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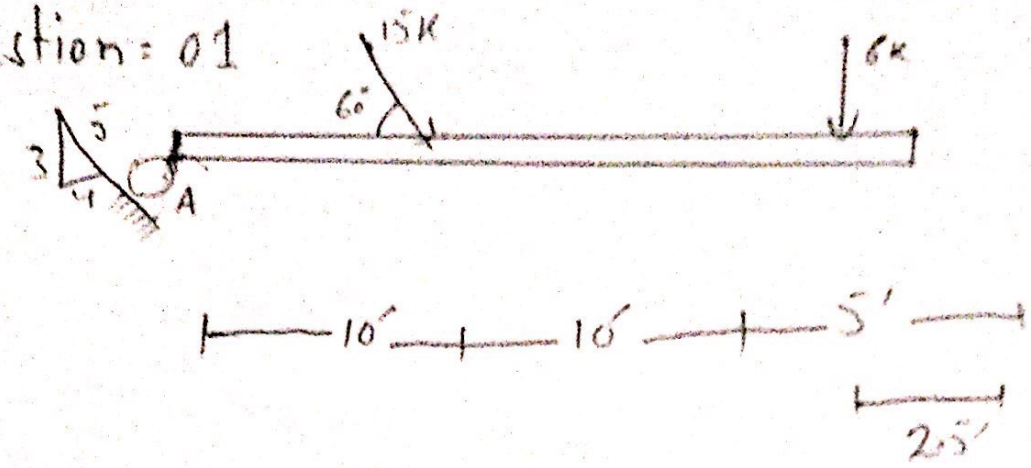
ID/sec 7875/B

Semester Summer

Subject Structural Analysis-I

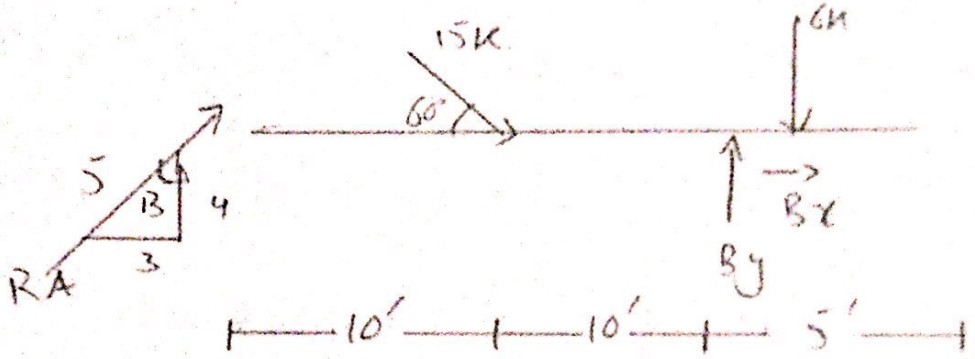
Teacher : Engr Saqib Ichan

Question: 01



SOLUTION:-

First we have to Draw F.B.D



$$\circlearrowleft \overset{+}{\Sigma} M_B = 0$$

$$-\frac{4}{5} R_A(20) + 15 \sin(60)(10) - 6(2.5) = 0$$

$$+4/5\, R_A(20) = +114.9$$

$$R_A = \frac{114.9}{20} \times \frac{5}{4}$$

$$\boxed{R_A = 7.18K} \uparrow$$

Now to find B_x :-

$$\Sigma F_x = 0 \longrightarrow +$$

$$\frac{3}{5}(7.18) + 15\cos(60) + B_x = 0$$

$$11.81 + B_x = 0$$

$$B_x = -11.81k$$

So its direction is opposite

Now:

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

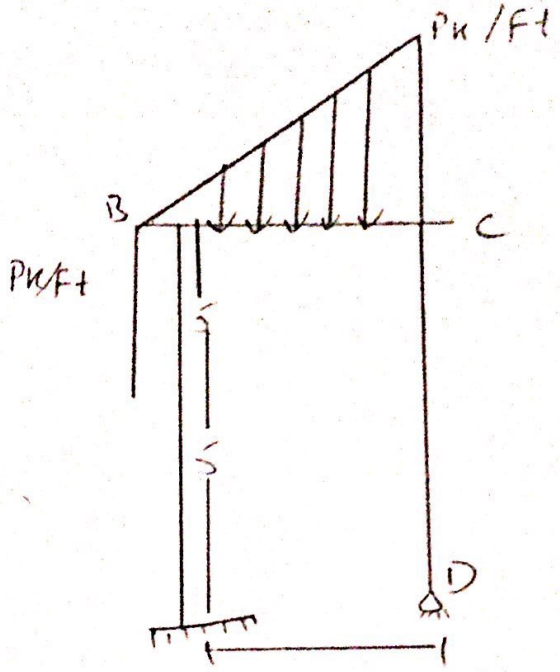
$$\frac{4}{5}(7.18) - 15\sin(60) + B_y - 6 = 0$$

