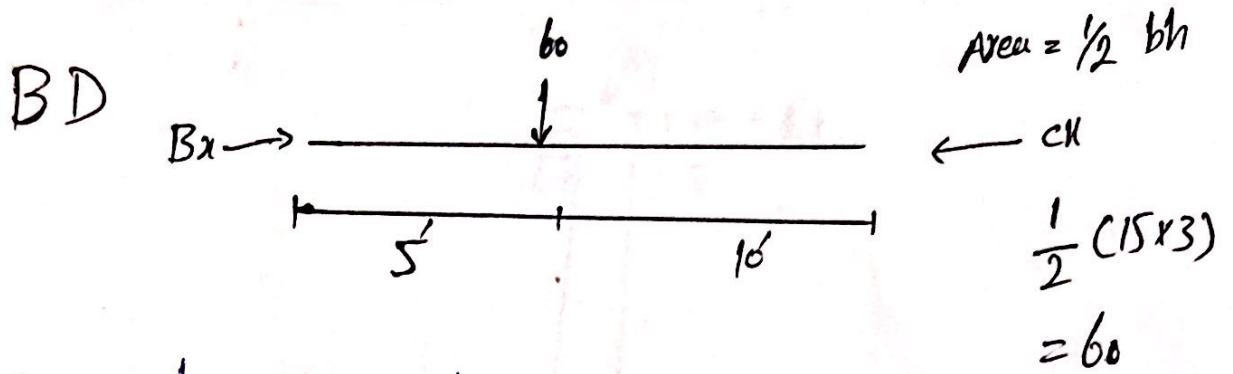
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f.B.D

