I.D :- 7278

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PAPER :- Structure Analysis - 1

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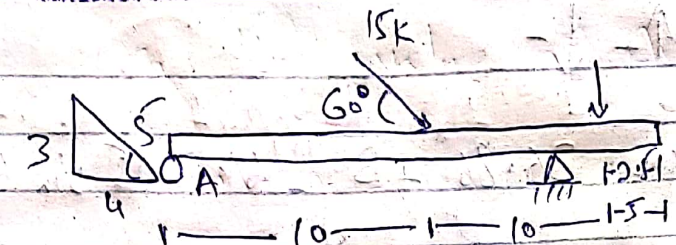
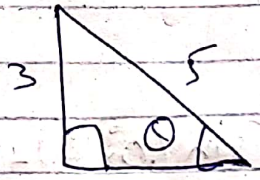
Q1



Solⁿ →

first of All we have to find the angle for the roller support



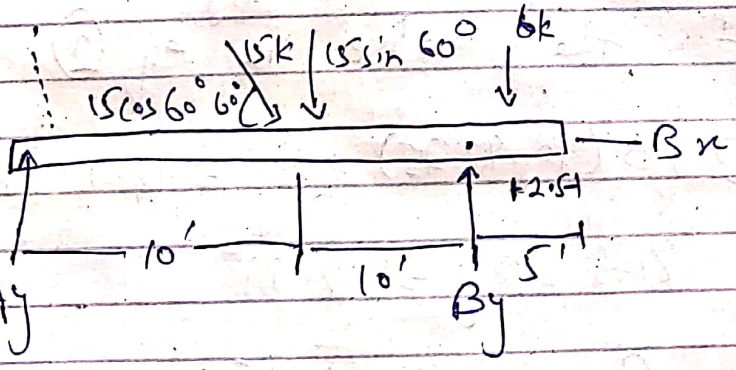
using Trigonometry

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

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

$$\theta = 36.86^\circ$$

So Now



1 $\Sigma f_x = 0 \quad \xrightarrow{+} \quad \leftarrow -$

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

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

(2)- $\Sigma f_y = 0 \quad \uparrow + \downarrow -$

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

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

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

(3)- $\Sigma M_B = 0 \quad \curvearrowleft + \curvearrowright -$

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

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

$$16 A_y - 175 = 0$$

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

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

Put the value in eq (2)

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

$$8.75 + B_y = 18.99$$

$$B_y = 18.99 - 8.75$$

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

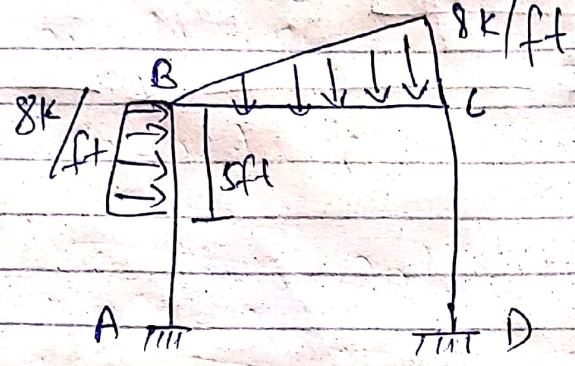
put the value of Ay in eq (1)

