Resolución del Segundo Examen Colegiado de Estática

Semestre: 2011-1 — Diciembre 11, 2010

1. $\bar{F} = |F|\bar{e}_{AB}$; $\bar{F} = 12\left(\frac{-2i-2j-k}{3}\right)$

a) $\bar{F} = -8i-8j-4k$ N

$\bar{M}_O^F = \bar{O}_A \times \bar{F}$; $\bar{M}_O^F = (3i-j+2k)\times(-8i-8j-4k)$

b) $\bar{M}_O^F = 20i-4j-32k$ N·m

$\bar{M}_D^F = \bar{D}_A \times \bar{F}$; $\bar{M}_D^F = (4i+4j+2k)\times(-8i-8j-4k)$

b) $\bar{M}_D^F = \bar{0}$ N·m ; D es un punto del soporte de $\bar{F}$

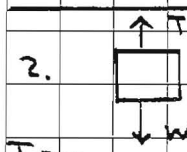
$\bar{M}_{OE}^F = (\bar{M}_O^F \cdot \bar{e}_{OE})\cdot \bar{e}_{OE}$

$|\bar{M}_{OE}^F| = (20i-4j-32k)\cdot\left(\frac{-6i+2j+3k}{7}\right)$

$\bar{M}_{OE}^F = -32\left(\frac{-6i+2j+3k}{7}\right)$

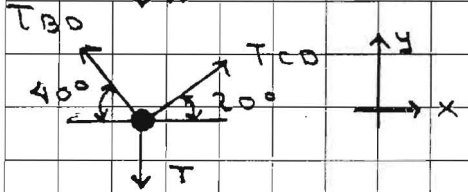
c) $\bar{M}_{OE}^F = 27.42i - 9.14j - 13.71k$ N·m

2.



$\sum F_y = 0$

$T = 200$ N



$\sum \bar{F} = \bar{0}$

$T_{CD}(\cos 20°\, i + \operatorname{sen} 20°\, j) + T_{BD}(-\cos 40°\, i + \operatorname{sen} 40°\, j) - 200j = 0i + 0j$

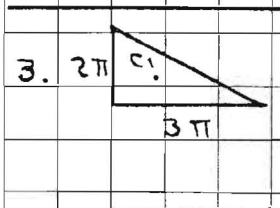
$T_{CD}\cos 20° - T_{BD}\cos 40° = 0$ — ①

$T_{CD}\operatorname{sen} 20° + T_{BD}\operatorname{sen} 40° = 200$ — ②

Resolviendo ① y ②:

$T_{BD} = 217.01$ N; $T_{CD} = 176.90$ N

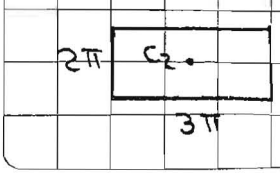
3.



$A_1 = 3\pi^2$

$\bar{x}_1 = -2\pi$

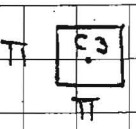
$\bar{y}_1 = \frac{2}{3}\pi$



$A_2 = 6\pi^2$

$\bar{x}_2 = 1.5\pi$

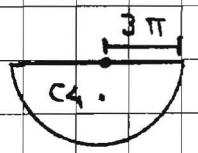
$\bar{y}_2 = \pi$



$A_3 = -\pi^2$

$\bar{x}_3 = \frac{1}{2}\pi$

$\bar{y}_3 = \frac{1}{2}\pi$



$A_4 = 4.5\pi^3$

$\bar{x}_4 = 0$

$\bar{y}_4 = -4$

$A = 8\pi^2 + 4.5\pi^3$; $Q_{xx} = -10.5\pi^3$; $Q_{yy} = 2.5\pi^3$

$\therefore \bar{x}_c = \frac{Q_{yy}}{A}$; $\bar{x}_c = 0.354$ cm

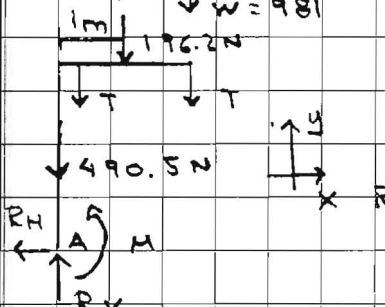
$\bar{y}_c = \frac{Q_{xx}}{A}$; $\bar{y}_c = -1.499$ cm

4.

$\sum F_y = 0$

$2T - 981 = 0$

$T = 490.5$ N



$\sum F_x = 0$; $R_H = 0$ N

$\sum F_y = 0$

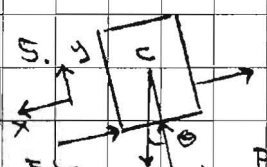
$R_V - 2(490.5) - 196.2 - 490.5 = 0$

$R_V = 1667.7$ N

$\sum M_A = 0$; $M - 490.5(0.2) - 196.2(1) - 490.5(2) = 0$

$M = 1275.3$ N·m

5.



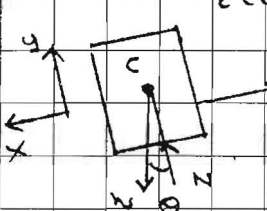
$\sum F_y = 0$; $N = w\cos\theta$

$\sum F_x = 0$; $w\operatorname{sen}\theta - \mu N - P = 0$

$P = w(\operatorname{sen}\theta - \mu\cos\theta) = 0.6535$ kN

$\sum M_C = 0$; $\mu N(2) + P(1) - N(d) = 0$

$d = \frac{0.2(4)\cos 30° + 0.6535(1)}{2\cos 30°} = 0.777$ m



$\sum F_x = 0$

$w\operatorname{sen}\theta - P = 0$

$P = 2\operatorname{sen} 30° = 1$ kN

$\sum M_C = 0$; $P(1) - N(d) = 0$

$\Rightarrow d = 0.577$ m $\therefore$ $0.6535 \le P \le 1$ kN