$$-7.246 + B_y = 6$$

$$B_y = 6 + 7.246$$

$$\boxed{B_y = 13.25k}$$

Question No(02)

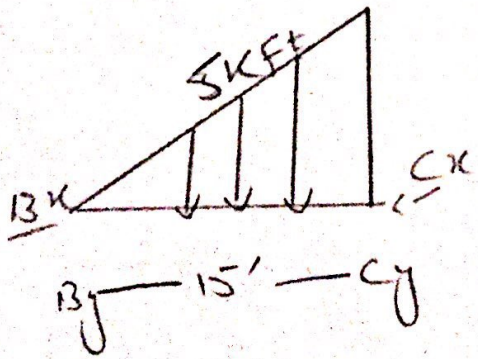


SOLUTION:-

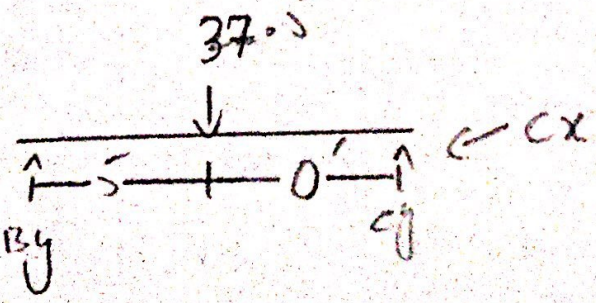
ID = 7883

1) Free body diagram

UVL



B.D



Area $= \frac{1}{2} bh$

$= \frac{1}{2} (15 \times 5)$

$= 37.5$

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

(i) $\Sigma Fx = 0 \rightarrow + \leftarrow -$

$bx - cx = 0$ —(1)

(ii) $\Sigma Fy = 0 \uparrow + \downarrow -$

$By + cy = 37.5$ k —(2)

(iii) $\Sigma M_B = 0 \circlearrowleft + \circlearrowright -$

$(37.5 \times 5) - cy \times 15 = 0$

$187.5 = 15\, cy$

~~$cy = 12.5$ k~~

$\boxed{cy = 12.5 \text{ k}}$

Put the value in eq 2)

$By + 12.5 = 37.5$

$By = 25$

Now Since C and D are at same line that load is transfered so

$$Cy = 12.5K$$

$$\boxed{\text{So } Dy = 12.5K}$$

Put the value of By in (4)

$$Ay - 20 = 0$$

$$Ay = 20$$

Put the value of Bx in eq 1)

$$11.20 - Cx = 0$$

$$Cx = 11.20K$$

$$\boxed{\text{So } Dx = 11.25K}$$

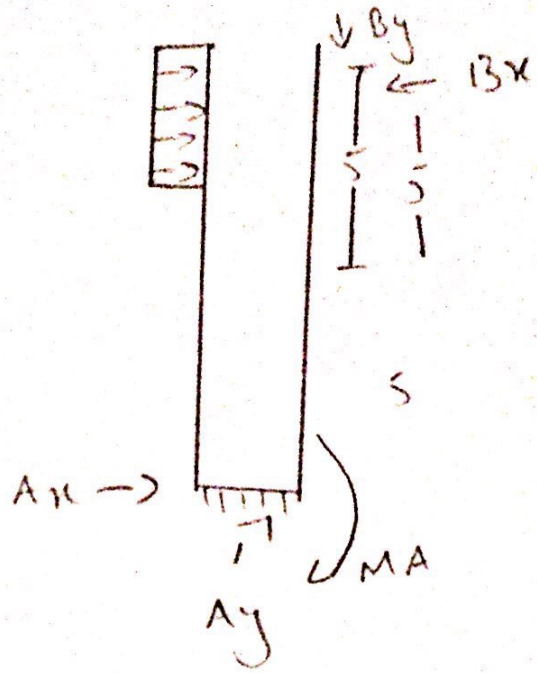
$$Mb = 0 \curvearrowleft +$$

$$-(5\times5)(2.5) - (A_x \times 10) + MA = 0$$

$$-(6.25) - (6.25 \times 10) + MA = 0$$

$$-62.5 + 62.5 + MA = 0$$

$$MA = 0$$



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

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

$A_x - B_x = -25$ — 1)

