

RESOLUCIÓN DEL PRIMER EXAMEN FINAL COLLEGIADO ESTÁTICA

SEMESTRE: 2011-1

DICIEMBRE 6, 2010

$$1. \vec{T}_{OA} + \vec{T}_{OB} + \vec{T}_{OC} - 100\vec{j} = \vec{0}$$

$$T_{OA} \left(\frac{4\vec{i} + 3\vec{j}}{5} \right) + T_{OB} \left(\frac{5\vec{j} - 12\vec{k}}{13} \right) + T_{OC} \left(\frac{-2\vec{i}\vec{j} + 2\vec{k}}{3} \right) - 100\vec{j} = \vec{0}$$

$$\frac{4}{5} T_{OA} - \frac{2}{3} T_{OC} = 0 \Rightarrow T_{OA} = \frac{10}{12} T_{OC} \quad \text{--- (1)}$$

$$\frac{3}{5} T_{OA} + \frac{5}{13} T_{OB} + \frac{1}{3} T_{OC} - 100 = 0 \quad \text{--- (2)}$$

$$-\frac{12}{13} T_{OB} + \frac{2}{3} T_{OC} = 0 \Rightarrow T_{OB} = \frac{26}{36} T_{OC} \quad \text{--- (3)}$$

de (1), (2) y (3):

$$T_{OA} = 75 \text{ kg}$$

$$T_{OB} = 65 \text{ kg}$$

$$T_{OC} = 90 \text{ kg}$$

$$2. \vec{R} = \vec{F}_A + \vec{F}_B + \vec{F}_C + \vec{F}_D + \vec{F}_E + \vec{F}_F$$

$$\vec{R} = 4\vec{i} + (b-4)\vec{j} + 5\vec{k} \quad \text{N}$$

$$\vec{M}_O = \vec{r}_O^A \times \vec{F}_A + \vec{r}_O^B \times \vec{F}_B + \vec{r}_O^C \times \vec{F}_C + \vec{r}_O^D \times \vec{F}_D + \vec{r}_O^E \times \vec{F}_E + \vec{r}_O^F \times \vec{F}_F$$

$$\vec{M}_O = (5\vec{k}) \times (2\vec{i} - 4\vec{j}) + (-3\vec{j}) \times (2\vec{i} + 4\vec{k}) + (5\vec{i}) \times (b\vec{j} + 6\vec{k}) + (4\vec{i} - 3\vec{k}) \times (-5\vec{k}) + (3\vec{i} + 4\vec{k}) \times (2\vec{i} - 1.5\vec{k}) + (-3\vec{i} - 4\vec{k}) \times (2\vec{i} + 1.5\vec{k})$$

$$\vec{M}_O = 25\vec{j} + (10 + 5b)\vec{k} \quad \text{N}\cdot\text{m}$$

$$\vec{R} \cdot \vec{M}_O = 0;$$

$$(4\vec{i} + (b-4)\vec{j} + 5\vec{k}) \cdot (25\vec{j} + (10 + 5b)\vec{k}) = 0$$

$$50b - 50 = 0; \quad \text{a) } b = 1$$

$$\therefore \vec{R} = 4\vec{i} - 3\vec{j} + 5\vec{k} \quad \text{N}$$

$$\vec{M}_O = 25\vec{j} + 15\vec{k} \quad \text{N}\cdot\text{m}$$

$$\vec{r} \times \vec{R} = \vec{M}_O;$$

$$(x\vec{i} + y\vec{j} + z\vec{k}) \times (4\vec{i} - 3\vec{j} + 5\vec{k}) = 25\vec{j} + 15\vec{k}$$

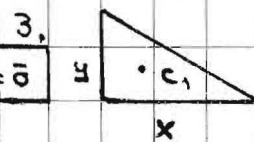
$$5y + 3z = 0 \quad \text{--- (1)}$$

$$4z - 5x = 25 \quad \text{--- (2)}$$

$$-3x - 4y = 15 \quad \text{--- (3)}$$

de (1), (2) y (3):

$$b) x = \frac{4}{5} z - 5 = -\frac{4}{3} y - 5$$



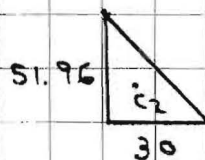
$$A_1 = 3117.6 \text{ cm}^2$$

$$\bar{X}_1 = 40 \text{ cm}$$

$$\bar{Y}_1 = 17.32 \text{ cm}$$

$$x = 90 + 60 \cos 60^\circ = 120$$

$$y = 60 \sin 60^\circ = 51.96$$



$$A_2 = 779.4 \text{ cm}^2$$

$$\bar{X}_2 = 10 \text{ cm}$$

$$\bar{Y}_2 = 17.32 \text{ cm}$$

$$A = 2338.2 \text{ cm}^2; \quad Q_x = 40497.62$$

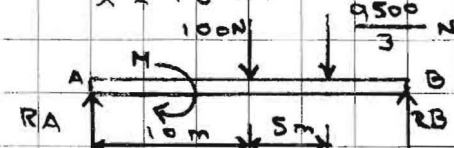
$$Q_y = 116910$$

$$\therefore \bar{X}_c = 50 \text{ cm}, \quad \bar{Y}_c = 17.32 \text{ cm}$$

$$4. A = \int_0^{20} x^2 dx = \frac{8000}{3}$$

$$Q_y = \int_0^{20} x(x^2) dx = \int_0^{20} x^3 dx = 40000$$

$$\bar{X} = 15 \text{ m}$$



$$\sum F_y = 0; \quad R_A + R_B - \frac{9500}{3} - 100 = 0 \quad \text{--- (1)}$$

$$\sum M_A = 0; \quad R_B(20) - 500 - 100(10) - \frac{9500}{3}(15) = 0 \quad \text{--- (2)}$$

$$\text{de (1) y (2): } R_A = 816.67 \text{ N}$$

$$R_B = 2450 \text{ N}$$

5. Bloque A:

$$\sum F_y = 0; \quad N_A - W \cos 60^\circ; \quad N_A = 30 \text{ N}$$

$$\sum F_x = 0; \quad -M + N_A - T + W \sin 60^\circ = 0$$

$$T = 0.3(30) + 60 \sin 60^\circ; \quad T = 42.96 \text{ lb} \quad \text{--- (1)}$$

Bloque B:

$$\sum F_j = 0; \quad N_B - 0.7071 W_B = 0$$

$$N_B = 0.7071 W_B \quad \text{--- (2)}$$

$$\sum F_x = 0; \quad T - M + N_B - W_B \sin 45^\circ = 0 \quad \text{--- (3)}$$

$$\text{(1) y (2) en (3): } W_B = 46.734 \text{ lb}$$