

Mid term Summer -20

Name

Rizwan ullah khan

ID

7807

Subject

Structure Analysis - I

Date

22/8/2020

Submitted To

Engr. Muhammad Sagib

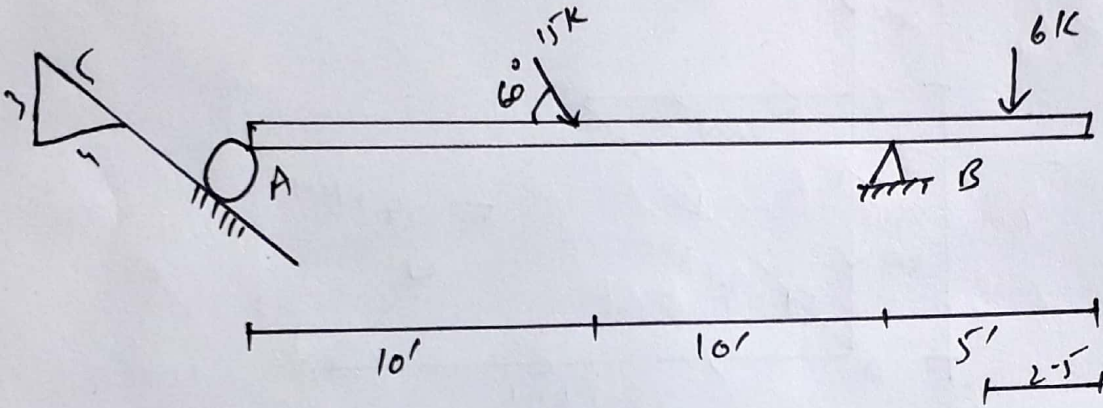
IQRA National University Peshawar.

①

Name = Rizwan ullekh Khan

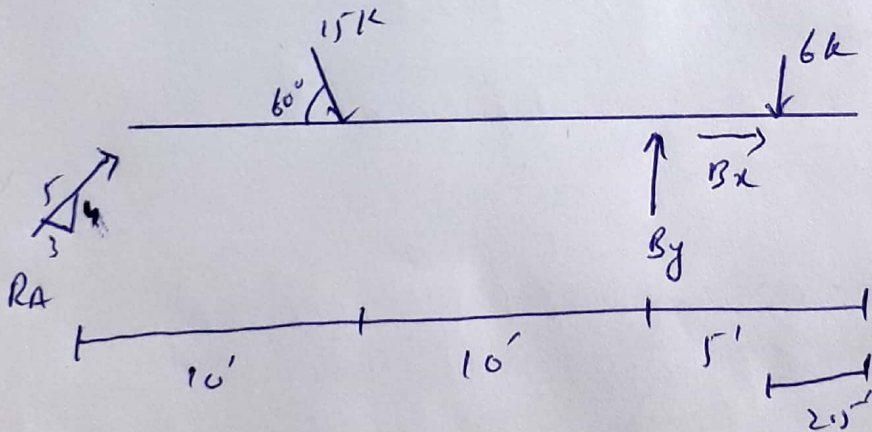
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Q No: 1/



Solution:

Draw Free Body Diagram.



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

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

$$+\frac{4}{5} R_A (20) = 7114.9$$

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

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

Now Find BC :-

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

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

$$11.81 + B_x = 0$$

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

It is in opposite direction.

