

NAME

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I.D

7869

Section

B

Subject

Structure Analysis 1

Submitted To:

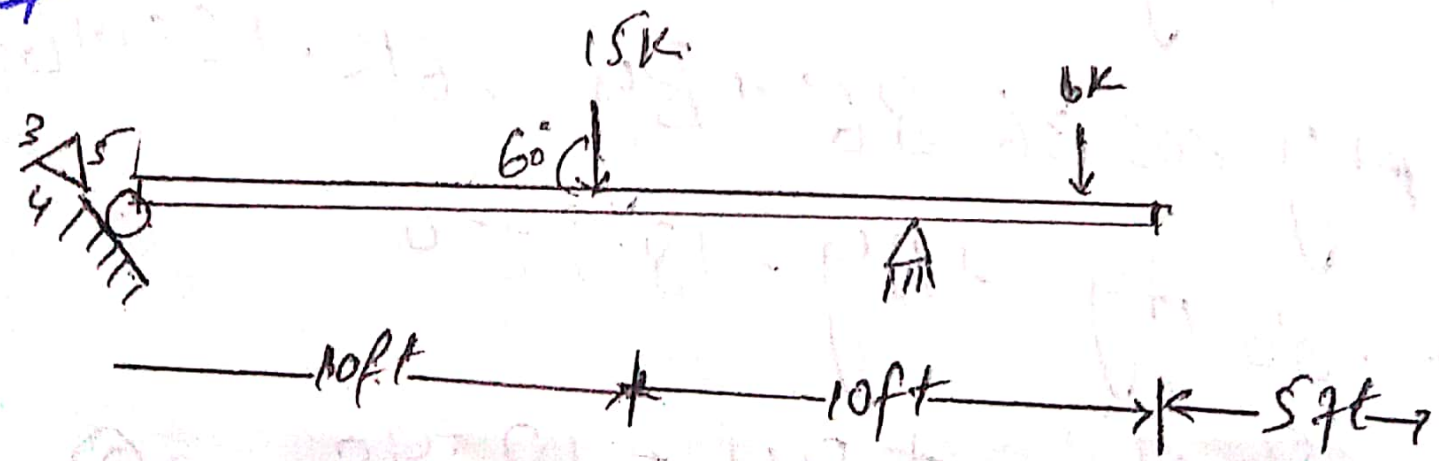
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1(3)

1)

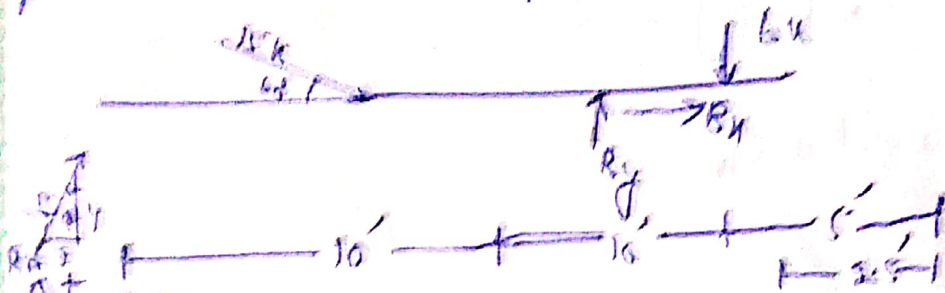
Q No 1: Determine the support reaction in the beam given below in figure 2 the roller support at point A.



Sol:

First we have to Draw F.B.D

2)



$$\sum M_B = 0$$
$$- \frac{4}{5} R_A (20) + 15 \sin(60) (10) - 6 (2.5) = 0$$
$$- 41.5 R_A (20) = -114.9$$

