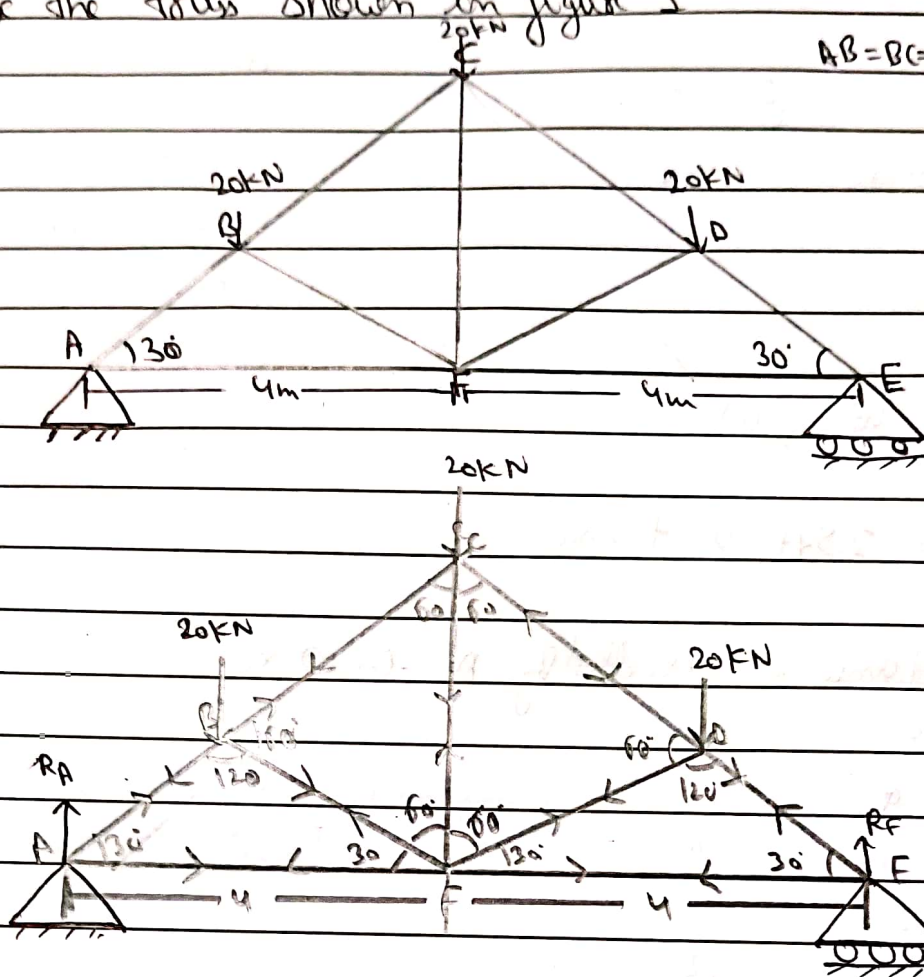


## RVTM

Q15) Analyse the truss shown in figure 1

$$AB = BC = CD = DE = 2$$



$$m = 9$$

$$j = 6$$

$$m = 2(j) - 3$$

$$9 = 2 \times 6 - 3$$

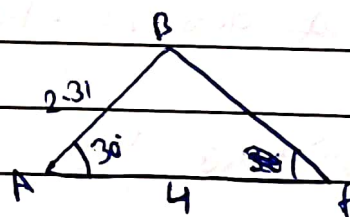
$$9 = 9$$

⇒ truss is perfect

$$AC \cos 30^\circ = 4$$

$$AC = 2.31 \times 2$$

$$\Rightarrow AB = BC \Rightarrow AB = 2.31$$



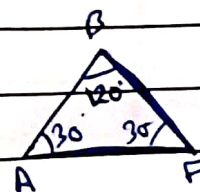
using cosine rule

$$\cos 30^\circ = \frac{(2.31)^2 + (4)^2 - (BF)^2}{2 \times 2.31 \times 4}$$

$$\Rightarrow BF = 2.31$$

$$\Rightarrow \angle BFA = 30^\circ$$

$$\Rightarrow \angle ABF = 120^\circ$$

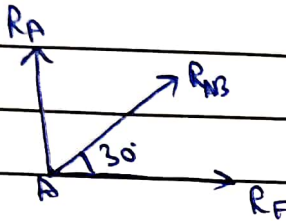


# RVTM

$$\sum F_y = 0 \quad R_A + R_E = 20 + 20 + 20 \Rightarrow 2R_A = 60 \Rightarrow R_A = 30 = R_E$$

