

NAME :: QAISER SIDDIQUE

ID :: 7863

SEMESTER :: (SUMMER)

SECTION :: "B"

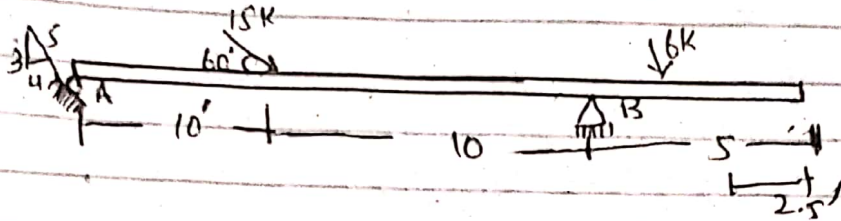
SUBJECT :: Structure Analysis  
I

TEACHER :: ENGR-SAGIB KHAN.

①

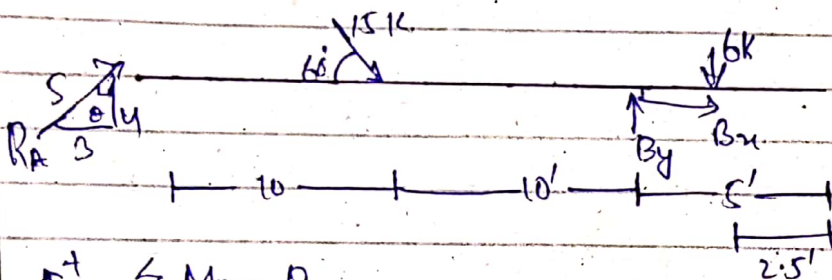
Q No 2

Determine the support reactions in the beam given below in Fig. 2.



Soln

First we have to draw F.B.D.



$$\sum M_B = 0$$

$$-\frac{4}{5} R_A (20) + 15 \sin(60)(10) - 6(25) = 0$$

$$+\frac{4}{5} R_A (20) = +114.9$$

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

$$R_A = 7.18 \text{ k}$$

Now to find  $B_x$  :  $\rightarrow$

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

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

$$11.81 + B_x = 0$$

$$B_x = -11.81 \text{ k}$$

(2)

So its direction is  
opposite.

Now.

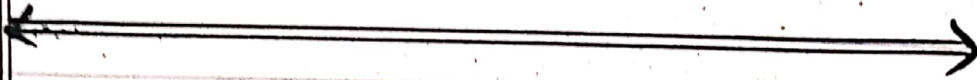
$$\sum F_y = 0 \uparrow$$

$$\frac{1}{5}(748) - 15 \sin(60) + B_y - 6 = 0$$

$$-7 \cdot 246 + B_y = 6$$

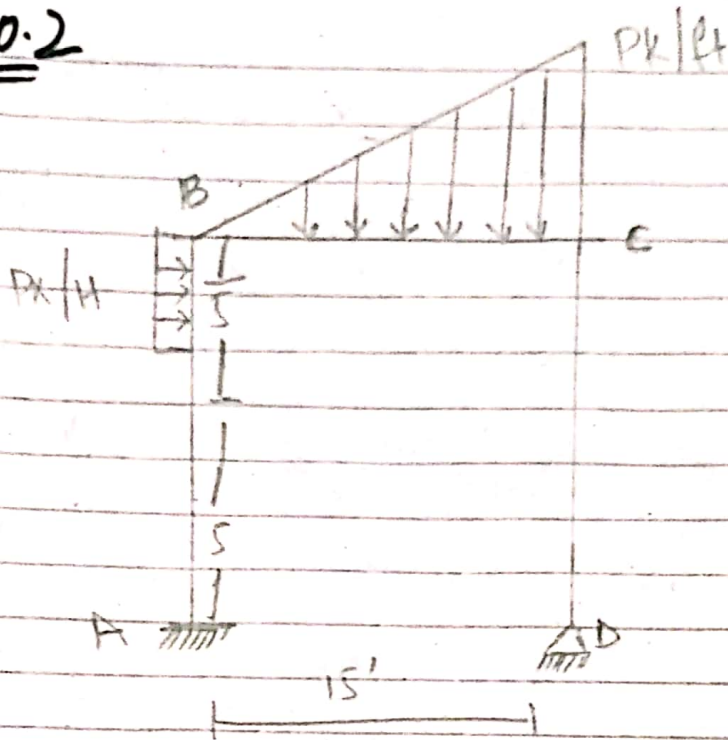
$$B_y = 6 + 7 \cdot 246.$$

$$B_y = 13 \cdot 252.$$



(3)

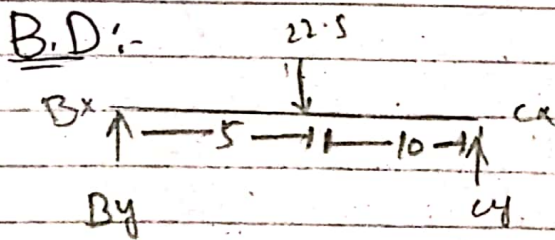
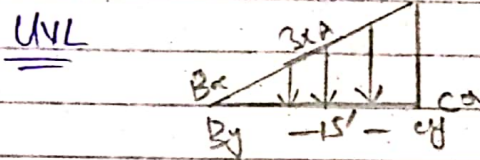
QNO.2



Sol:

ID = 7863

(1) Free body diagram.



