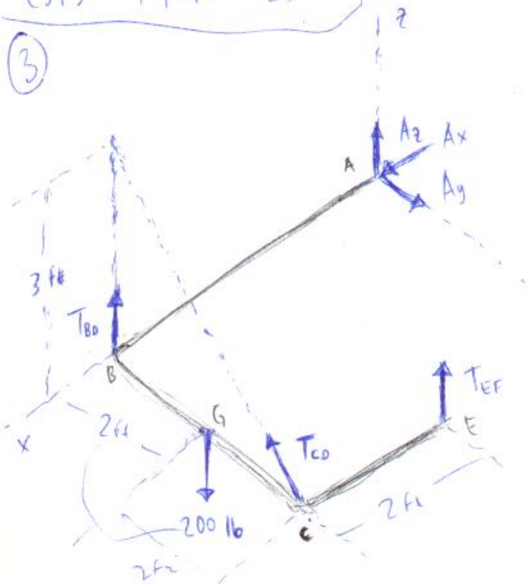
ESP3 - MCK - 2302

(3)



- Ecs. de equilibrio :

$$\Sigma \vec{F} = \vec{0} \; ; \quad \vec{R}_A + \vec{T}_{BD} + \vec{T}_{CD} + \vec{T}_{EF} + \vec{F} = \vec{0}$$

$$\Sigma \vec{M}_A = \vec{0} \; ; \quad \vec{M}_A^{T_{BD}} + \vec{M}_A^{T_{CD}} + \vec{M}_A^{T_{EF}} + \vec{M}_A^{F} = \vec{0}$$

- Fuerzas :

$$\vec{R}_A = (A_x \hat{\imath} + A_y \hat{\jmath} + A_z \hat{k}) \text{ lb}$$

$$\vec{T}_{BD} = (T_{BD} \hat{k}) \text{ lb}$$

$$\vec{T}_{EF} = (T_{EF} \hat{k}) \text{ lb}$$

$$\vec{T}_{CD} = (-0.8\, T_{CD} \hat{\jmath} + 0.6\, T_{CD} \hat{k}) \text{ lb}$$

$$\vec{F} = (-200 \hat{k}) \text{ lb}$$

- De la sumatoria de fuerzas :

Comp. $\hat{\imath} \rightarrow \quad A_x = 0 \quad \ldots \text{(i)}$

Comp. $\hat{\jmath} \rightarrow \quad A_y - 0.8\, T_{CD} = 0 \quad \ldots \text{(ii)}$

Comp. $\hat{k} \rightarrow \quad A_z + T_{BD} + T_{EF} + 0.6\, T_{CD} - 200 = 0 \quad \ldots \text{(iii)}$

- Calculando momentos :

$$\vec{M}_A^{T_{BD}} = \vec{r}_{AB} \times \vec{T}_{BD} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 4 & 0 & 0 \\ 0 & 0 & T_{BD} \end{vmatrix} = (-4\, T_{BD} \hat{\jmath}) \text{ lb}\cdot\text{ft}$$

$$\vec{M}_A^{T_{CD}} = \vec{r}_{AC} \times \vec{T}_{CD} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 4 & 4 & 0 \\ 0 & -0.8\, T_{CD} & 0.6\, T_{CD} \end{vmatrix} = (2.4\, T_{CD} \hat{\imath} - 2.4\, T_{CD} \hat{\jmath} - 3.2\, T_{CD} \hat{k}) \text{ lb}\cdot\text{ft}$$

$$\vec{M}_A^{T_{EF}} = \vec{r}_{AE} \times \vec{T}_{EF} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 2 & 4 & 0 \\ 0 & 0 & T_{EF} \end{vmatrix} = (4\, T_{EF} \hat{\imath} - 2\, T_{EF} \hat{\jmath}) \text{ lb}\cdot\text{ft}$$

$$\vec{M}_A^{F} = \vec{r}_{AG} \times \vec{F} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 4 & 2 & 0 \\ 0 & 0 & -200 \end{vmatrix} = (-400 \hat{\imath} + 800 \hat{\jmath}) \text{ lb}\cdot\text{ft}$$

Ecs. escalares :

Comp. $\hat{\imath} \rightarrow \quad 2.4\, T_{CD} + 4\, T_{EF} - 400 = 0 \quad \ldots \text{(iv)}$

Comp. $\hat{\jmath} \rightarrow \quad -4\, T_{BD} - 2.4\, T_{CD} - 2\, T_{EF} + 800 = 0 \quad \ldots \text{(v)}$

Comp. $\hat{k} \rightarrow \quad -3.2\, T_{CD} = 0 \quad \ldots \text{(vi)}$

De (vi) $\rightarrow \boxed{T_{CD} = 0}$

De (iv) $\rightarrow \boxed{T_{EF} = 100 \text{ lb}}$

De (v) $\rightarrow \boxed{T_{BD} = 150 \text{ lb}}$

De (i) $\rightarrow \boxed{A_x = 0}$

De (ii) $\rightarrow \boxed{A_y = 0}$

De (iii) $\rightarrow \boxed{A_z = -50 \text{ lb}}$

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