UVL



②



$$\text{Dist} = \frac{1}{3} (b) = \frac{1}{3} (15) = 5$$

$$\textcircled{1} \sum F_x = 0 \rightarrow + \leftarrow$$

$$B_x - C_x = 0 \quad \text{---} \textcircled{1}$$

$$\textcircled{2} \sum F_y = 0 \uparrow + \downarrow$$

$$B_y + C_y = 60 \text{ k}$$

$$\textcircled{3} \sum M_B = 0 \uparrow + \downarrow$$

$$(60 \times 5) - C_y \cdot 15 =$$

$$300 = 15 C_y$$

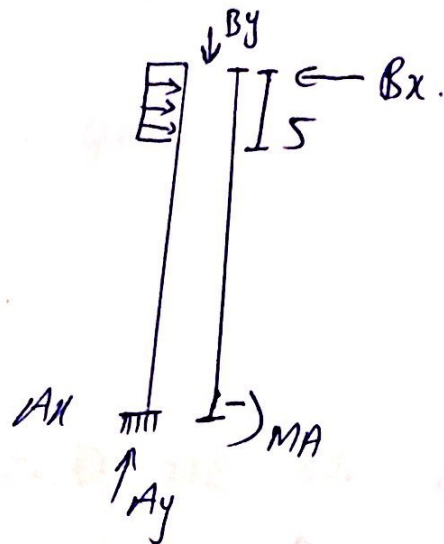
$$C_y = 20 \text{ k}$$

put values in eq  $\textcircled{2}$

$$B_y + 20 = 22.5$$

$$B_y = 22.5 - 20 \Rightarrow 2.5$$

③



$$\textcircled{1} \sum f_x = 0 \rightarrow + \leftarrow -$$

$$A_x + (8 \times 5) - B_x = 0$$

$$A_x - B_x = -40 \text{ --- } \textcircled{3}$$

$$\textcircled{2} \sum f_y = 0 \downarrow + \uparrow -$$

$$A_y - B_y = 0$$

$$\textcircled{3} \sum M_2 = 0 \downarrow + \uparrow -$$

$$(8 \times 5) \times (2.5 + 5) - B_x + 10 = 0$$

$$40 \times 7.5 - B_x + 10 = 0$$

$$B_x / 10 = 40 \times 7.5$$

$$B_x = \Rightarrow \frac{300}{10} \Rightarrow 30$$

put the value in eq ③

$$Ax - 30 = -40$$

$$Ax = -10k$$

Now Since C & D are at same line that load is transferred so

$$Cy =$$

$$\text{So } Dy = 20$$

put the values of  $B_y$  in ④

$$Ay - 40 = 0$$

$$Ay = 40k$$

put the value of  $B_x$  in eq ⑤

$$30 - Cx = 0$$

$$Dx = -30k$$

$$M_0 = 0k+$$

5

1

$$-(8 \times 5) (2.5 - (A \times 10)) + MA = 0$$

$$-(40) (2.5) - (A \times 10) + MA = 0$$

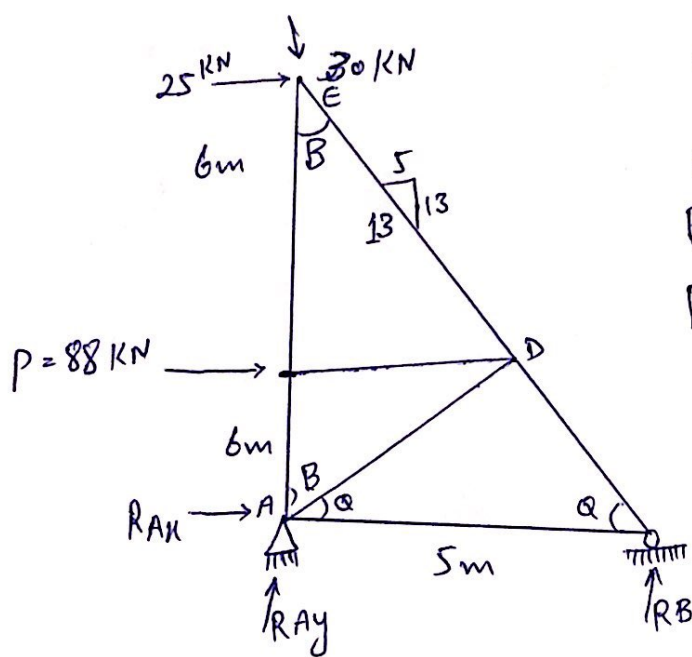
$$-100 - (10 \times 10) + MA = 0$$

$$MA = 0$$



①

# Question - 03



$$\theta = \tan^{-1} \frac{12}{5}$$

$$\theta = 67.38 = 67.4^\circ$$

$$\beta = 90 - 67.4$$

$$\beta = 22.6^\circ$$

$$\sum M_B = 0 \quad [\uparrow +]$$

$$25 \times 12 - 30 \times 5 + 88 \times 6 + R_{Ay} \times 5 = 0$$

$$\boxed{R_{Ay} = -135.6 \text{ kN}}$$

$$\sum f_y = 0 \quad [\uparrow +]$$

$$-135.6 - 30 + R_B = 0 \Rightarrow \boxed{R_B = 165.6 \text{ kN}}$$

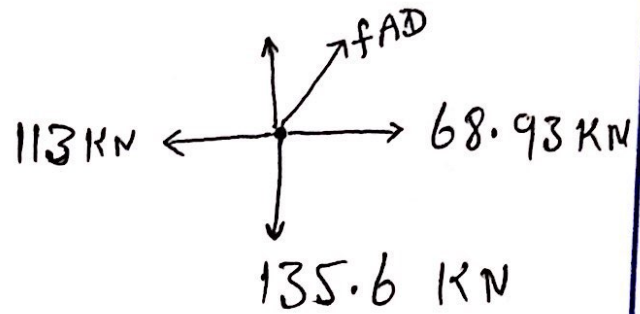
$$\sum f_x = 0 \quad [\rightarrow +]$$

$$R_{Ax} + 88 + 25 = 0 \Rightarrow \boxed{R_{Ax} = -113 \text{ kN}}$$

B using Method of joint

Joint A :-

$$\sum f_x = 0$$



$$-113 + f_{AD} \cos \theta + 68.93 = 0$$

$$f_{AD} = 114.68 \text{ kN}$$

Member forces :-

$$f_{AB} = 68.93 \text{ kN}$$

$$f_{AC} = 30.05 \text{ kN}$$

$$f_{BD} = -179.37 \text{ kN}$$

$$f_{CD} = -88 \text{ kN}$$

$$f_{CE} = 30.05 \text{ kN}$$

$$f_{DE} = -65.05 \text{ kN}$$



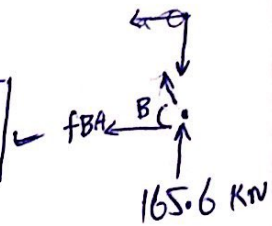
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## Joint B

$$\sum f_y = 0$$

$$165.6 \text{ kN} + f_{BD} \sin \theta$$

$$f_{BD} = -179.37 \text{ kN}$$



$$\sum f_x = 0$$

$$f_{BA} = 179.37 \cos \theta$$

$$f_{BA} = 68.93 \text{ kN} \checkmark$$

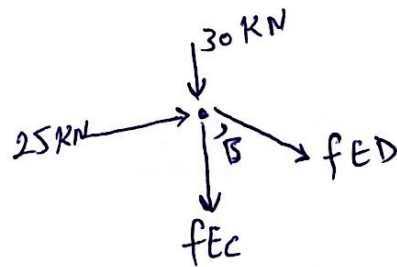
## Joint E

$$\sum f_y = 0 \quad [\uparrow +]$$

$$-30 - f_{Ec} - f_{ED} \cos B = 0$$

$$-30 - f_{Ec} - (65.05) \cos 22.6^\circ = 0$$

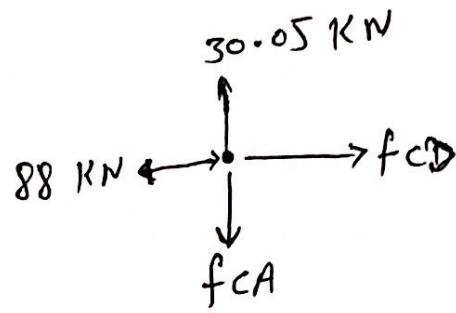
$$f_{Ec} = +30.05 \text{ kN} \checkmark$$



$$\sum f_x = 0 \quad [\rightarrow +]$$

$$25 + f_{ED} \sin B = 0 \rightarrow f_{ED} = -65.05 \text{ kN}$$

joint C



$$\sum f_x = 0 \quad (\rightarrow +)$$

$$f_{CD} = -88 \text{ kN}$$

$$f_y = 0 \quad (\uparrow +)$$

$$f_{CA} = 30.05 \text{ kN} \quad \checkmark$$