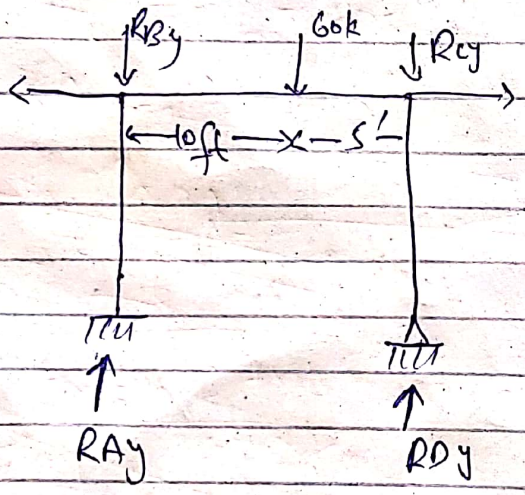
$$7.5 - Bx - 0.599(10.9375) = 0$$

$$\boxed{Bx = 0.9375k}$$

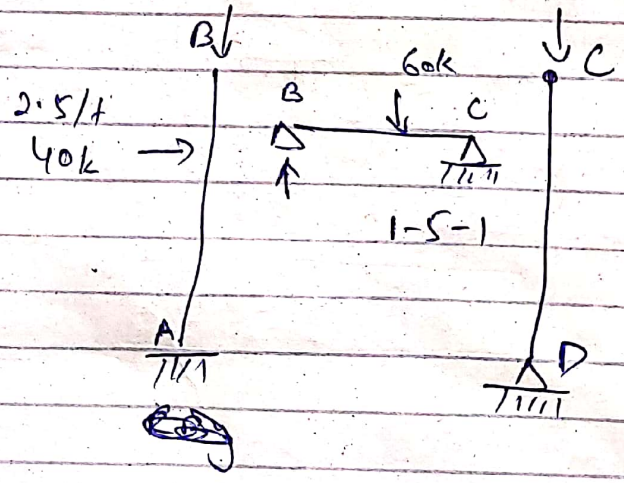
Q2:- find out the support reaction free body diagram

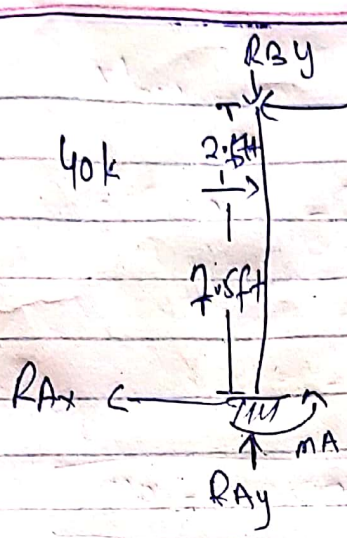
Sol:-





$M_A = -500$ kip-ft





$\sum M_A = 0$ (+)

