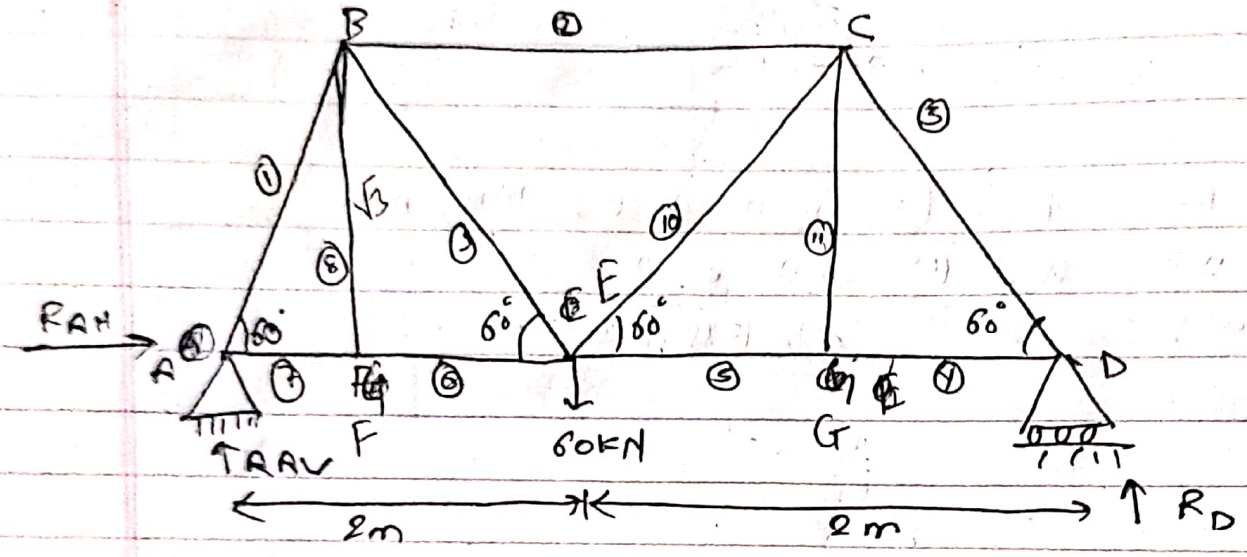
By Joint Method



Note: For FBD, choose the joint which has 2 unknown members.

We start from A.

To draw FBD, support we should remove the support with two reaction forces.

Now, there are 4 unknown members.

We should remove the support reactions.

For this, applying equilibrium condition,

$\rightarrow \Sigma f_x = 0$,

$\therefore \boxed{R_{AH} = 0}$.

$\curvearrowleft \Sigma M_A = 0$, (All the forces that pass through that point are zero).

i.e. $60 \times 2 - R_D \times 4 = 0$ [Force × ⊥r distance]

$120 - 4R_D = 0$

$\therefore \boxed{R_D = 30 kN}$

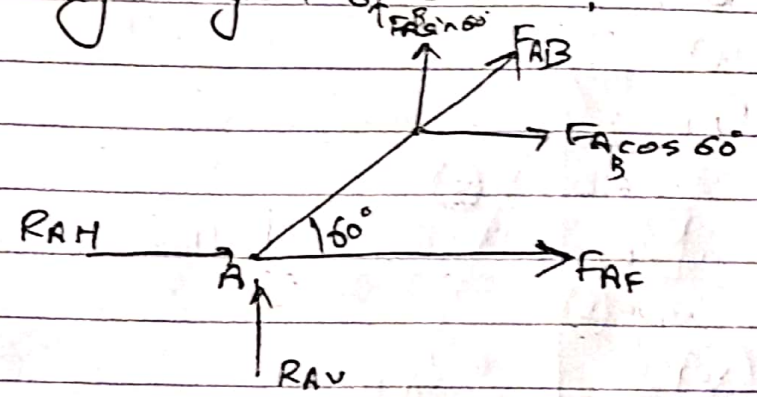
$+\uparrow \Sigma f_y = 0$

i.e. $R_{AV} + R_D - 60 = 0$

or, $R_{AV} + 30 - 60 = 0$

$\therefore \boxed{R_{AV} = 30 kN}$

Free Body Diagram of Joint A,



[Resolving inclined element]

Applying equilibrium condition,

$+\uparrow \Sigma f_y = 0$

$R_{AV} + F_{AB}\sin 60° = 0$

or, $30 + F_{AB} \times \frac{\sqrt{3}}{2} = 0$

or, $\boxed{F_{AB} = -34.641 \text{ kN}}$ (Compressive force)