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

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

Now to find R_{Bx} =

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

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

$$11.81 + R_{Bx} = 0$$

$$R_{Bx} = -11.81 \text{ k}$$

So its direction is opposite

Now

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

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

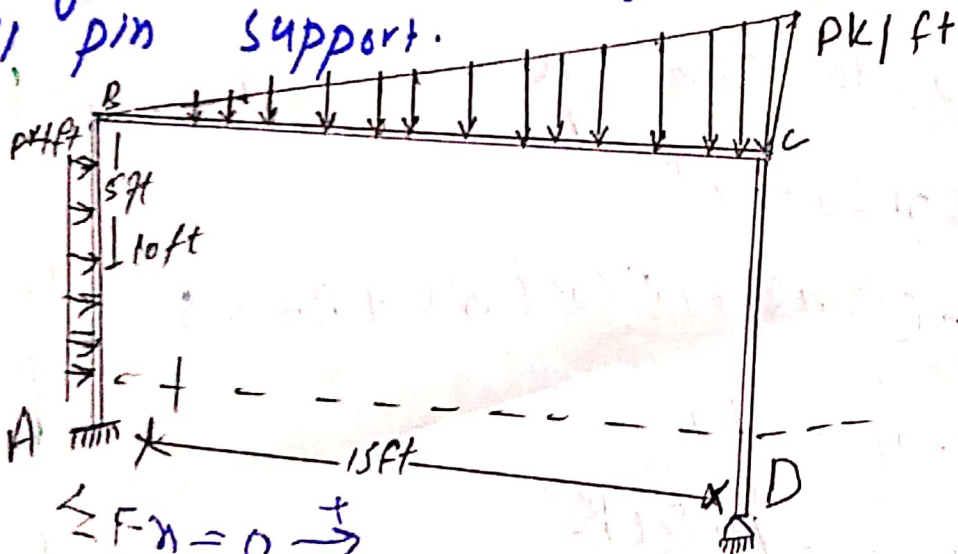
$$-7.246 + B_y = 6$$

$$B_y = 6 + 7.246$$

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

Q No 2:

Determine the support reaction of the given frame in Figure B, D are all pin support.



$$\sum F_x = 0 \rightarrow$$

$$A_x + 9(15) = 0$$

$$A_x = 45$$

$$A_x = 45 \leftarrow$$

Last digit of
I.D = 786 (9)

$$\text{Area} = 1/2 \times b \times h$$

$$= 1/2 (15 \times 9)$$

$$= 67.5$$

(3)

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

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

$$bx - cx = 0 \rightarrow \textcircled{1}$$

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

$$By + Cy = 67.5 \rightarrow \textcircled{2}$$

iii)

$$\sum M_B = 0 \downarrow + \downarrow$$

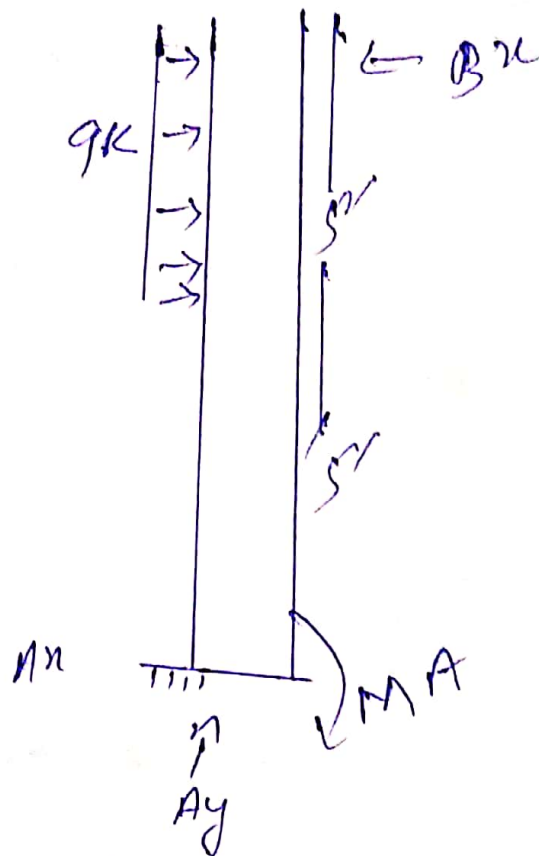
$$(67.5 \times 5) - Cy \times 15 = 0$$

$$y = 1012.5 \text{ k}$$

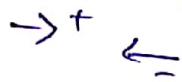
put the value in equation

$$By + 1012.5 = 67.5$$

$$By = -1005.75 \text{ k}$$



i) $\sum F_x = 0$



$$A_x - (9 \times 5) - B_x = 0$$

$$A_x - B_x = +45 \rightarrow \textcircled{1}$$

ii)