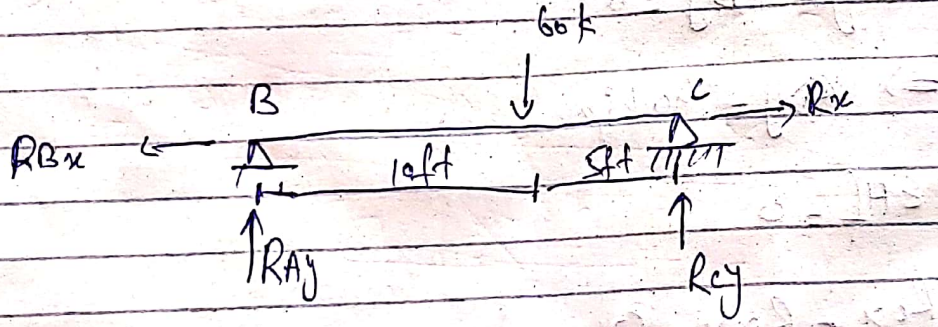
$-7.5 \times 40 + R_{B_x}(10) = 0$

$\Rightarrow R_B = 30$ kips

$\sum f_x = 0$

$-R_{A_x} + 40k - 30k = 0$

$\Rightarrow \boxed{R_{A_x} = 10k}$



$\sum M_B$ (+) $= 0$

$-60 \times 10 + R_{cy} \times 15 = 0$

$\boxed{R_{cy} = 40k}$

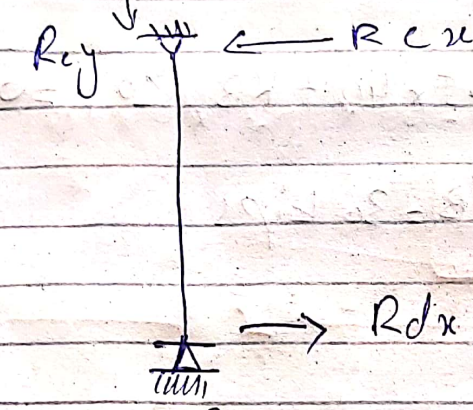
$\sum f_y = 0$

$R_{By} = 60 - 40$

$R_{By} = 60 + R_{cy} = 0$

$R_{By} = 60 - 40$

$\boxed{R_{By} = 20 \text{ kips}}$



$\Sigma f_y = 0$

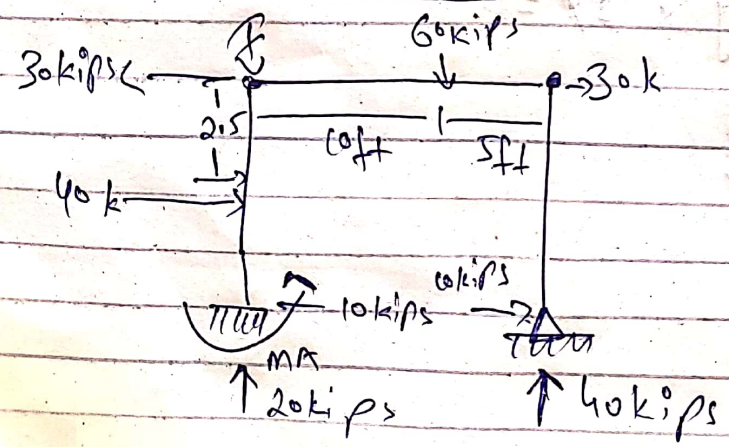
$-R_{cy} + R_{Dy} = 0$

$\Rightarrow R_{Dy} = 40 \text{ kips}$

$\Sigma H_f = 0$

$R_{cx} - R_{Dx} = 0$

$\boxed{R_{Dx} = 30 \text{ kips}}$



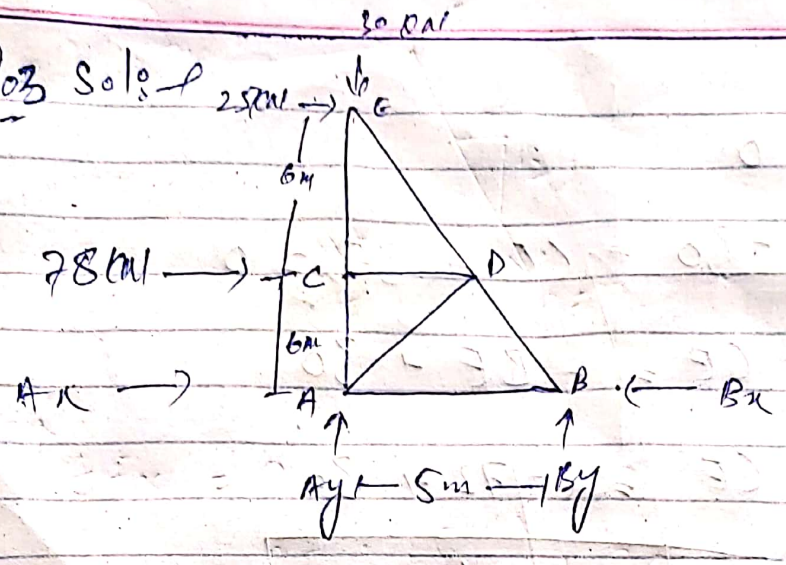
Now to find ΣM_A

$$\Sigma M_A = -7.5 \times 40 \times 30 \times 10 - 60 \times 10 + 40 \times 10 - 30 \times 10$$

