Solución: Segundo Examen Final Colegiado 2014-2
Estática

1.- $\vec{F}_1 = 180\hat{j} - 240\hat{k}$; $\vec{F}_3 = -200\hat{j}$

$\vec{F}_2 = \vec{R} - (\vec{F}_1 + \vec{F}_3)$

$\vec{F}_2 = 30\hat{i} - 55\hat{j} - 80\hat{k}$ [N]

$\underline{F_2 = 101.61\ N}$

2.- Con respecto al origen

$\vec{M}_1 = (1, 2, 0) \times (3, -2, 1)$

$\vec{M}_1 = 2\hat{i} - \hat{j} - 8\hat{k}$ [N·m]

$\vec{M}_2 = (2, -1, 3) \times (4a, 2, 3)$

$\vec{M}_2 = -9\hat{i} + (-6 + 12a)\hat{j} + (4 + 4a)\hat{k}$ [N·m]

$\vec{M}_3 = \vec{0}$

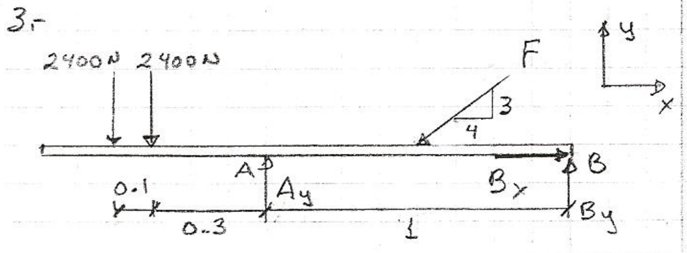
$\vec{M}_0 = \vec{M}_1 + \vec{M}_2 + \vec{M}_3$

$\vec{M}_0 = -7\hat{i} + (-7 + 12a)\hat{j} + (-4 + 4a)\hat{k}$ (N·m)

$\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 = (4a - 2)\hat{j} + 4\hat{j}$ [N]

$\vec{R} \cdot \vec{M} = 20a - 14 = 0 \Rightarrow \underline{a = 0.7}$

3.-



$\Sigma F_x = B_x - \frac{4}{5}F = 0$; $F = 20000$

$\Sigma F_y = A_y + B_y - \frac{3}{5}F - 4800 = 0$; $A_y = \frac{1}{3}B_y$

$\Sigma F_y = \frac{4}{3}B_y - \frac{3}{5}F = 4800$

$\Sigma M_B = 1.4(2400) + 1.3(2400) - (1)(\frac{1}{3}B_y) - M + 0.4(\frac{3}{5})F = 0$

$\underline{B_y = 12600\ N}$, $\underline{M = 7080\ N \cdot m}$

4.-

Figura	x_i [in]	y_i [in]	A_i [in^2]	x_iA_i [in^3]	y_iA_i [in^3]
1	0	0	$\pi(10)^2$	0	0
2	0	$\frac{4(6)}{3\pi}$	$\frac{\pi(6)^2}{2}$	0	$\frac{2(6)^3}{3}$
3	-5	-3	12	-60	-36
4	x_4	y_4	$\pi(3)^2$	$9\pi x_4$	$9\pi y_4$

Se requiere que: $\Sigma x_iA_i = 0$ y $\Sigma y_iA_i = 0$

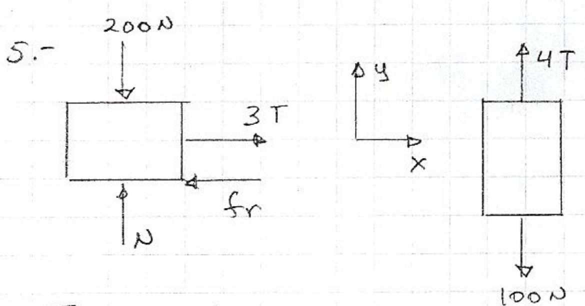
$\Sigma x_iA_i = -x_3A_3 - x_4A_4 = 0$

$\Sigma x_iA_i = 60 - 9\pi x_4 = 0 \Rightarrow \underline{x_4 = 2.12\ in}$

$\Sigma y_iA_i = -x_2A_2 - x_3A_3 - x_4A_4$

$\Sigma y_iA_i = -\frac{2(6)^3}{3} + 36 - 9\pi y_4 = 0 \Rightarrow \underline{y_4 = -3.82\ in}$

5.-



$\Sigma F_x = 3T - f_r = 0$

$\Sigma F_y = N - 200 = 0$

$\Rightarrow 3T = f_r = \mu N$

$\Sigma F_y = 4T - 100 = 0$

$\underline{T = 25\ N}$

$\underline{\mu = 0.375}$