Now :-

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

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

$$-7.246 + B_y = 6$$

$$B_y = 6 + 7.246$$

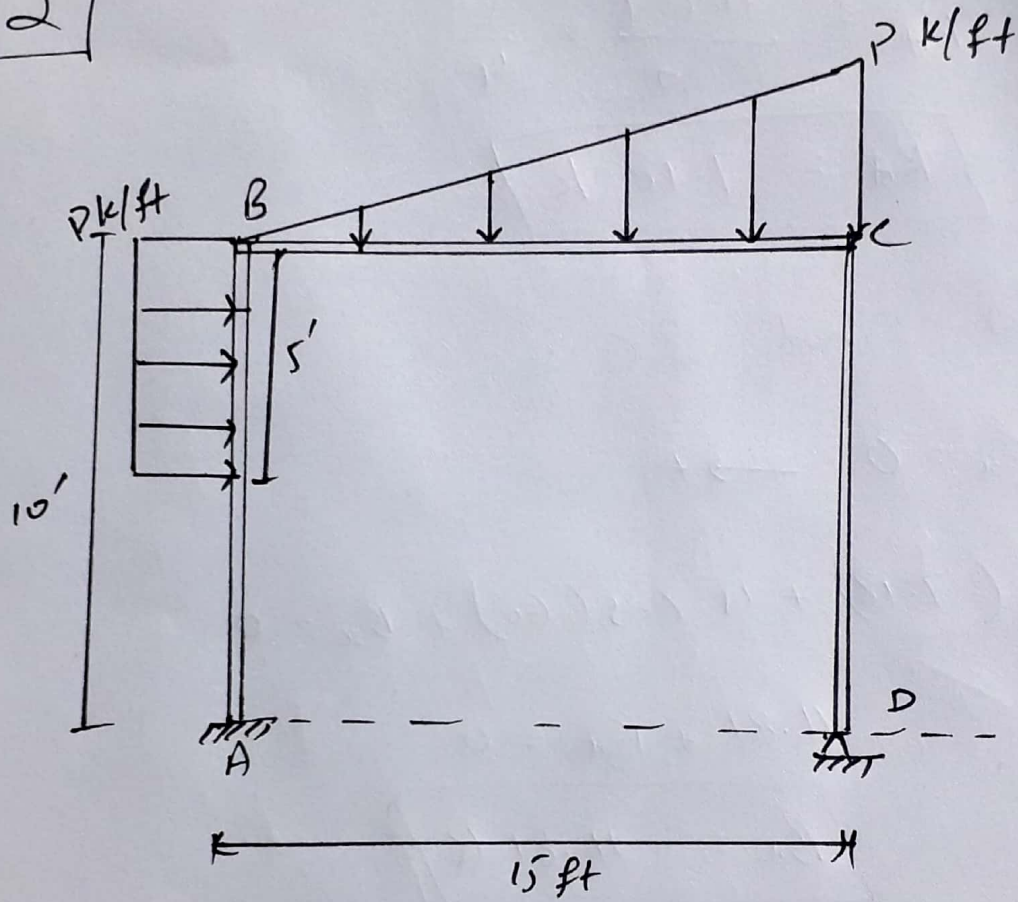
$$B_y = 13.25 \text{ k}$$

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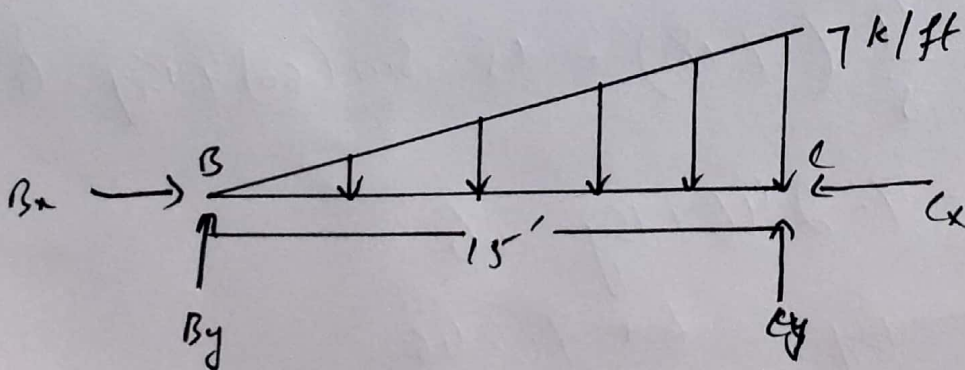
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Q:- 21



