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Section " "A"

ID " 7819

Subject " Structural Analysis-1

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⑤

$$(1) \quad \sum F_x = 0 \rightarrow + \leftarrow$$

$$B_x - C_x = 0 \rightarrow (1)$$

$$(2) \quad \sum F_y = 0 \uparrow \downarrow$$

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

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

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

$$337.5 - 15C_y = 0$$

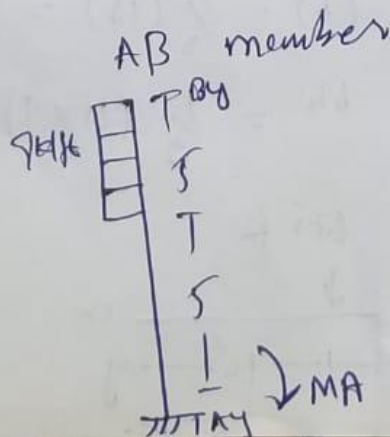
$$C_y = 22.5 \text{ k}$$

Put the in eq (2)

$$B_y + 22.5 = 67.5$$

$$B_y = 45$$

Now



So same

$$M_A = 0$$

(8)

(10)

$$\theta = ?$$

$$\tan \theta = \frac{12}{5} \Rightarrow \theta = \tan^{-1}\left(\frac{12}{5}\right) = 67.38^\circ$$

$$\theta = 67.38^\circ$$

Using method of joints:

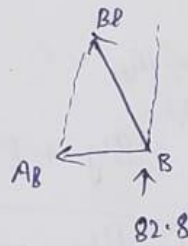
⇒ Joint B :-

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

$$82.8 + BD \sin \theta = 0$$

$$BD = -\frac{82.8}{\sin(67.38)}$$

$$\Rightarrow BD = -89.700 \text{ kN}$$



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

$$-AB - BD \cos \theta$$

$$AB = -BD \cos \theta$$

$$= -(-89.700) \cos(67.38)$$

$$AB = 34.500 \text{ kN}$$

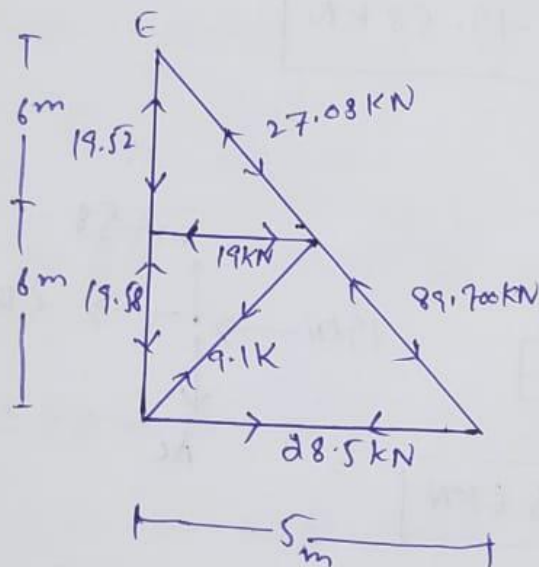
22)

Now $\sum F_x = 0 \rightarrow +$

$$-32 + 28.5 + AD \cos(67.38) = 0$$

$$AD = 9.1 \text{ kN}$$

So the force in each members are calculated.



(15)

⇒ Joint E :-

$$\sum F_x = 0$$

$$95 + ED \cos(22.62) = 0$$

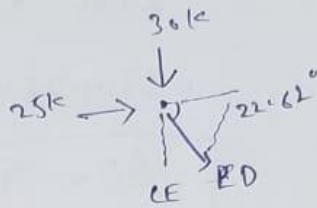
$$ED = -17.08 \text{ kN}$$

$$\sum F_y = 0 \uparrow$$

$$-30 - CE - ED \sin(22.62) = 0$$

$$-30 - CE - (-17.08) \sin(22.62) = 0$$

$$CE = -19.58 \text{ kN}$$

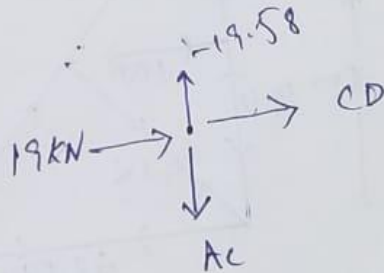


⇒ Joint C :-

$$\sum F_x = 0$$

$$CD = -19 \text{ kN}$$

$$AC = -19.58 \text{ kN}$$



⇒ Joint 'A'