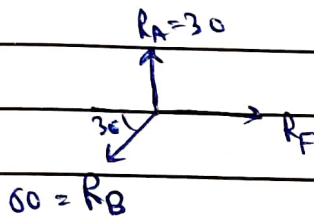
according to symmetry  
and there won't be any horizontal force on point joint A  
tho as all the forces applied on truss are vertical

@ A



$$\sum Y = 0 \quad R_B \sin 30 = -R_A$$

$$R_B = -2 + 30 = -60 \text{ kN}$$

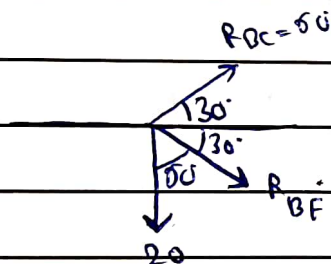


$$\sum X = 0 \quad R_F = R_B \cos 30$$

$$= 60 + \sqrt{3} = 30\sqrt{3}$$

$$R_{AF} = 51.96 \text{ kN}$$

@ B



$$\sum X = 0$$

$$R_{BC} \sin 30 + 60 \cos 60 = 20 + R_{BF} \cos 60$$

$$R_{BC} + 20 = R_{BF}$$

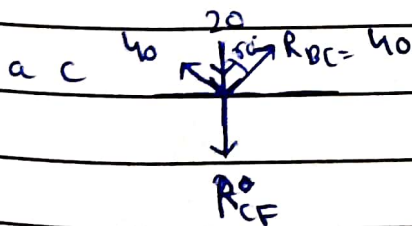
$$\sum Y = 0$$

$$R_{BF} \sin 60 + R_{BC} \cos 30 = (-60) \cos 30$$

$$R_{BF} + R_{BC} = -60$$

$$R_{BF} = -20 \text{ kN}$$

$$R_{BC} = -40 \text{ kN}$$



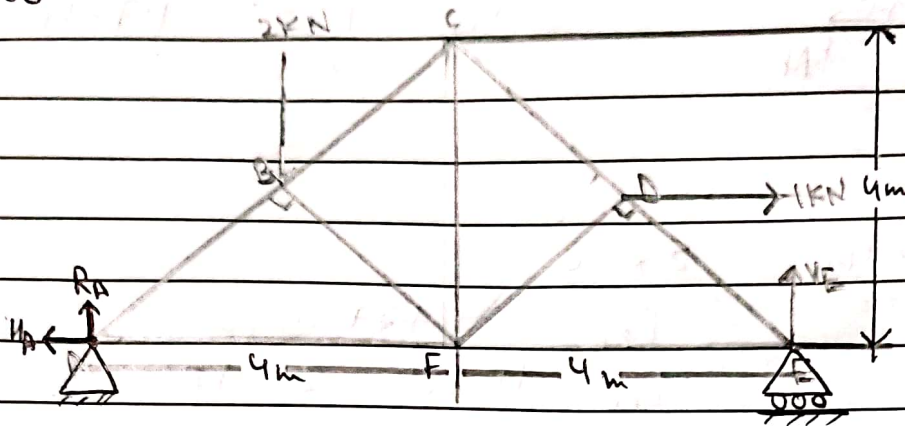
$$\sum Y = 0 \quad 40 \cos 60 + 40 \cos 60 = 20 + R_{CF}$$

$$R_{CF} = 20$$



# RVTM

Q14) Analyze the truss in the figure



$$m = 9$$

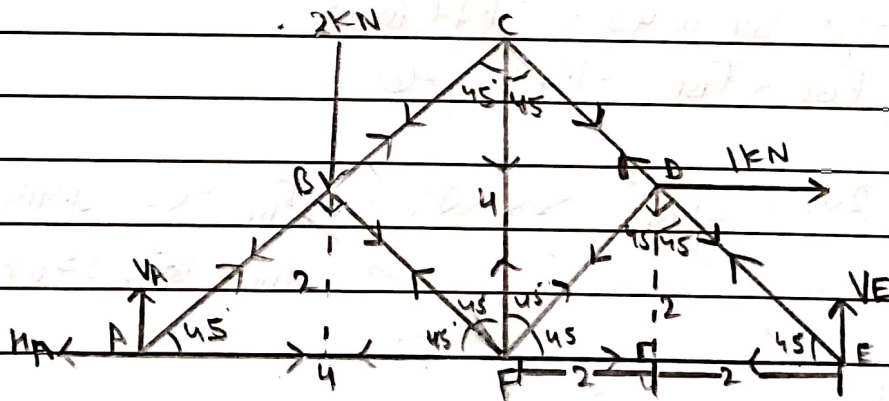
$$j = 6$$

$$m = 2(j) - 3$$

$$9 = 2(6) - 3$$

$$9 = 9$$

⇒ truss is perfect

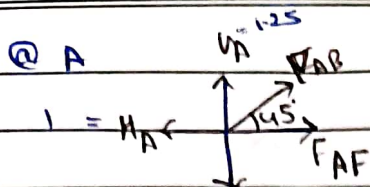


$$\sum Y = V_A + V_E = 2$$

$$\sum X = H_A = 1 \text{ kN}$$

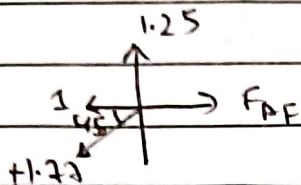
$$\sum M_A = V_E \times 8 = 2 \times 4 + 1 \times 2 \Rightarrow V_E = 0.75 \text{ kN}$$

