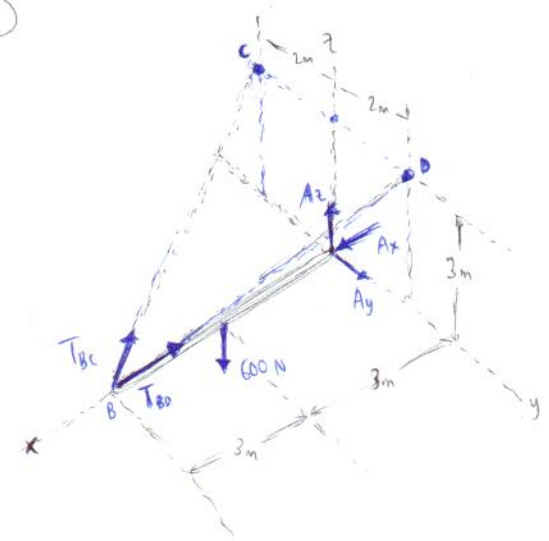
EOP1 - MCR - 38 - 2301

(3)



(40%)

- Ecs. de equilibrio

$$\sum \vec{F} = \vec{0}\ ;\quad \vec{R}_A + \vec{T}_{BC} + \vec{T}_{BD} + \vec{F} = \vec{0}$$

$$\sum \vec{M}_A = \vec{0}\ ;\quad \vec{M}_A^{T_{BC}} + \vec{M}_A^{T_{BD}} + \vec{M}_A^{F} = \vec{0}$$

- Vectores de fuerza

$$\vec{R}_A = (A_x\,\hat{i} + A_y\,\hat{j} + A_z\,\hat{k})\ N$$

$$\vec{F} = (-600\,\hat{k})\ N$$

$$\vec{T}_{BC} = T_{BC}\,\hat{u}_{BC} = T_{BC}\left[\frac{(-6\hat{i} - 2\hat{j} + 3\hat{k})}{\sqrt{6^2 + 2^2 + 3^2}}\right] = \left(-\frac{6}{7}\hat{i} - \frac{2}{7}\hat{j} + \frac{3}{7}\hat{k}\right) T_{BC}$$

$$\vec{T}_{BD} = T_{BD}\,\hat{u}_{BD} = T_{BD}\left[\frac{(-6\hat{i} + 2\hat{j} + 3\hat{k})}{\sqrt{6^2 + 2^2 + 3^2}}\right] = T_{BD}\left(-\frac{6}{7}\hat{i} + \frac{2}{7}\hat{j} + \frac{3}{7}\hat{k}\right)$$

- De la sumatoria de fuerzas:

Comp. $\hat{i}$ → $A_x - \frac{6}{7}T_{BC} - \frac{6}{7}T_{BD} = 0$ ... (i)

Comp. $\hat{j}$ → $A_y - \frac{2}{7}T_{BC} + \frac{2}{7}T_{BD} = 0$ ... (ii)

Comp. $\hat{k}$ → $A_z - 600 + \frac{3}{7}T_{BC} + \frac{3}{7}T_{BD} = 0$ ... (iii)

- Calculando momentos:

$$\vec{M}_A^{T_{BC}} = \vec{r}_{AB} \times \vec{T}_{BC} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 6 & 0 & 0 \\ -\frac{6}{7}T_{BC} & -\frac{2}{7}T_{BC} & \frac{3}{7}T_{BC} \end{vmatrix} = \left(-\frac{18}{7}T_{BC}\,\hat{j} - \frac{12}{7}T_{BC}\,\hat{k}\right)\ N\cdot m$$

$$\vec{M}_A^{T_{BD}} = \vec{r}_{AB} \times \vec{T}_{BD} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 6 & 0 & 0 \\ -\frac{6}{7}T_{BD} & \frac{2}{7}T_{BD} & \frac{3}{7}T_{BD} \end{vmatrix} = \left(-\frac{18}{7}T_{BD}\,\hat{j} + \frac{12}{7}T_{BD}\,\hat{k}\right)\ N\cdot m$$

$$\vec{M}_A^{F} = \vec{r}_{AE} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & 0 & 0 \\ 0 & 0 & -600 \end{vmatrix} = (1800\,\hat{j})\ N\cdot m$$

- Ecs. escalares de momento:

Comp. $\hat{i}$ → $0 = 0$ ...

Comp. $\hat{j}$ → $-\frac{18}{7}T_{BC} - \frac{18}{7}T_{BD} + 1800 = 0$ ... (iv)

Comp. $\hat{k}$ → $-\frac{12}{7}T_{BC} + \frac{12}{7}T_{BD} = 0$ ... (v)

- Resolviendo las ecuaciones:

De (v) → $T_{BD} = T_{BC}$

De (iv), haciendo que $T_{BC} = T_{BD}$:

$$-\frac{18}{7}T_{BD} - \frac{18}{7}T_{BD} + 1800 = 0$$

$$-\frac{36}{7}T_{BD} + 1800 = 0 \rightarrow \boxed{T_{BD} = 350\ lb} \quad \therefore \quad \boxed{T_{BC} = 350\ lb}$$

De (i) → $\boxed{A_x = 600\ lb}$

De (ii) → $\boxed{A_y = 0}$

De (iii) → $\boxed{A_z = 300\ lb}$

DCL → 5%

(3) Ecs. vect. y vectores, fuerza → 5%

Ecs. de fuerza → 5%

Calc. de momentos → 10%

Ecs. escalares de momento → 5%

Resolver ecs. → 10%

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