Name :- M. Hasnain

ID :- 7817

SEC :- A

Subject :- Structure Analysis 1

Instructor :- Engr. M. Saqib

Q no (1)

Solution:-

First of all we have to Find the angle For the roller support

$\therefore$ Using Trigonometry

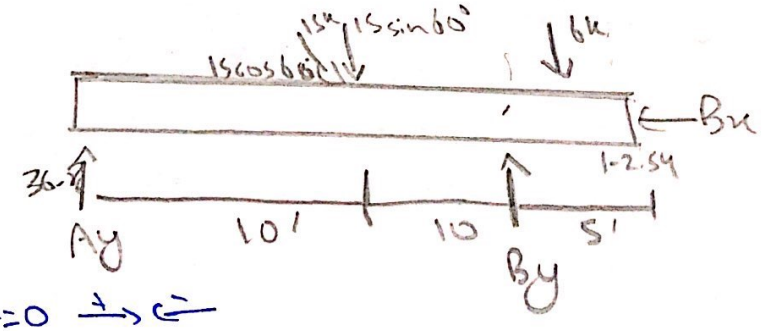
$$\sin\theta = \frac{P}{H}$$

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

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

$$\theta = 36.86^\circ$$

So Now



1. $\Sigma F_x = 0 \xrightarrow{+} \xleftarrow{-}$

$$15\cos 60^\circ - B_x - A_y \sin 3686^\circ = 0$$

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

2. $\Sigma F_y = 0 \uparrow + \downarrow -$

$A_y \cos 36.86° + B_y - 6k - 15 \sin 60° = 0$

$0.80 A_y + B_y - 18.99 = 0$

$0.80 A_y + B_y = 18.99 - ②$

3. $\Sigma M_B = 0 \circlearrowleft + \circlearrowright -$

$(A_y \cos 36.86 \times 20) - (15 \sin 60° \times 10) + 6 \times 2.5 = 0$

