Solución: Segundo Examen Final Colegiado — 2015-2
Estática

1.-

$$\vec{T}_{DA} = \frac{T_{DA}}{13}(4\hat{i} - 3\hat{j} + 12\hat{k})$$

$$\vec{T}_{DB} = \frac{T_{DB}}{13}(-3\hat{i} - 4\hat{j} + 12\hat{k})$$

$$\vec{T}_{DC} = \frac{T_{DC}}{13}(5\hat{j} + 12\hat{k})$$

$$\vec{W} = 100(-\hat{k})$$

$$\Sigma F_x = \frac{4}{13}T_{DA} - \frac{3}{13}T_{DB} = 0$$

$$\Sigma F_y = -\frac{3}{13}T_{DA} - \frac{4}{13}T_{DB} + \frac{5}{13}T_{DC} = 0$$

$$\Sigma F_y = \frac{12}{13}T_{DA} + \frac{12}{13}T_{DB} + \frac{12}{13}T_{DC} - 100 = 0$$

Resolviendo el sistema

$\underline{T_{DA} = 27.08\ N}$; $\underline{T_{DB} = 36.11\ N}$; $\underline{T_{DC} = 45.14\ N}$

2.- Sistema A

$$\vec{R} = 4\hat{i} + 2\hat{j} + 5\hat{k}\ [N]$$

$$\Sigma \vec{M}_o = (M_1 - 6)\hat{i} + (M_2 - 15)\hat{j} + (M_3 - 8)\hat{k}\ [N\cdot m]$$

Sistema B

$$\vec{R} = (6 + F_{6x})\hat{i} + (1 + F_{6y})\hat{j} + (-3 + F_{6z})\hat{k}\ [N]$$

$$\Rightarrow \underline{\vec{F}_6 = -2\hat{i} + \hat{j} + 8\hat{k}\ [N]}$$

Con respecto al origen

$\vec{M}_4 = -8\hat{i} - 8\hat{k}$; $\vec{M}_5 = -4\hat{i} - \hat{j} - 13\hat{k}$; $\vec{M}_6 = \vec{0}$

$$\Sigma \vec{M}_o = \vec{M}_4 + \vec{M}_5 + \vec{M}_6 + \vec{m}$$

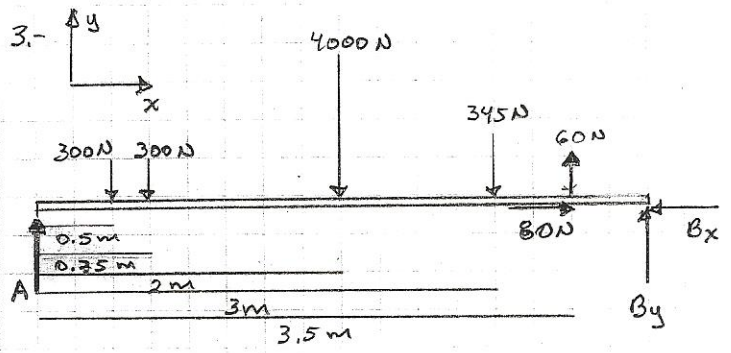
$$\Sigma \vec{M}_o = -2\hat{i} + \hat{j} - 23\hat{k}\ [N\cdot m]$$

Igualando ecuaciones

$\underline{\vec{M}_1 = 4\hat{i}\ [N\cdot m]}$; $\underline{\vec{M}_2 = 16\hat{j}\ [N\cdot m]}$

$\underline{\vec{M}_3 = -15\hat{k}\ [N\cdot m]}$

3.-



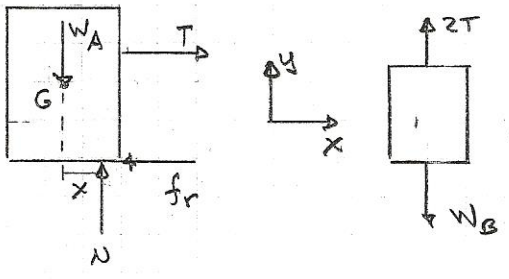
$$\Sigma F_x = 80 - B_x = 0 \Rightarrow B_x = 80\ N$$

$$\Sigma F_y = -4885 + A + B_y = 0$$

$$\Sigma M_A = -0.5(300) - 0.75(300) - 3(345) - 2(4000) + 3.5(60) + 4B_y = 0$$

$$\Rightarrow B_y = 2300\ N \Rightarrow \underline{A = 2585\ N}\ ;\ \underline{B = 2301.4\ N}$$

4.- Bloque A — Bloque B



$$\Sigma F_x = T - f_r = 0 \qquad \Sigma F_y = 2T - W_B = 0$$

$$\Sigma F_y = N - W_A = 0 \qquad T = \frac{W_B}{2}$$

$$\Rightarrow \frac{W_B}{2} - f_r = 0 \quad \text{en el límite } f_r = \mu_s W_A$$

$$\Rightarrow W_B = 2\mu_s W_A\ ;\ W_B = 50\ N \text{ mínimo para que se traslade}$$

Para el volcamiento, $x = 0.45\ m$

$$\Sigma M_6 = -0.375T - 0.625 f_r + xN = 0$$

$$\Rightarrow -0.375T - 0.625T + xW_A = 0$$

$$\Rightarrow \frac{W_B}{2} = xW_A \Rightarrow \underline{W_B = 45\ N} \text{ valor mínimo}$$

Por lo tanto primero se vuelca