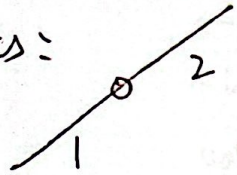
Pb1 BD. CD. CE.

① Simplify system

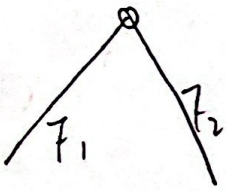
special joints:



collinear

$F_{ext} \times$.

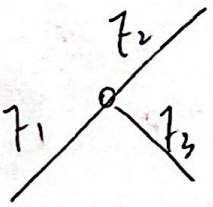
$F_1 = F_2$.



noncollinear

$F_{ext} \times$.

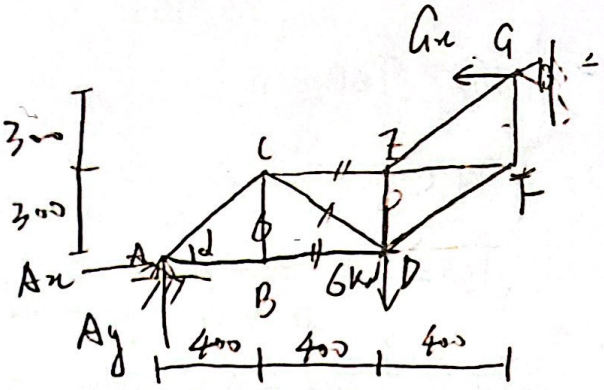
$F_1 - F_2 = 0$.



two collinear.

$F_1 = F_2$.

$F_3 = 0$.



$\Rightarrow$ $BC = 0$.

$\alpha = 36.9°$.

$\sin\alpha = \frac{3}{5}$

$\cos\alpha = \frac{4}{5}$

$\tan\alpha = \frac{3}{4}$

② free body diagram.

$\Sigma F_y = 0$ $A_y - 6 = 0$ $A_y = 6$.

$\Sigma F_x = 0$ $A_x = G_x$.

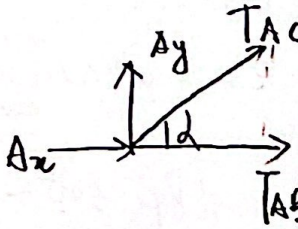
$\Sigma M_A = 0$. $6 \times 800 - G_x \cdot 600 = 0$.

$G_x = A_x = 8\,kN$.

③. joint A

$\Sigma F_x = 0$ $A_x + T_{AB} + \frac{4}{5} T_{AC} = 0$

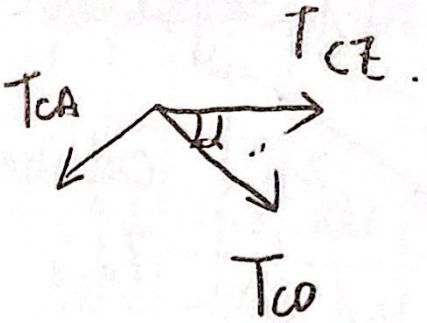
$\Sigma F_y = 0$ $A_y + \frac{3}{5} T_{AC} = 0$



$T_{AC} = -10$. $T_{AB} = 0$.

$T_{AB} = T_{BD} = 0$.

④ joint C



$T_{CA} = T_{AC} = -10$.

$\Sigma F_x = 0 \quad \frac{4}{5} T_{CA} - T_{CE} - \frac{4}{5} T_{CD} = 0$

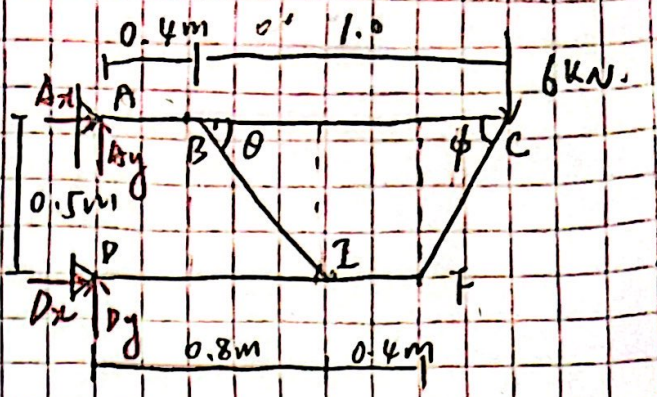
$\Sigma F_y = 0 \quad \frac{3}{5} T_{CA} + \frac{3}{5} T_{CD} = 0$.

$T_{CD} = -T_{AC} = 10 \text{ kN}$.

$T_{CE} = -16 \text{ kN}$

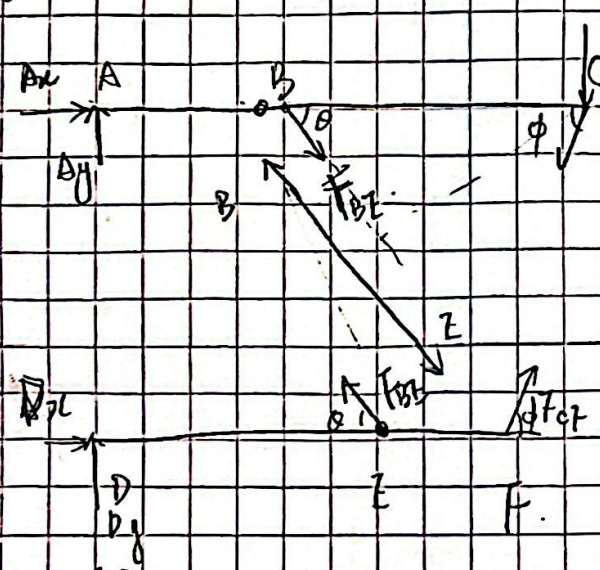
Problem 1

① Draw free-body diagram and analyze vector force



$$\begin{cases} \Sigma F_x = 0 & A_x + D_x = 0 \\ \Sigma F_y = 0 & D_y + A_y - 6 = 0 \\ \Sigma M_A = 0 & 0.5 D_x - 6 \times 1.4 = 0 \end{cases} \Rightarrow \begin{cases} D_x = 16.8 \text{ kN} \\ A_x = -16.8 \text{ kN} \end{cases}$$

② Analyze members



$$\tan\theta = \frac{0.5}{0.4}$$
$$\cos\theta = 0.62$$
$$\sin\theta = 0.78$$
$$\tan\phi = \frac{0.5}{0.2}$$
$$\cos\phi = 0.37$$
$$\sin\phi = 0.93$$

Member ABC.

$$\Sigma F_x = 0 \quad A_x + F_{BE}\cos\theta - F_{CF}\cos\phi = 0$$
$$\Sigma F_y = 0 \quad A_y - F_{BE}\sin\theta - F_{CF}\sin\phi - 6 = 0$$
$$\Sigma M_C = 0 \quad 1.8\sin\theta\, F_{BE} - A_y \cdot 1.4 = 0$$

$$\Rightarrow \begin{cases} A_y = 11.25 \\ D_y = -5.25 \\ F_{BE} = 20.2 \\ F_{CF} = -11.3 \end{cases}$$

Member DEF

$$\Sigma F_x = 0 \quad D_x + F_{CF}\cos\phi - F_{BE}\cos\theta = 0$$
$$\Sigma F_y = 0 \quad D_y + F_{BE}\sin\theta + F_{CF}\sin\phi = 0$$
$$\Sigma M_D = 0 \quad 0.8 F_{BE}\sin\theta + 1.2 F_{CF}\sin\phi = 0$$

2.