Solution

Take member BC



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

$$-15c_y + \frac{1}{2} \times 7 \times 15 \times \frac{2}{3} \times 15 = 0$$

$$c_y = 35 \text{ kips}$$

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

$$B_y + c_y = \frac{1}{2} \times 7 \times 15$$

$$B_y = 52.5 - 35$$

$$B_y = 17.5 \text{ kips}$$

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

$$B_x = C_x = 0$$

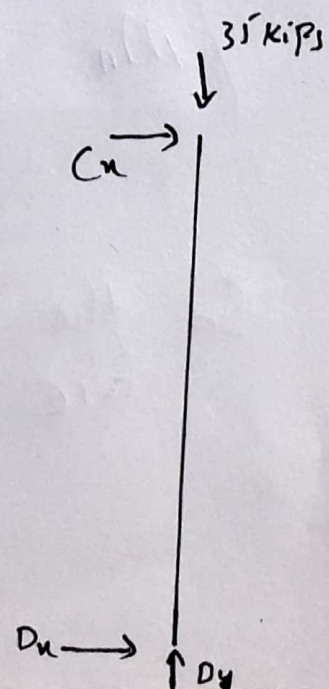
Now Member CD

$$\sum F_x = 0$$

$$\Rightarrow C_x = D_x = 0$$

$$\sum F_y = 0$$

$$D_y = 35 \text{ kips}$$



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Member AB :