$$V_A = 1.25 \text{ kN}$$



$$\sum Y = 0 \Rightarrow F_{AB} \sin 45 + 1.25 = 0$$

$$\Rightarrow F_{AB} = \frac{-1.25}{\sin 45} = -1.77 \text{ kN}$$

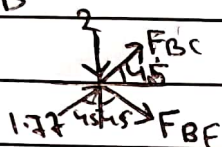


$$\sum X = 0$$

$$\Rightarrow F_{AF} = 1 + 1.77 \cos 45$$

$$F_{AF} = 1 + 1.25 = 2.25 \text{ kN}$$

(a) B



$$\sum Y = 0$$

$$F_{BC} \sin 45 + 1.77 \sin 45 = 2 + F_{BF} \cos 45$$

$$F_{BC} + 1.77 = 2\sqrt{2} + F_{BF} \quad \text{--- (1)}$$

$$\sum X = 0$$

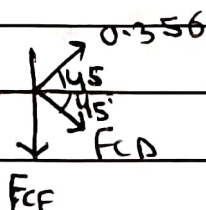
$$F_{BC} \cos 45 + F_{BF} \cos 45 = -1.77 \cos 45$$

$$F_{BC} + F_{BF} = -1.77 \quad \text{--- (2)}$$

$$2\sqrt{2} + 2F_{BF} = -2 \times 1.77 \Rightarrow F_{BF} = -\sqrt{2} = -1.414 \text{ kN}$$

$$\Rightarrow F_{BC} = 0.356 \text{ kN}$$

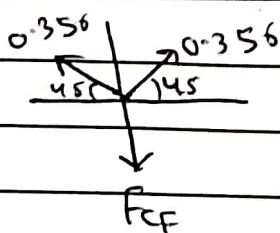
(c)



$$\sum Y = 0$$

$$0.356 \cos 45 = -F_{CD} \cos 45$$

$$\Rightarrow F_{CD} = -0.356 \text{ kN}$$

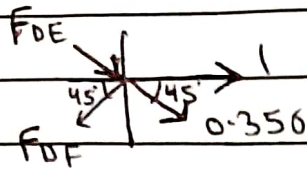


$$\sum Y = 0$$

$$2 \times 0.356 \times \cos 45 = F_{CF}$$

$$\Rightarrow F_{CF} = 0.503 \text{ kN}$$

@ D



$$\sum X = 0$$

$$1 + 0.356 \cos 45 + F_{DE} \cos 45 = F_{DF} \cos 45$$

$$\sqrt{2} + 0.356 + F_{DE} = F_{DF} \quad \text{--- (1)}$$

$$\sum Y = 0$$

$$0.356 \sin 45 + F_{DF} \sin 45 + F_{DE} \sin 45 = 0 \quad \text{--- (2)}$$

$$0.356 + F_{DF} + F_{DE} = 0$$

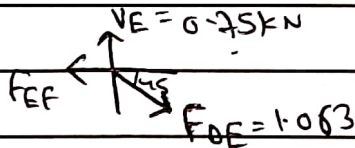
$$\sqrt{2} + 2 \times 0.356 + 2 F_{DE} = 0$$

$$F_{DE} = -0.356 \text{ kN} \frac{-\sqrt{2}}{2}$$

$$\Rightarrow F_{DE} = -1.063 \text{ kN}$$

$$\Rightarrow F_{DF} = 0.707 \text{ kN}$$

@ E

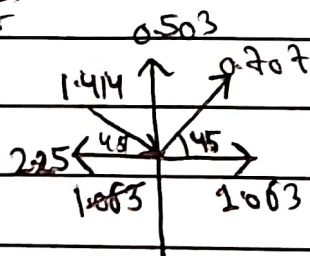


$$E_{EF} = 1.063 \cos 45$$

$$E_{EF} = 0.75 \text{ kN}$$

Verification

@ F



$$\sum F_x = 0$$

$$1.414 \cos 45 = 0.503 + 0.707 \cos 45$$

$$\text{LHS} = \text{RHS}$$

Hence verified