$16 A_y - 190 + 15 = 0$

$16 A_y - 175 = 0$

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

$A_y = 10.9375k$

Put the value in eq ②

$0.80(10.9375) + B_y = 18.99$

$8.75 + B_y = 18.99$

$B_y = 18.99 - 8.75$

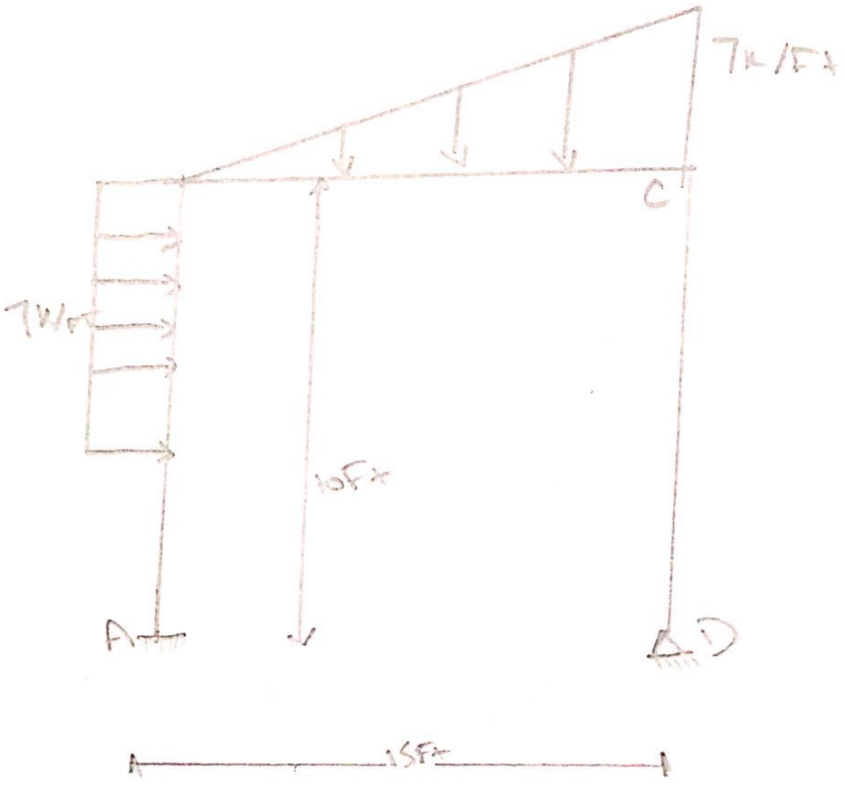
$B_y = 10.25k$

Put the value in eq ①

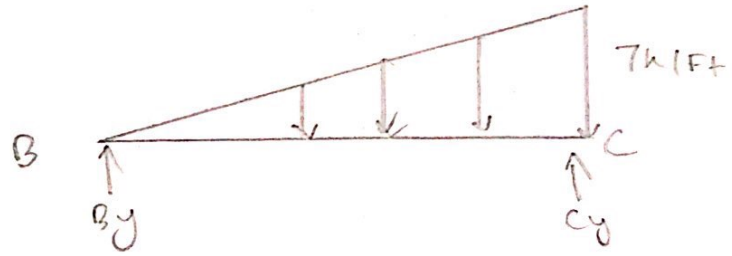
$7.5 - B_x - 0.599(10.9375) = 0$

$B_x = 0.9375k$

Qno(2) ID:- 7817



Member e1)



$\Sigma M_B = 0 \quad \curvearrowleft +$

$= \frac{1}{2} \times 15 \times 7 \times \frac{2}{3} \times 15 = Cy \times 15$

$= ey = 35k$

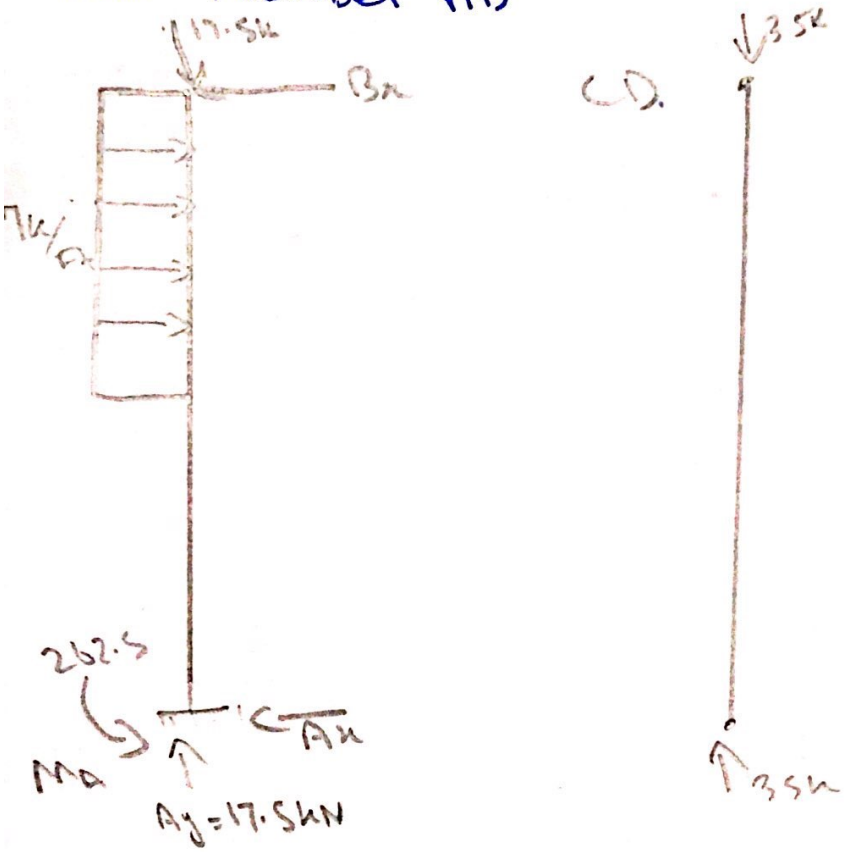
$\Sigma F_y = 0$

$\Rightarrow By + Cy = \frac{1}{2} \times 15 \times 7$

$\Rightarrow By = 52.5 - 35$

$By = 17.5k$

Now Member AB



For whole structure

$\Sigma M_A = 0$ ↻

$$-M_A + 7\times5\times7.5 + \frac{1}{2}\times7\times15\times\frac{2}{3}\times15 - 35\times15 = 0$$

