Solución: Primer Examen Final Colegiado 2015-1
Estática Matutino

1.- $\vec{T}_{AB} = \frac{T_{AB}}{\sqrt{72}}(8\hat{i} - 2\hat{j} + 2\hat{k})$ [N]

$\vec{T}_{AC} = \frac{T_{AC}}{\sqrt{108}}(-10\hat{i} - 2\hat{j} + 2\hat{k})$ [N]

$\vec{W} = 200(0\hat{i} + 0\hat{j} - \hat{k})$ [N]

$\vec{P} = P(0\hat{i} + \hat{j} + 0\hat{k})$ [N]

Equilibrio

$\Sigma F_x = \frac{8}{\sqrt{72}} T_{AB} - \frac{10}{\sqrt{108}} T_{AC} = 0$

$\Sigma F_y = -\frac{2}{\sqrt{72}} T_{AB} - \frac{2}{\sqrt{108}} T_{AC} + P = 0$

$\Sigma F_z = \frac{2}{\sqrt{72}} T_{AB} + \frac{2}{\sqrt{108}} T_{AC} - 200 = 0$

Resolviendo el sistema

$T_{AB} = 471.40$ N ; $T_{AC} = 461.88$ N ; $P = 200$ N

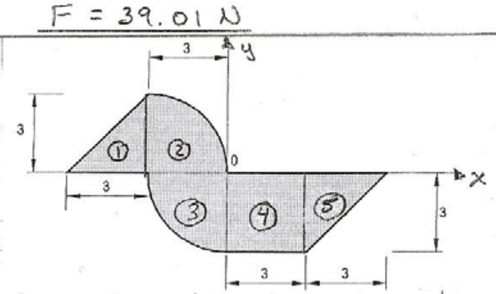
2.- $\vec{r} = 2.5\left(\frac{\sqrt{3}}{2}\hat{i} + \frac{1}{2}\hat{j}\right)$ [m]

$\vec{F} = F\left(-\frac{12}{13}\hat{i} + \frac{5}{13}\hat{j}\right)$ [N]

$\vec{r} \times \vec{F} = \frac{2.5}{26} F(5\sqrt{3} + 12)\hat{k} = 77.5\hat{k}$

$F = 39.01$ N

3.-

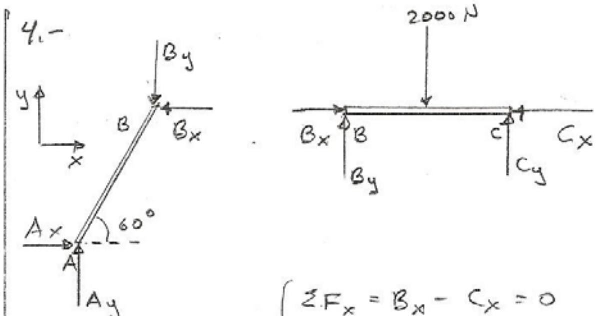


	$\bar{x}_i$ [cm]	$\bar{y}_i$ [cm]	A_i [cm²]	$\bar{x}_i A_i$ [cm³]	$\bar{y}_i A_i$ [cm³]
①	-4	1	$\frac{9}{2}$	-18	$\frac{9}{2}$
②	$-3+\frac{4}{\pi}$	$\frac{4}{\pi}$	$\frac{9\pi}{4}$	$-\frac{27\pi}{4}+9$	9
③	$-\frac{4}{\pi}$	$-\frac{4}{\pi}$	$\frac{9\pi}{4}$	-9	-9
④	$\frac{3}{2}$	$-\frac{3}{2}$	9	$\frac{27}{2}$	$-\frac{27}{2}$
⑤	4	-1	$\frac{9}{2}$	18	$-\frac{9}{2}$
Σ			32.13	-7.7	-13.5

$\bar{x} = -0.24$ cm $\quad \bar{y} = -0.42$ cm

El ejercicio se puede resolver de una forma más simple si se observa la simetría en las regiones ① y ⑤, así como en ② y ③.

4.-



De la barra BC
$$\begin{cases} \Sigma F_x = B_x - C_x = 0 \\ \Sigma F_y = B_y + C_y - 2000 = 0 \\ \Sigma M_C = 2(2000) - 4B_y = 0 \end{cases}$$

Como

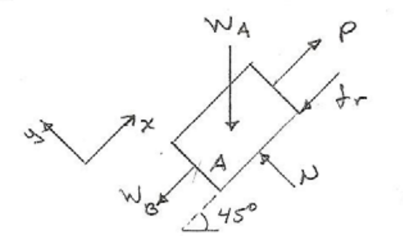
$B_x = \frac{1}{2}B$; $B_y = \frac{\sqrt{3}}{2}B \Rightarrow B = 1154.7$ N

$\Rightarrow C_x = 577.35$ N ; $C_y = 1000$ N $\Rightarrow C = 1154$ N

De la barra AB $\rightarrow A_x = B_x$; $A_y = B_y$

$A = 1154.7$ N

5.-



$\Sigma F_x = P - \frac{1}{\sqrt{2}} W_A - W_B - f_r = 0$

$\Sigma F_y = N - \frac{1}{\sqrt{2}} W_A = 0$

$\Rightarrow P + \frac{1}{\sqrt{2}} W_A + W_B + \frac{1}{\sqrt{2}} \mu W_A = 0$

$P > 1075.77$ N