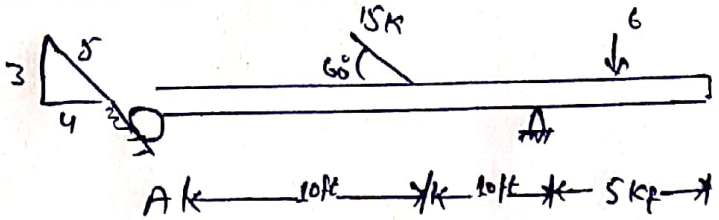
ID #6938

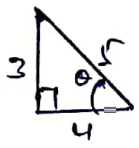
Name- Shahzeb Khan

Question:
No! 01.



Solution

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



∴ Using Trigonometry

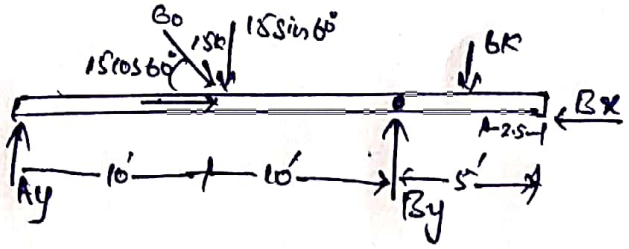
$$\sin\theta = \frac{P}{H}$$

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

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

$$\theta = 36.86^\circ$$

So Now



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

$$15\cos 60^\circ - Bx - Ay \sin 36.86^\circ = 0$$

$$7.5 - Bx - 0.599Ay = 0 \longrightarrow (I)$$

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

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

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

$$0.80\, A_y + B_y = 18.99 \longrightarrow (2)$$

3- $\Sigma M_B = 0 \; +\circlearrowleft -$

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

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

$$16 A_y - 175 = 0$$

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

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

Put the value * in equation (2)

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

$$8.75 + B_y = 18.99$$

$$B_y = 18.99 - 8.75$$

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

Put the value of x in equation (1)

$$7.5 - 3x - 0.599(10.9375) = 0$$

$$\boxed{3x = 0.9375\ K}$$

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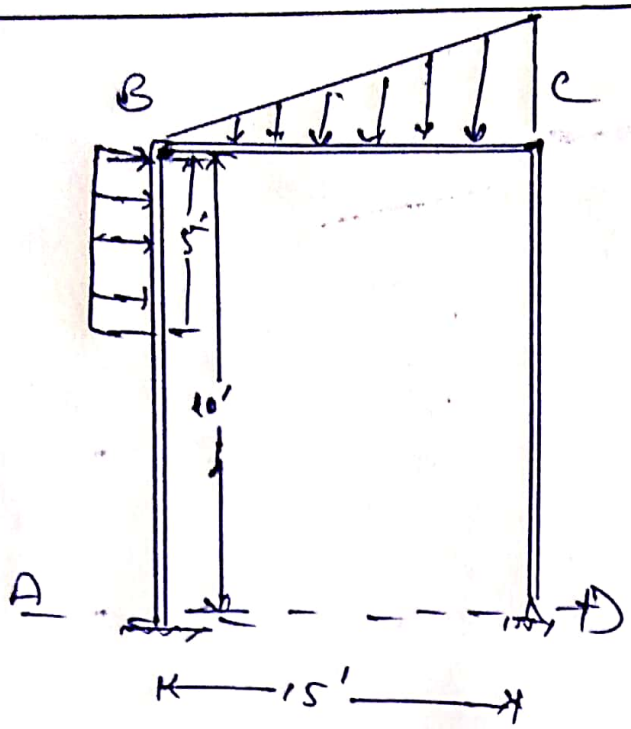
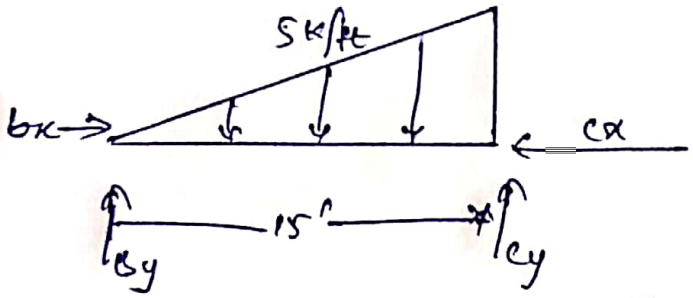
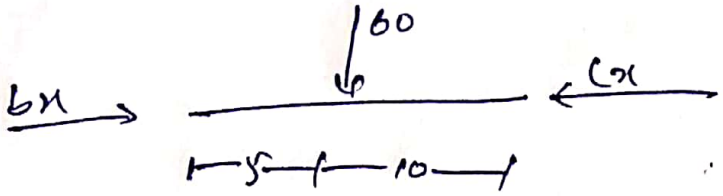
Question No 02