$M_A = 262.5$ k.ft

Now in Member AB

$\Sigma M_B = 0$ ↺+

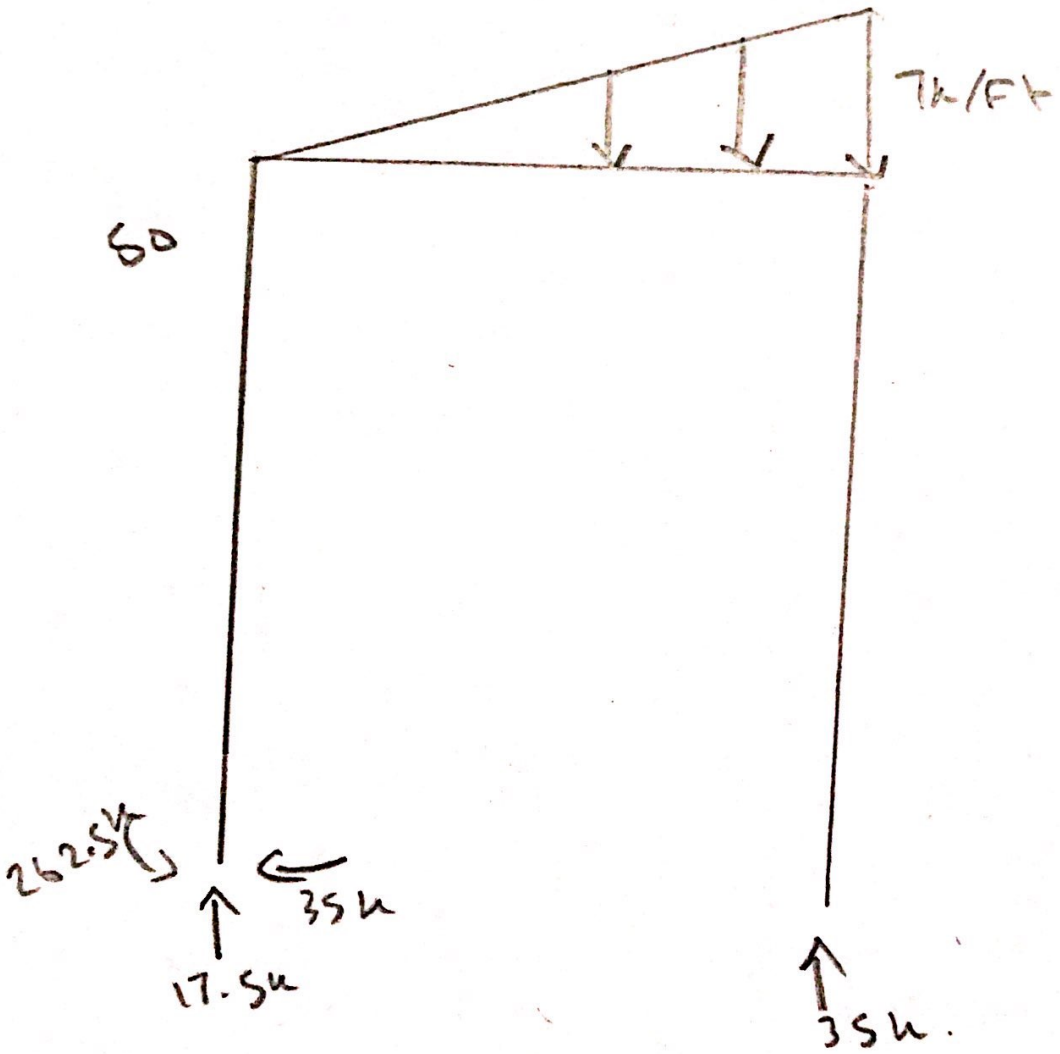
$$7\times5 + 2.5 + 262.5 = A_x \times 10$$

$$\Rightarrow A_x = 3\ K$$

$\Sigma F_x = 0$

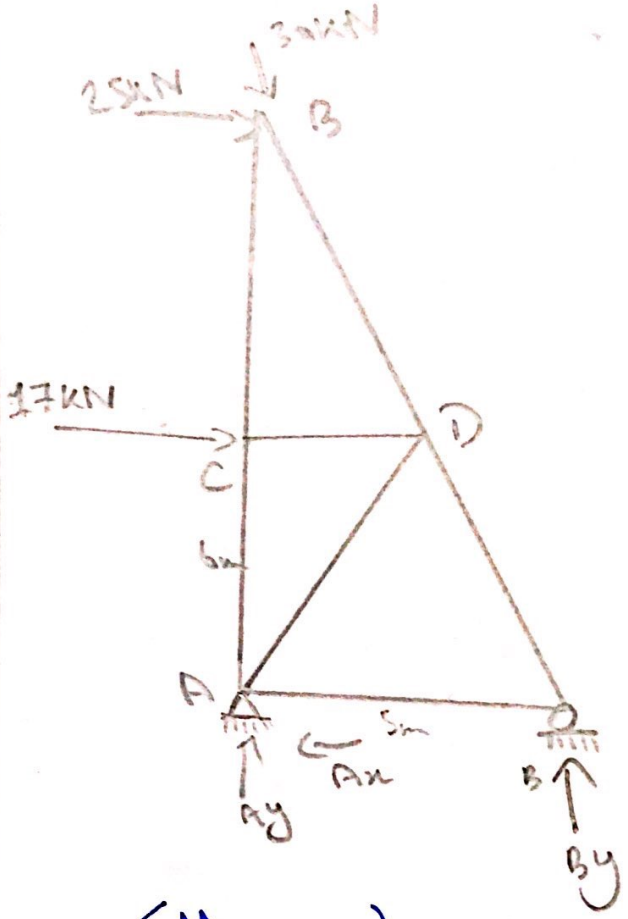
$\Rightarrow A_x + B_x = 35$

$= B_x = 0$



Qno (3)