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

$A_y - B_y = 0$

iii) $\Sigma M_1 = 0 \circlearrowleft + \circlearrowright -$

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

$25 \times 7.5 = 10 B_x$

$B_x = 6.75$

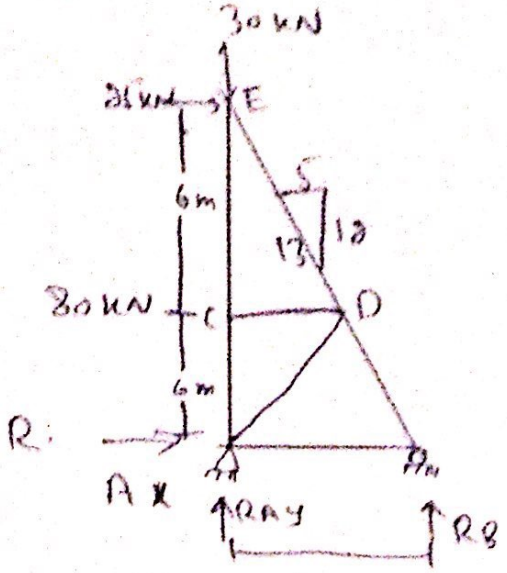
$\boxed{B_x = 6.75 K}$

Put the value in eq 1)

$A_x - 6.75 = -15$

$A_x = -2.22$ $\boxed{A_x = -2.22}$

Question - 3



$\theta = \tan^{-1} \frac{12}{5}$

$\theta = 67.38 = 67.4°$

$B = 90° - 67.4$

$B = 22.6°$

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

$25 \times 12 - 30 \times 5 + 75 \times 6 + R_{Ay} \times 5 = 0$

$R_{Ay} = -121 kN$

$\Sigma f_y = 0 \quad \uparrow +\downarrow -$

$= -121 - 30 + R_B = 0$

$R_B = 151 kN$

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

$R_{Ax} + 75 + 25 = 0$

$R_{Ax} = -100 kN$

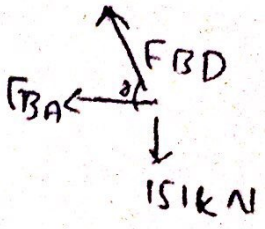
Using Joints Method

Joint B

$\Sigma f_y = 151 + F_{BD} \sin\theta$

$F_{BD} = F_{BD} = \frac{-151}{\sin 67.4}$

$F_{BD} = 169.5$



$\Sigma F_x = 0$

$F_{BA} = 169.5 \cos D$

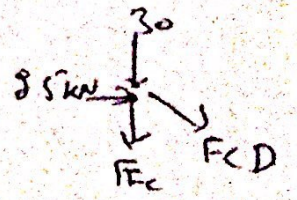
$= 64.41\ kN$

Joint E

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

$-30 - F_{BC} - F_{BD} \cos B = 0$

$30 - F_{BC} (-65.06kN) \cos 22.6° = 0$



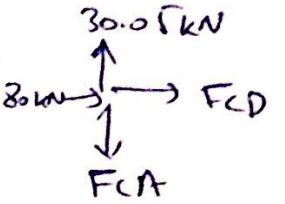
$25 + F_{FD} \sin B = 0 \Rightarrow F_{Bb} = 65.05kN$

$F_{EC} = 30.05\ kN$

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

Joint "C"

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



$F_{CD} = -80\ kN$

~~$\Sigma F_x = 0$~~

$F_y = 0 \quad \uparrow +$

P.

$F_{CA} = 30.05$

Joint A

$\Sigma F_x = 0$

~~-100~~ $-100 + F_{AD}\cos\theta + 64.41 = 0$

$F_{AD} = 106.81$

Members	Forces
F_{AB}	64.41
F_{AC}	30.5
F_{BD}	-169.5
F_{CD}	-80
F_{CE}	30.5
F_{DE}	65.05