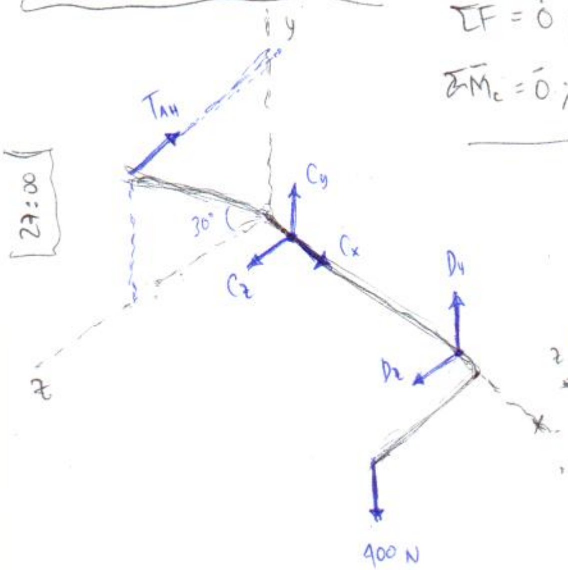
ESP3 - MCR - 2302



o Ecuaciones vectoriales de equilibrio:

$$\Sigma\vec{F} = \vec{0}\ ; \quad \vec{T}_{AH} + \vec{R}_C + \vec{R}_D + \vec{F} = \vec{0}$$

$$\Sigma\vec{M}_C = \vec{0}\ ; \quad \vec{M}_C^{T_{AH}} + \vec{M}_C^{R_D} + \vec{M}_C^{F} = \vec{0}$$

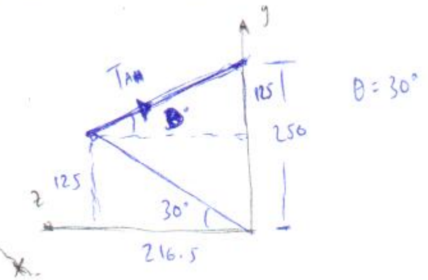
$$\vec{R}_C = (C_x\,\hat{\imath} + C_y\,\hat{\jmath} + C_z\,\hat{k})\ N$$

$$\vec{R}_D = (D_y\,\hat{\jmath} + D_z\,\hat{k})\ N$$

$$\vec{F} = (-400\,\hat{\jmath})\ N$$

$$\vec{T}_{AH} = (\text{sen}\,30°\,\hat{\jmath} - \cos 30°\,\hat{k})\ T_{AH}$$

$$\therefore \vec{T}_{AH} = (0.5\,T_{AH}\,\hat{\jmath} - 0.866\,T_{AH}\,\hat{k})\ N$$



o De la sumatoria de fuerzas:

Comp. $\hat{\imath}$ → $C_x = 0$ ... (i)

Comp. $\hat{\jmath}$ → $C_y + D_y - 400 + 0.5\,T_{AH} = 0$ ... (ii)

Comp. $\hat{k}$ → $C_z + D_z - 0.866\,T_{AH} = 0$ ... (iii)

o Calculando momentos:

$$\vec{M}_C^{T_{AH}} = \vec{r}_{CH} \times \vec{T}_{AH} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ -50 & 250 & 0 \\ 0 & 0.5\,T_{AH} & -0.866\,T_{AH} \end{vmatrix} = (-216.5\,T_{AH}\,\hat{\imath} - 43.3\,T_{AH}\,\hat{\jmath} - 25\,T_{AH}\,\hat{k})\ N\cdot mm$$

$$\vec{M}_C^{R_D} = \vec{r}_{CD} \times \vec{R}_D = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 300 & 0 & 0 \\ 0 & D_y & D_z \end{vmatrix} = (-300\,D_z\,\hat{\jmath} + 300\,D_y\,\hat{k})\ N\cdot mm$$

$$\vec{M}_C^{F} = \vec{r}_{CF} \times \vec{F} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 350 & 0 & 250 \\ 0 & -400 & 0 \end{vmatrix} = (100\,000\,\hat{\imath} - 140\,000\,\hat{k})\ N\cdot mm$$

Esc. escalares:

Comp. $\hat{\imath}$ → $-216.5\,T_{AH} + 100\,000 = 0$ ... (iv)

Comp. $\hat{\jmath}$ → $-43.3\,T_{AH} - 300\,D_z = 0$ ... (v)

Comp. $\hat{k}$ → $-25\,T_{AH} + 300\,D_y - 140\,000 = 0$ ... (vi)

De (iv) → $\boxed{T_{AH} = 462\ N}$

De (v) → $\boxed{D_z = -66.7\ N}$

De (vi) → $\boxed{D_y = 505.2\ N}$

De (i) → $\boxed{C_x = 0}$

De (ii) → $\boxed{C_y = -336.2\ N}$

De (iii) → $\boxed{C_z = 466.8\ N}$