ID:-78(17)



$\Sigma M_A = 0$ ↻+

$\Rightarrow 25 \times 12 + 17 \times 6 = By \times 5$

$By = 80.4$

Now $Ay + By = 30$

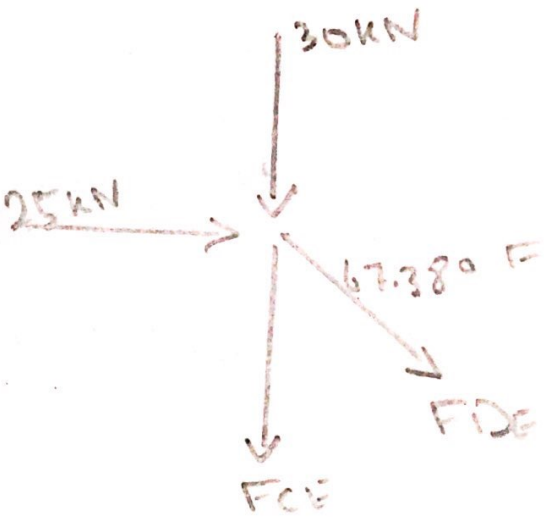
$Ay = 30 - 80.4$

$Ay = -50.4$

$Ax = 25 + 17$

$\boxed{Ax = 42\ kN}$

Join E



$\Sigma F_x = 0 \quad \rightarrow +$

$\Rightarrow 25 + F_{DE} \cos 67.38$

$F_{DE} = \frac{-25}{\cos 67.38}$

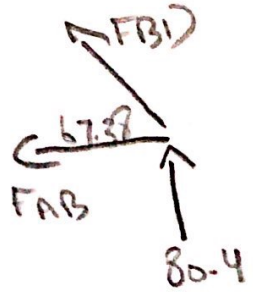
$F_{DE} = -65\ kN$ (Compression)

$\Sigma F_y = 0 \quad \uparrow$

$-30 - F_{CE} + 65 \sin 67.38$

$\Rightarrow F_{CE} = 30kN$ (Tension)

Now Joint B



$F_{BD} \sin 67.38 = -80.4$

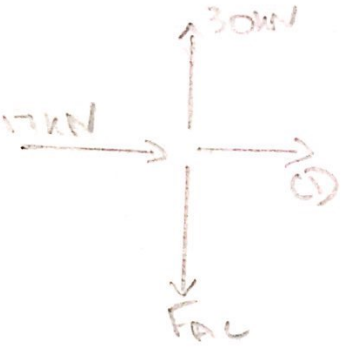
$F_{BD} = -87.1\ kN$ (Compression)

$\Sigma F_x = 0 \longrightarrow +$

$\Rightarrow -F_{AB} + 87.1 \times \cos 67.38 = 0$

$F_{AB} = 33.5\ kN$ (Tension

Now Joint C



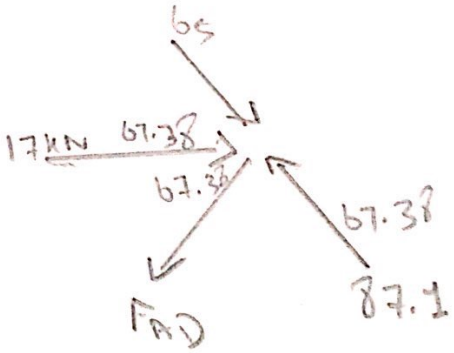
$\Sigma F_x = 0$

$= F_{CD} = -17\ kN$ (compression)

$\Sigma F_y = 0$

$F_{AC} = 30kN$ (Tension)

Now joint D



$\Sigma F_y = 0 \uparrow$

[redacted]

[redacted]

$= 87.1 \cdot \sin(67.38) - 65 \cdot \sin(67.38) - F_{AD} \sin(67.38) = 0$

$= 80.39 - 59.99 - F_{AD})(0.92) = 0$

$F_{AD} = 20.4 / 0.92$

$\boxed{F_{AD} = 22.17\ kN}$