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

$$-A_x - B_x + 7 \times 5 = 0$$

$$\Rightarrow A_x = 35 \text{ kips}$$

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

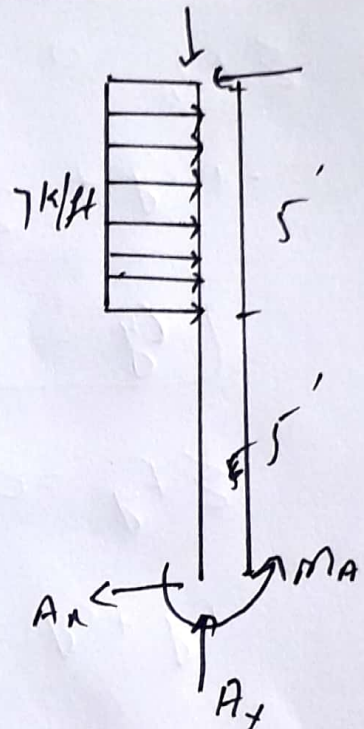
$$A_y = B_y$$

$$A_y = 17.5 \text{ kips}$$

$$\sum M_A = 0 \curvearrowright +$$

$$-M_A + 7 \times 5 + \left(5 + \frac{5}{2}\right) = 0$$

$$M_A = 262.5 \text{ k-ft}$$

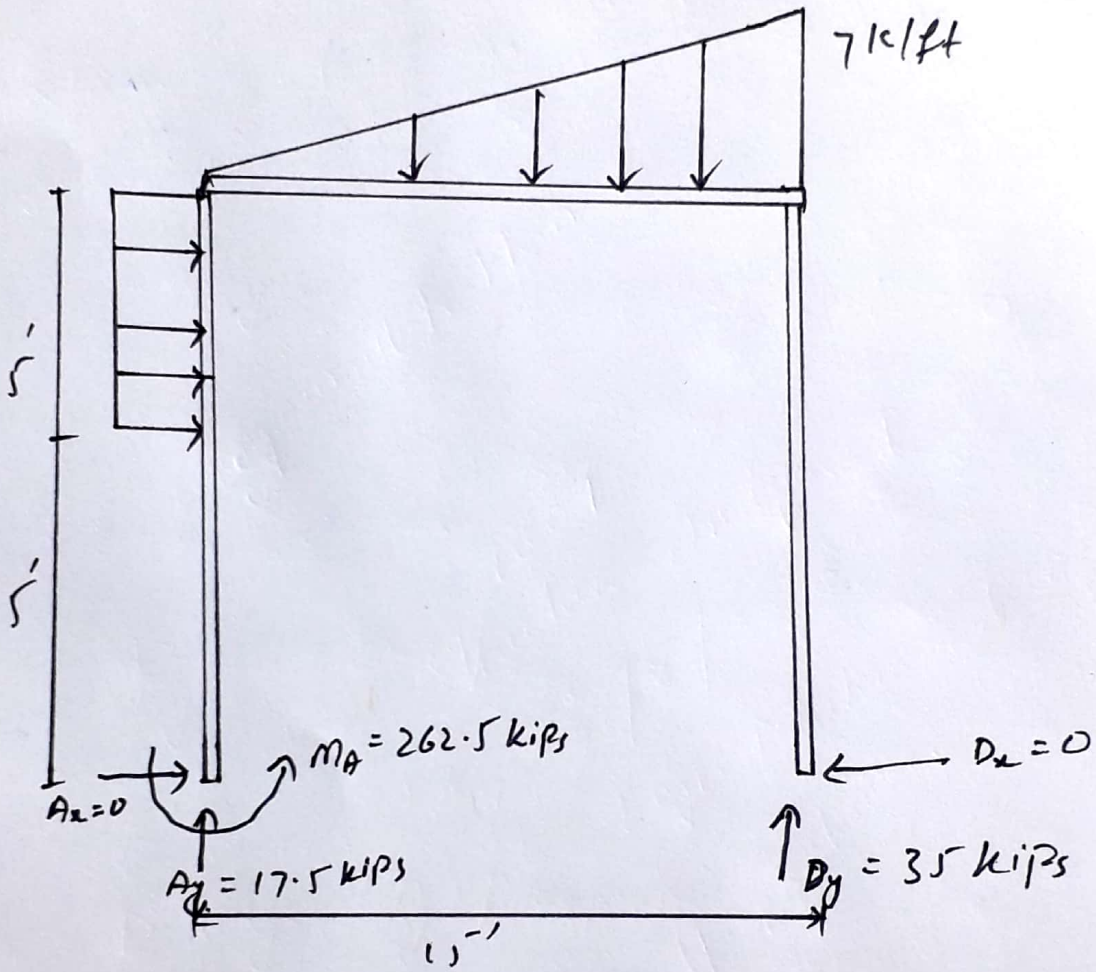


So the required support reactions are

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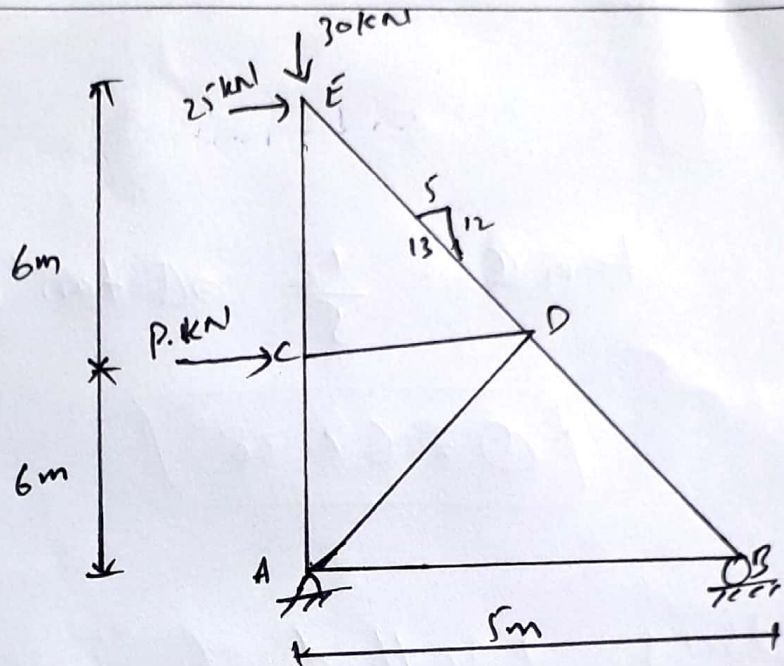
⑦