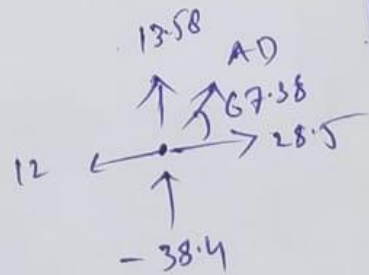
Let θ is the angle
b/w AD & AB

$$\frac{5}{12} = \frac{x}{6}$$

$$x = 12$$

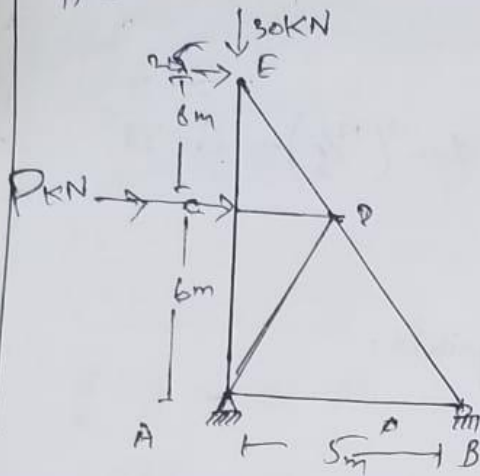
$$\tan \theta = \frac{6}{2.5}$$

$$\Rightarrow \theta = \tan^{-1} \frac{6}{2.5} = 67.38^\circ$$



Q No #103

(9)



Q Solution:-

$$\sum M_A = 0 \quad (\uparrow)$$

$$-5B_y + 19 \times 6 + 25 \times 12 = 0$$

$$B_y = 82.8 \text{ KN}$$

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

$$-30 + A_y + B_y = 0$$

$$A_y = 30 - B_y$$

$$A_y = 30 - 82.8$$

$$A_y = -52.8 \text{ KN}$$

$$\sum F_x = 0$$

$$A_x = 25 + 19 = 44 \text{ KN}$$

$$A_x = 44 \text{ KN}$$

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

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

$$\text{so } D_y = 22.5 \text{ k}$$

Put the value of B_y in (1)

$$A_y - B_y$$

$$A_y - 45 = 0$$

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

Put the value of B_x in (2)

$$11.25 - C_x = 0$$

$$C_x = 11.25 \text{ k}$$

$$\text{So } D_x = 11.25 \text{ k}$$

$$\sum M_B = 0 \rightarrow$$

$$-(9 \times 5) - (A_x \times 6) + M_A = 0$$

$$- 45 - (11.25 \times 6) + M_A = 0$$

$$- 45 - 67.5 + M_A = 0$$

$$M_A = 112.5$$

(6)

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

$$Ax + (9 \times 5) - Bx = 0$$

$$Ax - Bx = -45 \rightarrow \textcircled{8}$$

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

$$Ay - By = 0$$

(iii) $\sum M_A = 0 \curvearrowright + \curvearrowleft -$

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

$$45 + 12.5 = 10Bx$$

$$337.5 = 10Bx$$

$$Bx = \frac{337.5}{10}$$

$$Bx = 33.75 \text{ K}$$

put the value in eq (8)