$+\rightarrow \Sigma f_x = 0$

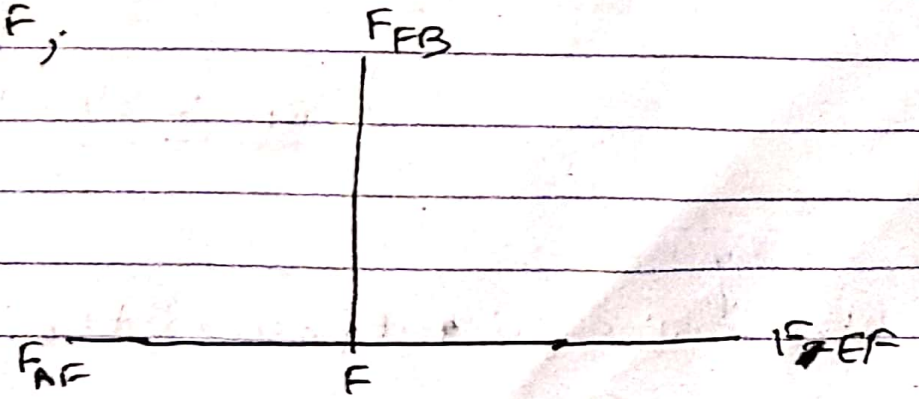
or, $R_{AH} + F_{AF} + F_{AB}\cos 60° = 0$

or, $0 + F_{AF} + F_{AB}\frac{1}{2} = 0$

or, $F_{AF} = \frac{34.641}{2}$

$\therefore \boxed{F_{AF} = 17.32 \text{ kN}}$ (Tensile Force)

FBD of F,



Applying equilibrium condition,

$\rightarrow \Sigma f_x = 0$

$F_{EF} - F_{AF} = 0$

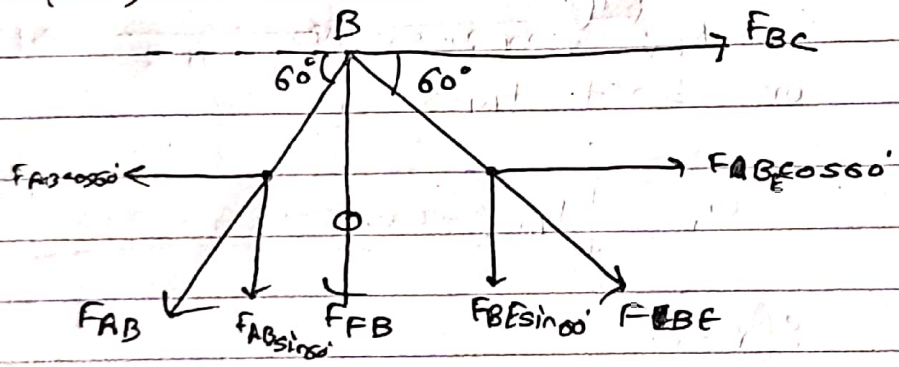
or, $F_{EF} - 17.32 = 0$

$\therefore \boxed{F_{EF} = 17.32 \text{ kN}}$ (Tensile force)

$\uparrow + \Sigma f_y = 0$

or, $\boxed{F_{FB} = 0}$

FBD of B,



Applying Equilibrium condition,

$\rightarrow + \Sigma f_y = 0$

or, $-F_{AB}\sin60° + F_{FB} + F_{BE}\sin60° = 0$

or, $-F_{AB}\frac{\sqrt{3}}{2} + 0 + F_{BE}\frac{\sqrt{3}}{2} = 0$

or, $34.641 \times \frac{\sqrt{3}}{2} = F_{BE}\frac{\sqrt{3}}{2}$

$\therefore \boxed{F_{BE} = 34.64 \text{ kN}}$ Tensile force

$\Sigma f_y = 0$

or, $F_{BE}\cos60° + F_{AB}\cos60° + F_{BC} = 0$

or, $34.641 \times \frac{1}{2} + 34.641 \times \frac{1}{2} + F_{BC} = 0$

or, $\boxed{F_{BC} = -34.641 \text{ kN}}$ (Compressive Force)

By symmetry of structure,

$F_{CD} = F_{AB}$

$F_{AD} = F_{AF}$

$F_{CG} = F_{FB}$

$F_{CE} = F_{BE}$.

S.No.	Force in Member	Magnitude	Nature
1.	F_{AB}, F_{CD}	34.641 kN	C
2.	F_{AF}, F_{AD}	32 kN	T
3.	F_{FB}, F_{CG}	0	—
4.	F_{BE}, F_{CE}	34.641 kN	T
5.	F_{EF}, F_{GE}	32 kN	T
6	F_{BC}	34.641 kN	C