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ID = 2807

Q 31

C = 07



Solution:-

$$\sum M_A = 0 \quad \curvearrowright +$$

$$-5B_y + 7 \times 6 + 25 \times 12 = 0$$

$$B_y = 68.4 \text{ kN}$$

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

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

$$A_y = 30 - B_y$$

$$= 30 - 68.4$$

$$A_y = -38.4 \text{ kN}$$

$$\sum F_x = 0$$

$$A_x = 25 + 7 = 32 \text{ kN}$$

$$A_x = 32 \text{ kN}$$



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$$\theta = ?$$

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

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

Using Method of Joint =

Joint B :-

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

$$68.4 + BD \sin \theta = 0$$

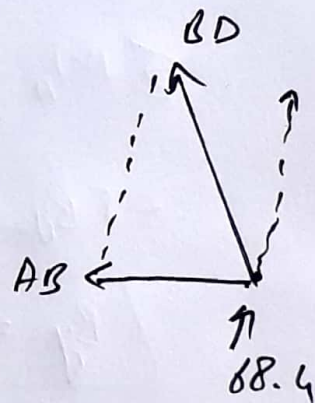
$$\Rightarrow BD = \frac{-68.4}{\sin(67.38)} = -74.1 \text{ kN}$$

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

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

$$\Rightarrow AB = -BD \cos \theta = -(-74.1) \cos(67.38)$$

$$\boxed{AB = 28.5 \text{ kN}}$$



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Joint E:-

$$\sum F_x = 0$$

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

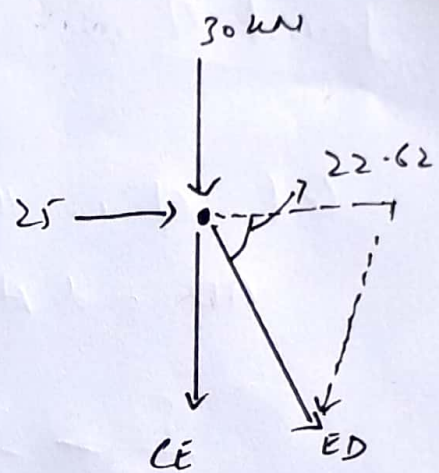
$$ED = -27.08 \text{ kN}$$

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

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

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

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

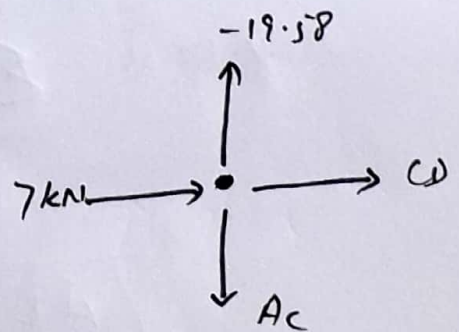
Joint C

$$\sum F_x = 0$$

$$CD = -7 \text{ kN}$$

$$\sum F_y = 0$$

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



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Joint A

Let  $\theta$  is the angle b/w  
AD and AB

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

$$x = 2.5$$

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

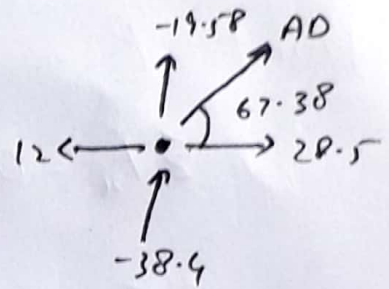
$$\Rightarrow \theta = \tan^{-1} \left( \frac{6}{2.5} \right) = 67.38^\circ$$

Now  $\sum F_x = 0 \rightarrow +$

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

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

So the Forces in each member are calculated.



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