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

$$A_y - B_y = 0$$

(iii)

$$\sum M_A = 0$$

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

$$45 \times 7.5 = 10 B_x$$

~~$$B_x = 33.75$$~~

$$B_x = 18.75$$

Now since C and D are at same 6)

line

this

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

So $D_y = 7.5 \text{ k}$

put the value of B_y in (x)

$$A_y - 15 \text{ k} = 0$$

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

put the value of B_x is equal

put

$$11.25 - C_n = 0$$

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

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

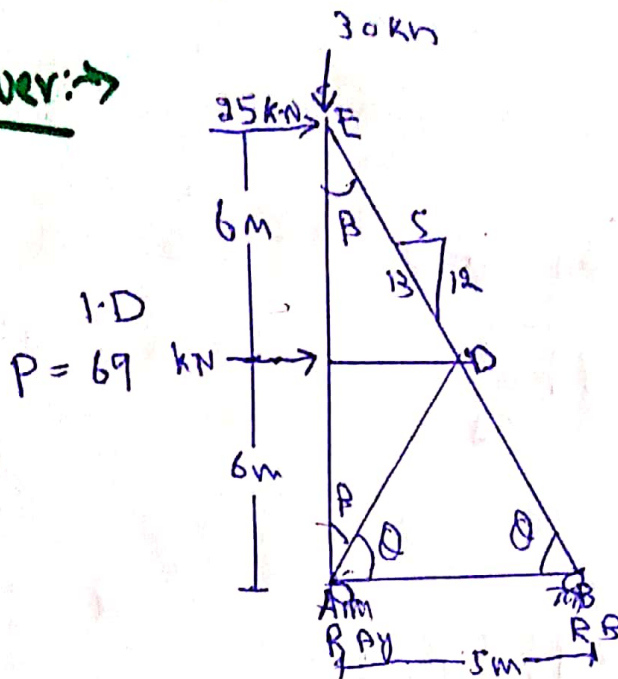
$$M_b = 0 \text{ } ^+$$

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

Question = 03

7)

Answer: →



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

$$\alpha = 67.38^\circ = 67.4^\circ$$

$$\beta = 90^\circ - 67.4^\circ = 22.6^\circ$$

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

$$25 \times 12 - 30 \times 5 + 69 \times 6 + R_{Ay} \times 5 = 0$$

$$R_{Ay} + 2220 = 0$$

$$\boxed{R_{Ay} = -2220 \text{ kN}}$$

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

$$-2220 - 30 + R_B = 0$$

$$\Rightarrow \boxed{R_B = 2250}$$

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

$$R_{Ax} + 69 + 25 = 0$$

$$\Rightarrow \boxed{R_{Ax} = 94}$$

By using Method of joint

Joint B

$$\sum F_y = 0$$

$$22.50 \text{ k} + F_{BD} \sin \theta$$

$$F_{BD} = -2077.2 \text{ kN}$$

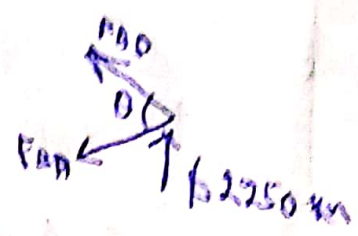
$$\therefore \theta = 67.4$$

$$\sum F_x = 0$$

$$F_{BA} = 2077 \cos \theta$$

$$\therefore Q = 67.4$$

$$F_{BA} = 797.98 \text{ kN}$$



Joint E

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

$$-30 - F_{EC} - F_{ED} \cos \theta = 0$$

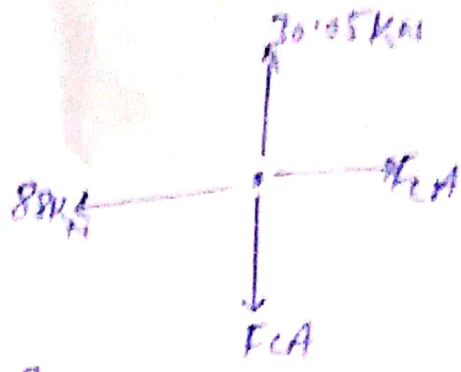
$$-30 - F_{EC} - (65.05) \cos 22.6^\circ = 0$$

$$F_{EC} = +30.03 \text{ kN}$$

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

$$25 + F_{ED} \sin \theta = 0 \Rightarrow F_{ED} = -65.05 \text{ kN}$$

Joint C



$$\sum F_x = 0$$

$$\left[\rightarrow \right]$$

$$F_{CD} = -69 \text{ kN}$$

$$F_y = 0 \left[\uparrow \right]$$

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

Joint A

$$\sum F_x = 0$$

$$-13 + F_{AD} \cos 0 + 797.98 \text{ kN} = 0$$

$$F_{AD} = 685.36 \text{ kN}$$

- member forces:
- $F_{AB} = 797.98 \text{ kN}$
- $F_{AC} = 30.05 \text{ kN}$
- $F_{BD} = -2077.2 \text{ kN}$
- $F_{CD} = -69 \text{ kN}$
- $F_{CE} = 30.05 \text{ kN}$
- $F_{DE} = 11.06 \text{ kN}$

The End

9)