Solución: Primer Examen Final Colegiado 2015-2

Estática Matutino

1.- $\vec{T}_{AB} = \frac{210}{7}(-2\hat{i} - 6\hat{j} + 3\hat{k})$ [N]

$\vec{T}_{AC} = \frac{140}{7}(-6\hat{i} - 3\hat{j} + 2\hat{k})$ [N]

$\vec{R} = \vec{T}_{AB} + \vec{T}_{AC}$

$\underline{\vec{R} = -180\hat{i} - 240\hat{j} + 130\hat{k}\ [N]}$

$\cos\theta = \frac{\vec{T}_{AB} \cdot \vec{T}_{AC}}{|\vec{T}_{AB}||\vec{T}_{AC}|}$; $\underline{\theta = 42.72°}$

2.- $\vec{R} = -1035\hat{j}$ [N]

Con respecto al origen

$\Sigma M_{xx} = 3(375) + 0.5(260) + 4.75(400)$

$\Sigma M_{xx} = 3155$ N·m

$\Sigma M_{yy} = 0$

$\Sigma M_{zz} = -1(375) - 1.5(260) - 4.75(400)$

$\Sigma M_{zz} = -2665$

$\bar{M}_0 = 3155\hat{i} - 2665\hat{k}$ [N·m] ①

Ubicación de la resultante

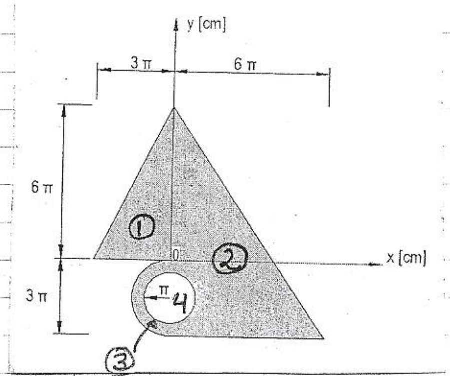
$\bar{M}_0 = (x, 0, z) \times (0, -1035, 0)$

$\bar{M}_0 = 1035z\hat{i} - 1035x\hat{k}$ [N·m] ②

Igualando ① y ②

$\underline{x = 2.57\ m}$, $\underline{y = 0}$, $\underline{z = 3.05\ m}$

3.-



	$\bar{x}_i$ [cm]	$\bar{y}_i$ [cm]	A_i [cm²]	$\bar{x}_i A_i$ [cm³]	$\bar{y}_i A_i$ [cm³]
①	$-\pi$	2π	$9\pi^2$	$-9\pi^3$	$18\pi^3$
②	2π	0	$27\pi^2$	$54\pi^3$	0
③	-2	-1.5π	$1.125\pi^3$	$-2.25\pi^3$	$-1.68\pi^4$
④	0	-1.5π	π^3	0	$-1.5\pi^4$
Σ			359.18	1325.52	539.85

$\underline{\bar{x} = 3.69\ cm}$ $\underline{\bar{y} = 1.5\ cm}$

4.- $\bar{R} = -5000\hat{j}$; $\bar{M}_B = -2000\hat{k}$ [N·m]

a) $\bar{R} \cdot \bar{M}_B = 0$ el sistema se reduce a una sola fuerza

b) $x(5000) = 2000 \Rightarrow x = 0.4$ m a la derecha de B

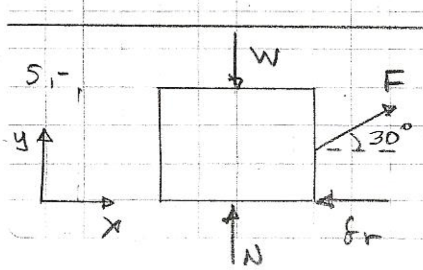
cruza las barras $\overline{BC}$, $\overline{MC}$ y $\overline{ML}$

c) $\Sigma F_y = R_A + R_H - 5000 = 0$; $\Sigma F_x = 0$

$\Sigma M_A = -1.4(5000) + 6R_H = 0$

$\underline{R_A = 3833.33\ N}$; $\underline{R_H = 1166.67\ N}$

5.-



$\Sigma F_x = \frac{\sqrt{3}}{2}F - f_r = 0$

$\Sigma F_y = N + \frac{1}{2}F - W = 0$

$f_r = \mu_s N$

$N = W - \frac{1}{2}F$

$F = \frac{2\mu_s W}{\sqrt{3} + \mu}$

$\underline{F = 15\ N}$