$$Ax - Bx = -45$$

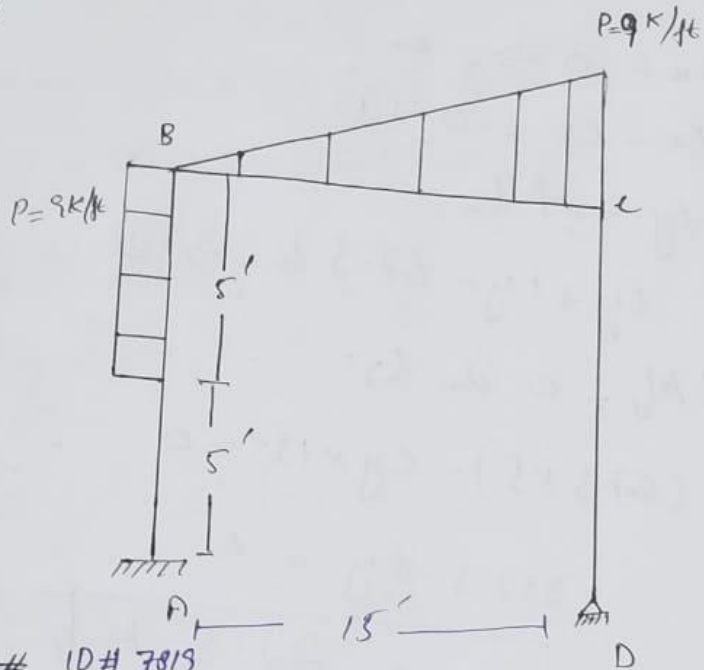
$$Ax - 33.75 = -45$$

$$Ax = -45 + 33.75$$

$$Ax = -11.25 \text{ K}$$

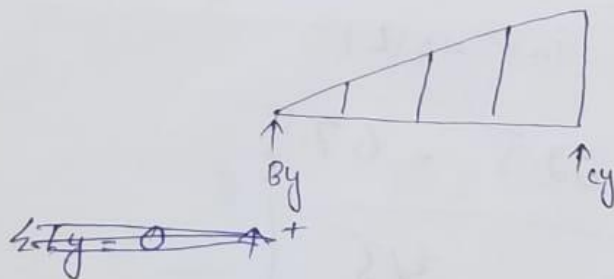
(4)

Q No # 02



Solution # 10# 7819

Member BC 9 k/ft

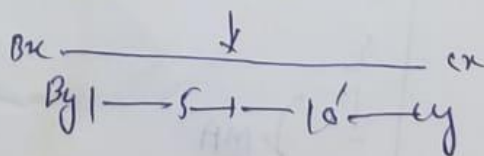


$$B_y + C_y =$$

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

$$\text{area} = \frac{1}{2} bh = \frac{1}{2} (15 \times 9) = 67.5 \text{ K}$$

F. B. D 67.5 K



(2)

$$0.80A_y + B_y - 6K - 15 \sin 60^\circ = 0$$

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

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

(3) $\sum M_B = 0 \downarrow + \uparrow -$

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

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

$$16A_y - 175 = 0$$

$$A_y = 175/16$$

$$A_y = 10.9375 K$$

Put the value in equation (2)

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

$$8.75 + B_y = 18.99$$

$$B_y = 18.99/8.75$$

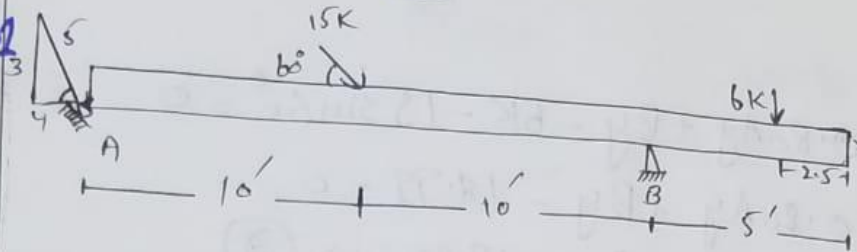
$$B_y = 10.25 K$$

Put the value of A_y in eq (1)

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

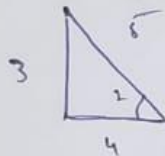
$$B_x = 0.9375 K$$

Q No 1



Solution

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



∴ using Trigonometry

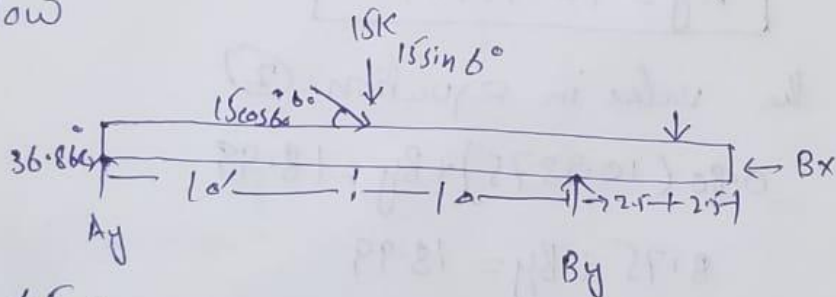
$$\sin \theta = P/H$$

$$\sin \theta = 3/5$$

$$\theta = \sin^{-1}(3/5)$$

$$\theta = 36.86^\circ$$

Now



1) For $\sum F_x$

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

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

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

(2) For $\sum F_y = 0 \quad \uparrow \quad \downarrow$

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