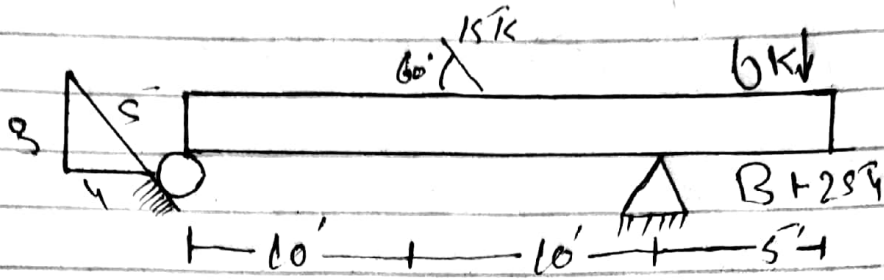
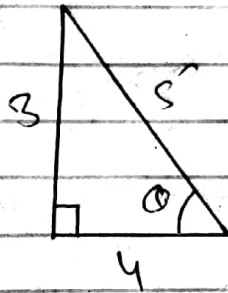


Q no 1



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



Using trigonometry

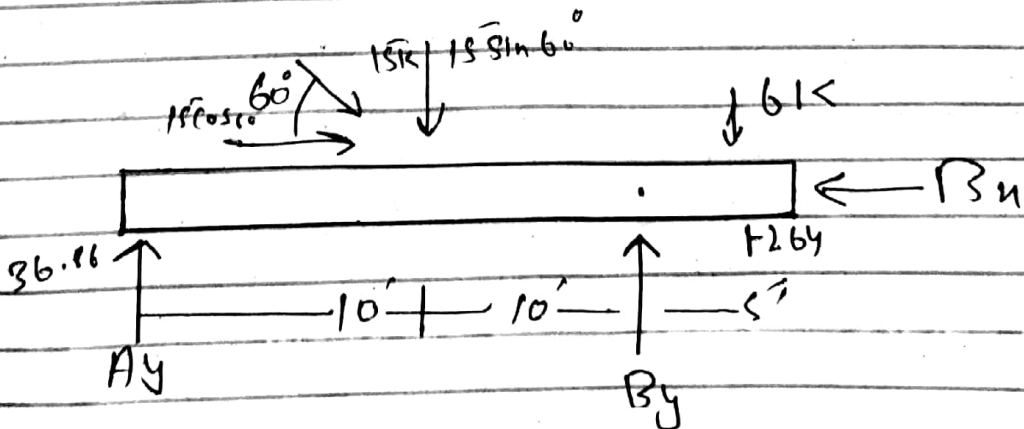
$$\sin \theta = \frac{P}{H}$$

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

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

$$\theta = 36.86^\circ$$

So now



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

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

$$7.5 - B_x - 0.599 A_y = 0 \rightarrow \textcircled{1}$$

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

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

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

$$0.80 A_y + B_y = 18.99 \rightarrow \textcircled{2}$$

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

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

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

$$16 A_y - 175 = 0$$

$$16 A_y = 175$$

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

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

Put the value in eq $\textcircled{1}$

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

$$8.75 + B_y = 18.99$$

$$B_y = 18.99 - 8.75$$

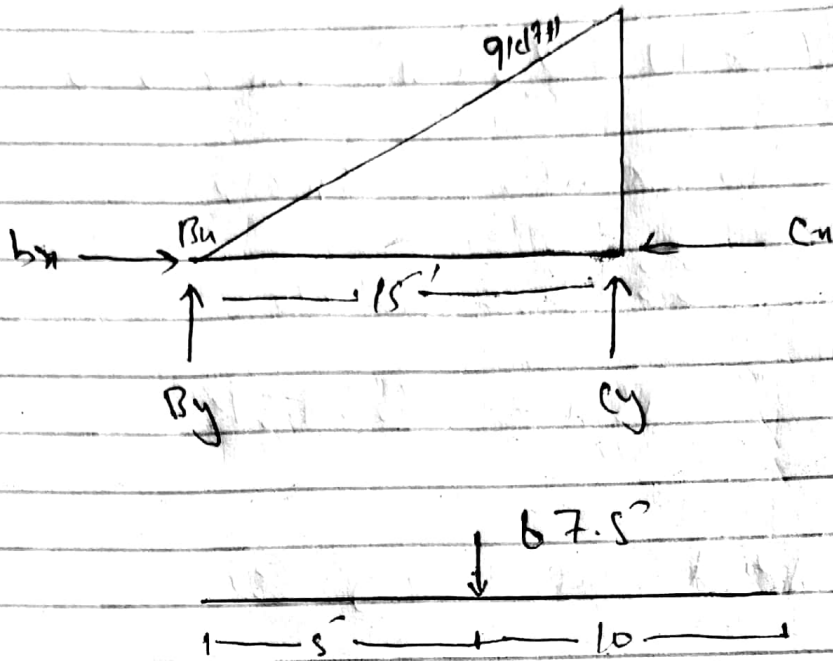
$$B_y = 10.25 \text{ k}$$

Put the value of A_y in ①

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

$$B_x = 0.9375 \text{ k}$$

Q2



$$\text{Area} = \frac{1}{2} (15 \times 9) = 67.5$$