$$= -7.5 \times 40 - 60 \times 10 \times 40 \times 10$$

$$\boxed{M_A = -500 \text{ kip.ft}}$$

Q03 Sol:-



Analysis of Truss By Joint Method

$\circlearrowleft$ +ve $\Sigma M_B = 0$

$-5Ay + 78 \times 6 = 0$

$Ay = 93.6 KN.$

$\Sigma Fy = 0$

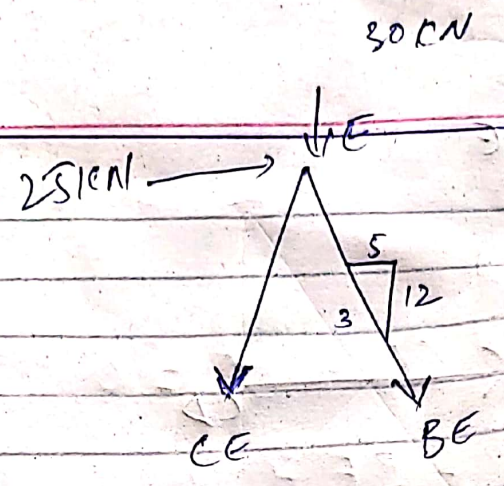
$93.6 - 30 + By = 0$

$\boxed{By = 63.6 KN}$

$\Sigma Fx = 0$

$Bx - Ax - 78 - 25 = 0$

$\boxed{Bx = 103 KN}$



$\uparrow \Sigma F_x = 0$

$$-BE\left(\frac{5}{12}\right) + 30 = 0$$

$$\boxed{BE = 72 \text{ KN}}$$

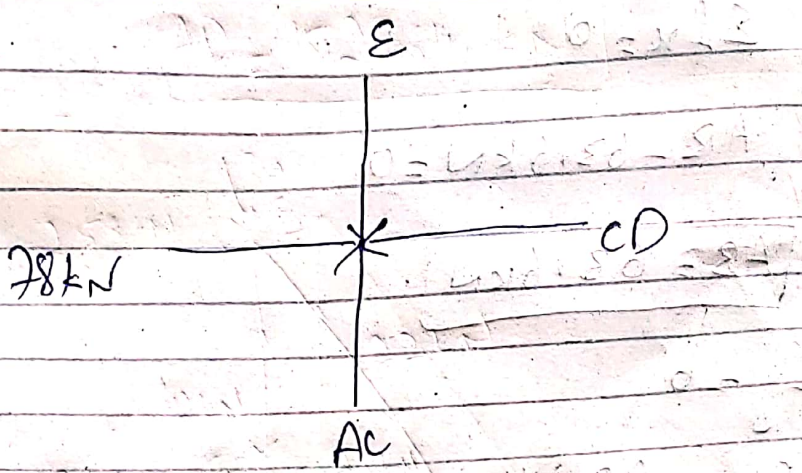
$+\uparrow \Sigma F_y = 0$

$$-30 + CE + BE = 0$$

$$CE = -BE + 30$$

$$CE = -72 + 30$$

$$\boxed{CE = -42 \text{ KN}}$$



$\Sigma fx = 0$

$78 - CD = 0$

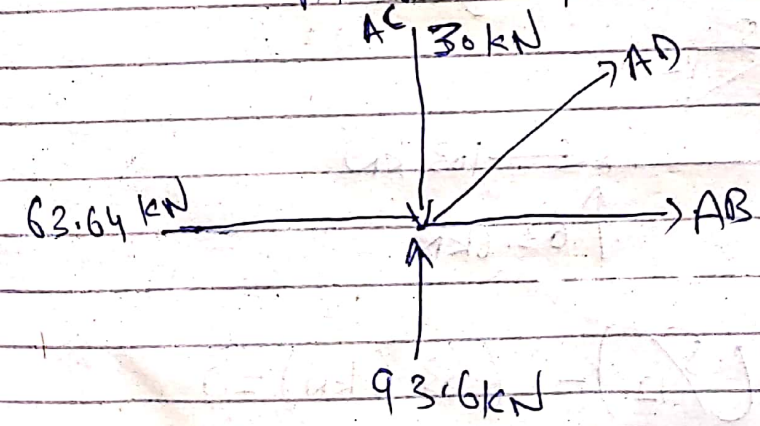
$\boxed{CD = 78kN}$

$\Sigma fy = 0$

$Ac - 30\,kN = 0$

$\boxed{Ac = 30kN}$

Now At Point A.



$\Sigma f_x = 0$

$AB - 63.6\,kN = 0$

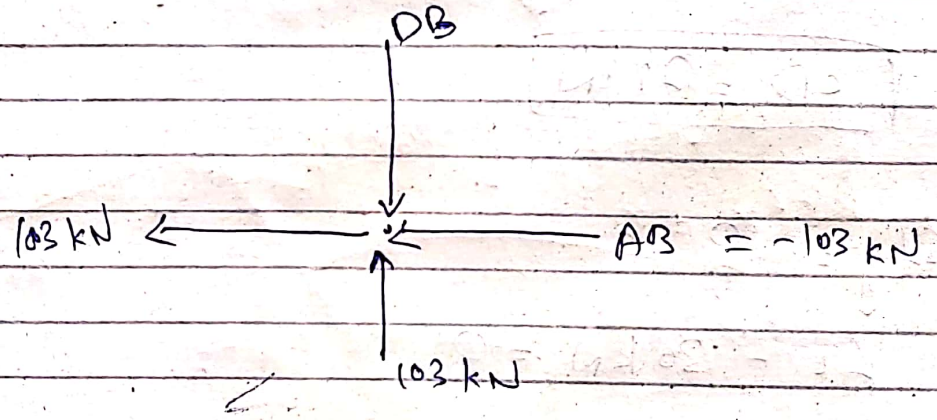
$\boxed{AB = 63.6\,kN}$

$\Sigma f_y = 0$

$A_C - 93.6\,kN$

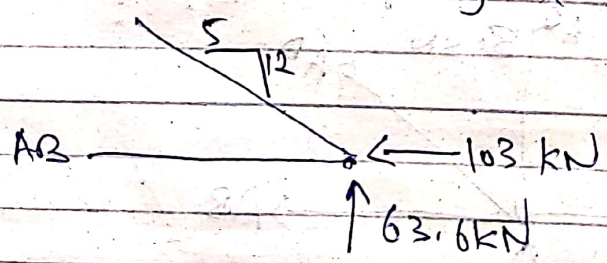
$\Rightarrow \boxed{AC = 93.6\,kN}$

Now At Point B



$\boxed{DB = 103\,kN}$

Now at the joint



$\Sigma f_y = 0$

$DA\left(\frac{5}{12}\right) - (63.6\,kN) = 0$

AD = 152.64 kN