Resolución del Segundo Examen Final Colegiado de Estática

Semestre: 2011-2 — Junio 7, 2011

1.

$$\bar{T}_{AC} = 5\left(\frac{4.5i - 6k}{7.5}\right) = 3i - 4k \ \text{kN}$$

$$\bar{T}_{AB} = 3\left(\frac{3i + 6j - 6k}{9}\right) = i + 2j - 2k \ \text{kN}$$

$$\theta = \text{ang}\cos\frac{3+8}{(5)(3)} = \text{ang}\cos\frac{11}{15}$$

$$\therefore \ \underline{\theta = 42.83^\circ}$$

$$\bar{R} = \bar{T}_{AC} + \bar{T}_{AB} = 4i + 2j - 6k \ \text{kN}$$

$$\bar{M}_D^R = \bar{M}_D^{T_{AC}} + \bar{M}_D^{T_{AB}}$$

$$\begin{vmatrix} i & j & k \\ 0 & -4 & 6 \\ 4 & 2 & -6 \end{vmatrix} = \begin{vmatrix} i & j & k \\ 4.5 & -4 & 0 \\ 3 & 0 & -4 \end{vmatrix} + \begin{vmatrix} i & j & k \\ 0 & -4 & 6 \\ 1 & 2 & -2 \end{vmatrix}$$

$$-i + 24j + 16k = (16i + 18j + 12k) + (-4i + 6j + 4k)$$

$$\therefore \underline{12i + 24j + 16k = 12i + 24j + 16k}$$

2.

$$\bar{R}_1 = (-220i + 125(0.8) + F_3\cos\phi)i + (25 - 125(0.6) + F_3\,\text{sen}\,\phi)j$$

$$\bar{R}_1 = (-120 + F_3\cos\phi)i + (-50 + F_3\,\text{sen}\,\phi)j$$

$$\bar{R}_2 = \bar{0}$$

De $\bar{R}_1$ y $\bar{R}_2$:

$$F_3\cos\phi = 120 \quad -①$$

$$F_3\,\text{sen}\,\phi = 50 \quad -②$$

de ① y ②:

$$F_3^2(\cos^2\phi + \text{sen}^2\phi) = 16900$$

$$\Rightarrow F_3 = [16900]^{1/2}$$

$$\underline{a)\ F_3 = 130 \ \text{N}}$$

$$M_O^{F1} + M_O^{F2} + M_O^{F3} + M_O^{F4} = M_{par}$$

$$M_O^{S_1} = 220(2) - 130\left(\tfrac{12}{13}\right)(2) + 130\left(\tfrac{5}{13}\right)(3) - 125\left(\tfrac{3}{5}\right)(3)$$

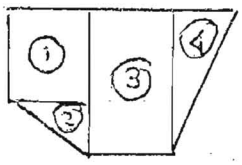
$$M_O^{S_1} = 125 \quad -③$$

$$M_O^{S_2} = 125d \quad -④$$

igualando ③ y ④:

$$125 = 125d; \quad \underline{b)\ d = 1 \ \text{m}}$$

3.



① $A_1 = 450$, $\bar{x}_1 = 0.75$, $\bar{x}_1 A_1 = 337.5$

② $A_2 = 75$, $\bar{x}_2 = 1$, $\bar{x}_2 A_2 = 75$

③ $A_3 = 600$, $\bar{x}_3 = 2.25$, $\bar{x}_3 A_3 = 1350$

④ $A_4 = 600$, $\bar{x}_4 = 4$, $\bar{x}_4 A_4 = 2400$

$$A = A_1 + A_2 + A_3 + A_4 = 1725$$

$$\underline{a)\ R = 1725 \ \text{lb}}$$

$$\bar{x} = \frac{\sum \bar{x}A}{A} = \frac{4162.5}{1725}; \quad \underline{b)\ \bar{x} = 2.413 \ \text{ft}}$$

4.

$$\sum F_x = 0; \quad A_H + 400\left(\tfrac{4}{5}\right) - 600\left(\tfrac{3}{5}\right) = 0$$

$$\Rightarrow A_H = 40 \ \text{N}$$

$$\sum F_y = 0; \quad A_V - 200 - 400\left(\tfrac{3}{5}\right) - 600 - 600\left(\tfrac{4}{5}\right) - 300 + E_V = 0$$

$$A_V + E_V = 1820 \quad -①$$

$$\sum M_A = 0$$

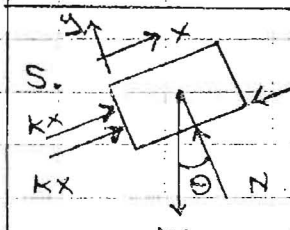
$$-400\left(\tfrac{4}{5}\right)(1.25) - 400\left(\tfrac{3}{5}\right)(3) - 600(6) + 600\left(\tfrac{3}{5}\right)(1.25) - 600\left(\tfrac{4}{5}\right)(9) - 300(12) + E_V(12) = 0$$

$$12E_V = 12190 \Rightarrow \underline{E_V = 1015.83 \ \text{N}}$$

De ①: $A_V = 804.17$ N

$$A = [(A_H)^2 + (A_V)^2] \Rightarrow \underline{A = 805.16 \ \text{N}}$$

5.



$$2kx - \mu W\cos\theta - W\,\text{sen}\,\theta = 0$$

$$k = \frac{\mu W\cos\theta + W\,\text{sen}\,\theta}{2x} = 490.5 \ \frac{N}{m}$$

$$\therefore \underline{k > 490.5 \ \frac{N}{m}}$$