Now C and D are at the same line that has is. So

$$C_y = 7.5 \text{ k}$$

$$\text{So } D_y = 7.5 \text{ k}$$

(6)

Put the value of  $B_y$  in (1)

$$A_y - 15 = 0$$

$$A_y = 15 \text{ k}$$

Put the value of  $B_x$  in (2)

$$11.25 - C_x = 0$$

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

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

$$M_B = 0$$

$$-(3 \times 5)(2.5) - (A_x \times 10) + M_A = 0$$

$$-(37.5) - (-37.5) \times 10 + M_A = 0$$

$$-37.5 + 375 + M_A = 0$$

$$M_A = 0$$

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

$$= \frac{1}{2}(15 \times 3)$$

$$= 22.5$$

$$D_{1/3} = \frac{1}{3}(b) = \frac{1}{3}(15) = 5'$$

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

$$B_x - C_x = 0 \rightarrow \ominus$$

①

$$\textcircled{i} \quad \sum F_y = 0 \uparrow \downarrow$$

$$B_y + 22.5k = 22.5k \quad \textcircled{ii}$$

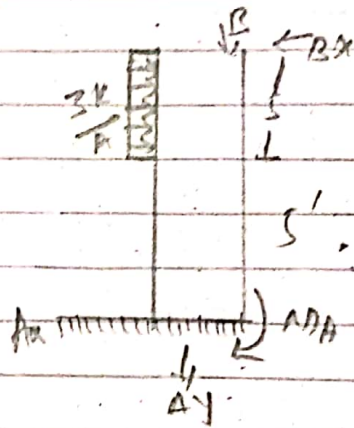
$$\textcircled{ii} \quad \sum M_D = 0 \uparrow \downarrow$$

$$(22.5 \times 5) - C_y \times 15 = 0$$
$$112.5 = 15C_y$$
$$C_y = 7.5k$$

put in eq  $\textcircled{ii}$

$$B_y + 7.5 = 22.5$$

$$B_y = 15k$$



$$\textcircled{i} \quad \sum F_x = 0 \rightarrow + \leftarrow$$

$$A_x + (3 \times 5) - B_x = 0$$

$$A_x - B_x = -15 \quad \textcircled{ii}$$

$$\textcircled{ii} \quad \sum F_y = 0 \downarrow \uparrow +$$

$$A_y - B_y = 0$$

6

$$\textcircled{ii} \quad \sum M_z = 0 \downarrow + \uparrow$$

$$(3 \times 5) \times (2.5 \times 5) - B_x \times 10 = 0$$

$$15 \times 7.5 = 10 B_x$$

$$\boxed{B_x = 11.25 \text{ k}}$$

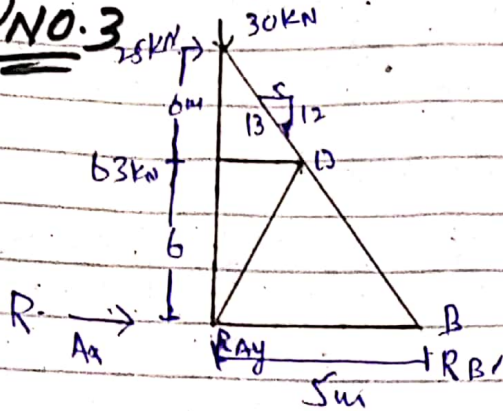
put the value in eq.  $\textcircled{3}$

$$A_x - 11.25 = 15$$

$$\boxed{A_x = -3.75 \text{ k}}$$

7

QNO.3



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

$$\theta = 67.38 = 67.4^\circ$$

$$B = 90^\circ - 67.4$$

$$B = 22.6^\circ$$

$$\sum M_B = 0 \quad [\uparrow +]$$

$$25 \times 12 - 30 \times 5 + 63 \times 6 + R_{Ay} \times 5 = 0$$

$$R_{Ay} = -126 \text{ k}$$

$$\sum F_y = 0 \quad [\uparrow + \downarrow -]$$

$$-126 - 30 + R_B = 0$$

$$R_B = +156 \text{ kN}$$

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

$$R_{Ax} + 63 + 25 = 0$$

$$R_{Ax} = -105 \text{ kN}$$

Using Joints Method.

Joint B.

$$\sum F_y = 156 + F_{BD} \sin \theta$$



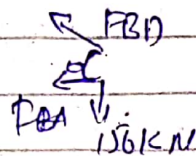
(8)

$$FBD = \frac{-156}{\sin(67.4)}$$

$$FBD = 169.5$$

$$E_{fx} = 0$$

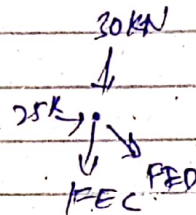
$$FBA = 169.5 \cos \theta$$
$$= 64.41 \text{ kN}$$



Joint E

$$E_{fy} = 0 \text{ [}\uparrow\text{]}$$

$$-30 - F_{ec} - F_{ed} \cos \beta = 0$$



$$30 - F_{ec} - (-65.05 \text{ kN}) \cos 22.6^\circ = 0$$

$$25 + F_{ed} \sin \beta = 0$$

$$F_{ed} = -65.05 \text{ kN}$$

$$F_{ec} = 30.05 \text{ kN}$$

$$E_{fx} = 0 \rightarrow +$$

Joint C

9

$$\sum F_x = 0 \quad [\rightarrow]$$

$$F_{CD} = -80 \text{ kN}$$

$$\sum F_y = 0 \quad [\uparrow]$$

$$F_{CA} = 30.05$$

Joint A.

$$\sum F_x = 0$$

$$-105 + F_{AD} \cos \theta + 64.41 = 0$$

$$F_{AD} = 106.81$$

Member	Forces
F <sub>AB</sub>	64.41
F <sub>AC</sub>	30.5
F <sub>AD</sub>	106.81
F <sub>CD</sub>	-80
F <sub>CE</sub>	30.5 kN
F <sub>DE</sub>	65.05

"THE END"