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

$$\text{i. } \sum F_x = 0 \rightarrow + \leftarrow$$

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

$$\text{ii. } \sum F_y = 0 \uparrow + \downarrow -$$

$$B_y + C_y = 67.5 \text{ k} \quad \text{--- (2)}$$

$$\text{iii. } \sum M_B = 0 \downarrow + \uparrow -$$

$$(67.5)(5) - (C_y \times 15) = 0$$

$$337.5 = 15 C_y$$

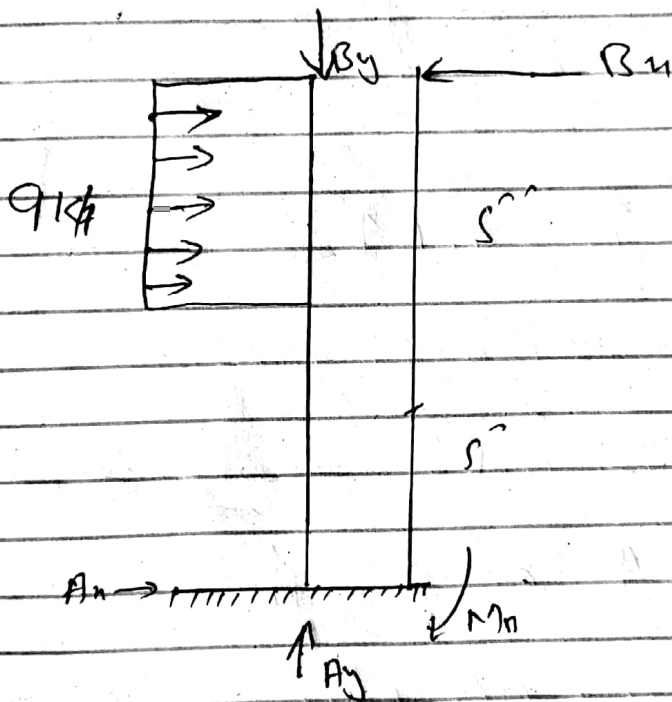
$$C_y = 22.5$$

Put the value in eq 6

$$B_y + 22.5 = 67.5$$

$$B_y = 67.5 - 22.5$$

$$B_y = 45 \text{ k}$$



$$(i) \sum F_x = 0 \rightarrow + \leftarrow$$

$$A_x + (5 \times 9) - B_x = 0$$

$$A_x - B_x = -45$$

$$(ii) \sum F_y = 0 \uparrow + \downarrow$$

$$A_y - B_y = 0 \rightarrow \text{ⓐ}$$

(iii)

$$(8 \times 9) - (2.5 + 5) R_u \times 10 = 0$$

$$45 \times 7.5 = R_u \times 10 = 0$$

$$337.5 = R_u \times 10$$

$$R_u = 33.75 \text{ k}$$

Put in eq (3)

$$A_u = 33.75 = -9.5$$

$$A_u = 312.5 \text{ k}$$

Now since C and D at same line this load is transferred so

$$C_y = 22.5 \text{ k}$$

$$\text{So } D_y = -22.5 \text{ k}$$

Put the value of R_y in eq (4)

$$A_y - 45 = 0$$

$$A_y = 45$$

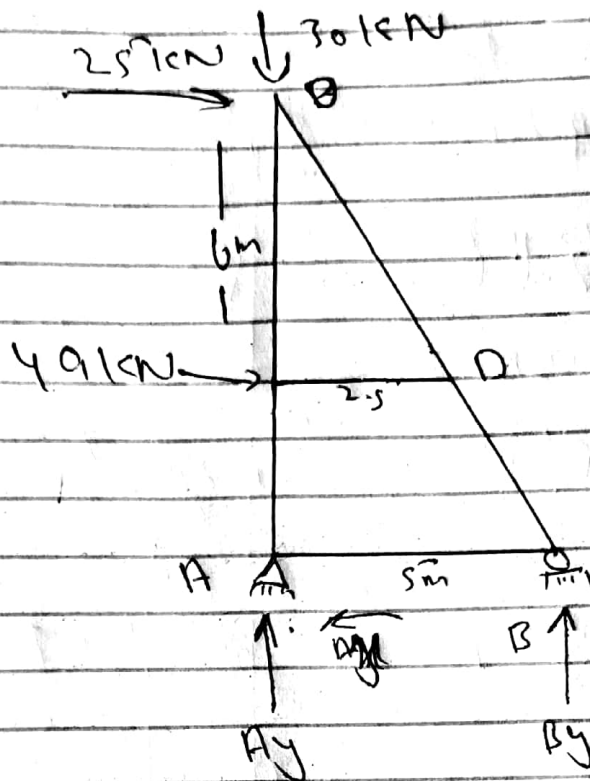
Put the value in eqn ①

$$337.5 - Q_n = 0$$

$$Q_n = 337.5 \text{ ic} \quad \text{lies on sample place}$$

$$\text{So } D_n = -337.5 \text{ ic}$$

Q no 3



$$\sum M_A = 0 \quad \downarrow +$$

$$\Rightarrow 25 \times 12 + 49 \times 6 = B_y \times 5$$
$$= B_y \quad 118.8 \text{ kN}$$