Solution





$$\text{Area} = \frac{1}{2}(15 \times 8)$$

$$= 60$$

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

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i- $\Sigma F_x = 0 \rightarrow + \leftarrow$

$-B_x - (x = 0 \longrightarrow (1)$

ii- $\Sigma F_y = 0 \uparrow + \downarrow -$

$B_y + C_y = 60k \longrightarrow (2)$

iii- $\Sigma M_B = 0 +\circlearrowleft (\overset{+}{\curvearrowright})$

$(60)(5) - (C_y \times 15 = 0$

$300 = 15 C_y$

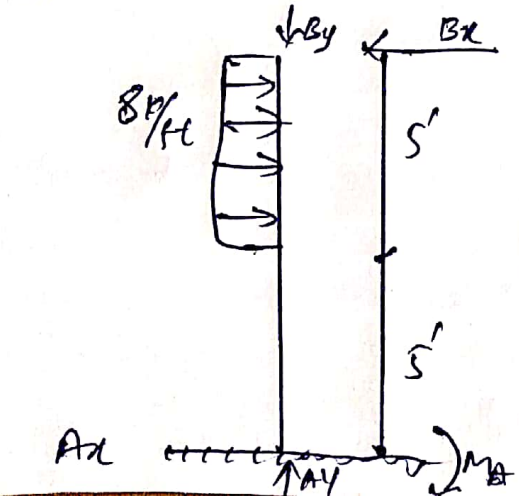
$\boxed{C_y = 20}$

Put the value in eq (2)

$B_y + 20 = 60$

$B_y = 60 - 20$

$B_y = 40 k$



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i- $\Sigma F_x = 0 \longrightarrow + \longleftarrow -$

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

$$A_x + 40 - B_x = 0$$

$$A_x - B_x = -40 \longrightarrow (3)$$

ii- $\Sigma F_y = 0 \uparrow + \downarrow -$

$$A_y - B_y = 0 \longrightarrow (4)$$

iii- $\Sigma M_A = 0 \; +\circlearrowleft -$

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

$$40 \times 20 - B_x \times 10 = 0$$

$$800 = B_x \times 10$$

$$B_x = 80 \text{ K}$$

Put in eq (3)

$$A_x - 80 = -40$$

$$A_x = 40$$

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

$C_y = 20\,K$

So $D_y = -20\,K$

Put the value of B_y in eq (4)

$A_y - 40 = 0$

$A_y = 40$

put the value of B_x in eq 1

$80 - C_x = 0$

$C_x = 80\,K$

line on same place

So $D_x = -80\,K$

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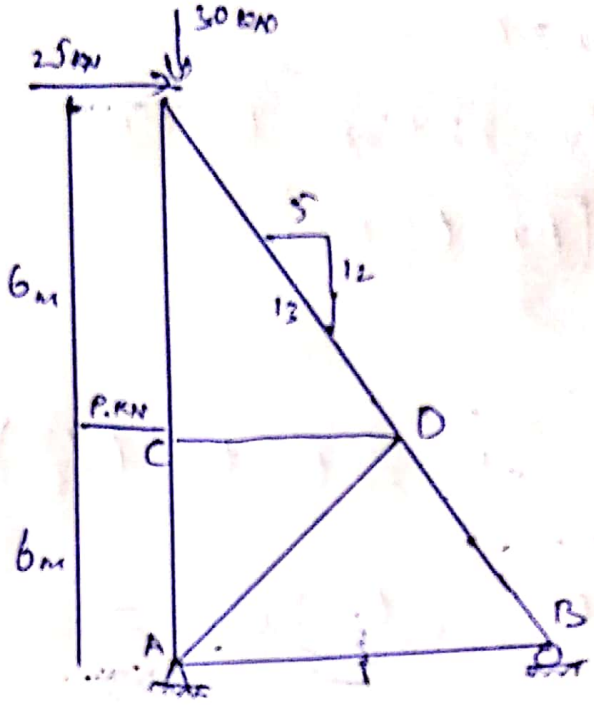
Question:

No! 03

C = 38



Solution:-

$$\Sigma M_A = 0 \quad \circlearrowleft +$$

$$-5By + 38 \times 6 + 25 \times 12 = 0$$

$$12y = 105.6 \text{ KN}$$

$$\Sigma Fy = 0 \uparrow +$$

$$-30 + Ay + By$$

$$Ay = 30 - By$$

$$= 30 - 105.6$$

$$Ay = -75.6$$

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$\Sigma F_x = 0$

$A_x = 25 + 38 = 63\ KN$

$\boxed{A_x = 63\ KN}$

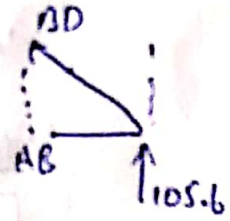
$\theta = ?$

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

$\boxed{\theta = 67.38^\circ}$

Using Method of joint

joint B :



$\Sigma F_y = 0 \uparrow +$

$105.6 + BD\sin\theta = 0$

$\Rightarrow BD = \frac{-105.6}{\sin(67.38} = -114.4\ KN$

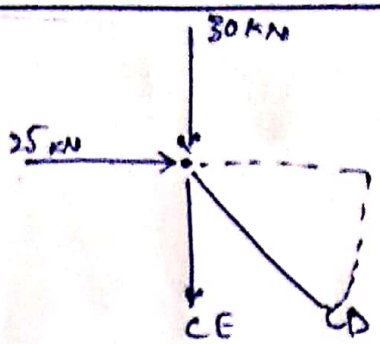
$\Sigma F_x = 0 \rightarrow +$

$-AB - BD\cos\theta = 0$

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

$= (-114.4)\cos(67.38)$

$\Rightarrow \boxed{AB = 44\ KN}$



Joint E :-

$$\Sigma F_x = 0$$

$$25 + ED\cos(22.62) = 0$$

$$ED = -27.8 \text{ KN}$$

$$\Sigma F_y = 0 \uparrow +$$

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

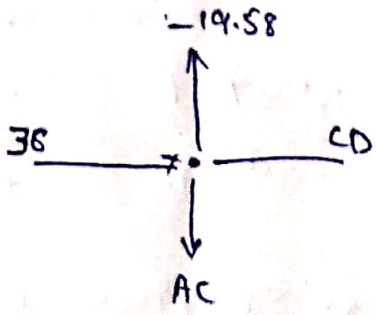
$$-30 - CE - (-27.08)\sin(22.62) = 0$$

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

Joint C

$$\Sigma F_x = 0$$

$$CD = -36 \text{ KN}$$



$$\Sigma F_y = 0$$

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

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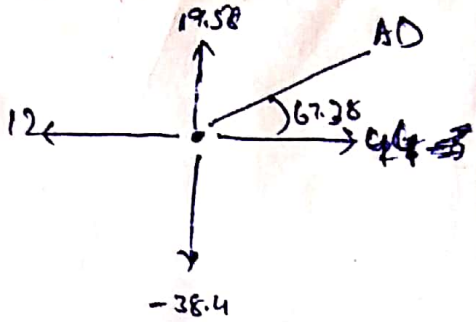
joint. A

Let ϕ is the angle b/w

AD & AB



$$\frac{5}{\frac{4}{2}} = \frac{x}{6}$$

$$x = 2.5$$

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

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

Now $\sum F_x = 0 \longrightarrow +$

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

$$AD = 9.1\ KN.$$

So the forces in each member are Calculated