$$\text{Now } A_y + B_y = 30$$

$$A_y = 30 - 118.8$$

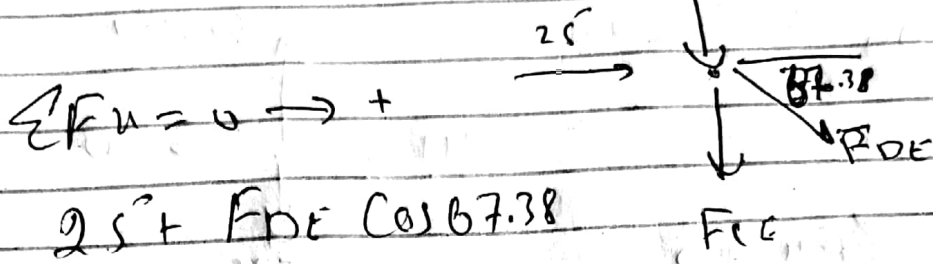
$$A_y = -88.8 \quad \text{Means down ward}$$

$$A_x = 25 + 49$$

$$A_x = 74$$

(2)

Joint E



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

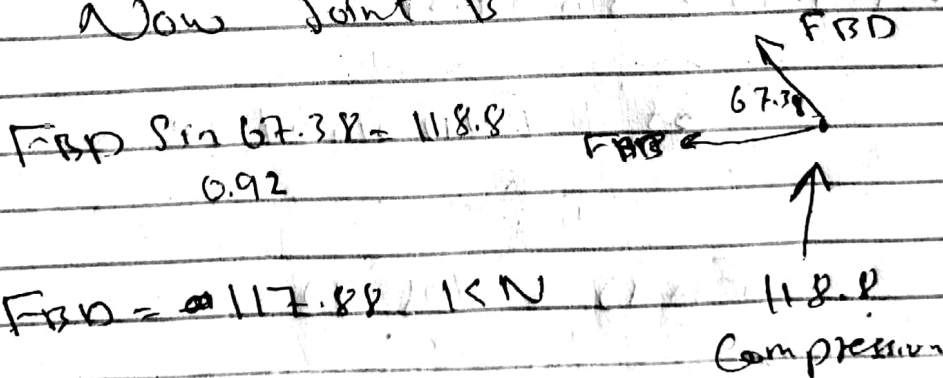
$$F_{DE} = -65 \text{ Compression}$$

$$\sum F_y = 0 \uparrow$$

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

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

Now Joint B



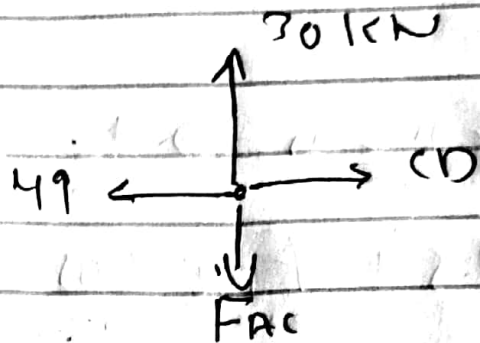
$$\sum F_x = 0 \rightarrow +$$

$$-F_{AB} + 117.88 \times \cos 67.38 = 0$$

$$F_{AB} = 45.3 \text{ kN}$$

Now

Joint C



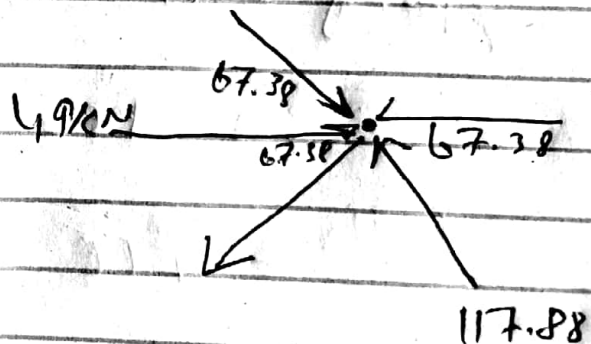
$$\Rightarrow \sum F_x = 0$$

$$\Rightarrow F_{CD} = -49 \text{ kN Comp}$$

~~$$\sum F_y = 0$$~~

$$F_{AC} = 30 \text{ kN Ten}$$

Joint D



$$\sum F_y = 0 \uparrow$$

$$\Rightarrow 117.88 \times \sin 67.38$$

$$65 + F_{AD} \sin 67.38$$

$$F_{AD} = 65.92$$