

Solución: Primer Examen Final Colegiado
ESTÁTICA

2013-1

Matutino

1. $\vec{r}_{1/a} = 4\hat{i} - \hat{j} - 12\hat{k}$ m; $\vec{r}_{2/a} = -\hat{i} + 2\hat{j} - \hat{k}$ m

$\vec{F}_1 = 3\hat{i} - 4\hat{j} - 12\hat{k}$ N; $\vec{F}_2 = -4\hat{i} - 2\hat{j} - 2\hat{k}$ N

$\vec{M}_1 = \vec{r}_{1/a} \times \vec{F}_1 = -36\hat{i} + 12\hat{j} - 13\hat{k}$ N.m

$\vec{M}_2 = \vec{r}_{2/a} \times \vec{F}_2 = -6\hat{i} + 2\hat{j} + 10\hat{k}$ N.m

$\vec{M}_1 + \vec{M}_2 = -42\hat{i} + 14\hat{j} - 3\hat{k}$ N.m

$\vec{R} = \vec{F}_1 + \vec{F}_2 = -\hat{i} - 6\hat{j} - 14\hat{k}$ N

$\vec{r} = -3\hat{j} - 14\hat{k}$ m

$\vec{M} = \vec{r} \times \vec{R} = -42\hat{i} + 14\hat{j} - 3\hat{k}$ N.m

2.- Suma de fuerzas

$\vec{F}_1 = 180\hat{i} - 240\hat{j}$ N

$\vec{F}_2 = -240\hat{j} - 180\hat{k}$ N

$\vec{F}_3 = -180\hat{i} + 180\hat{k}$ N

$\vec{R} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 = \vec{0}$

Con respecto al origen

$\vec{M}_1 = \vec{r}_1 \times \vec{F}_1 = 60(12\hat{i} + 9\hat{j} - 12\hat{k})$ N.m

$\vec{M}_2 = \vec{r}_2 \times \vec{F}_2 = 60(-12\hat{i} + 9\hat{j} + 12\hat{k})$ N.m

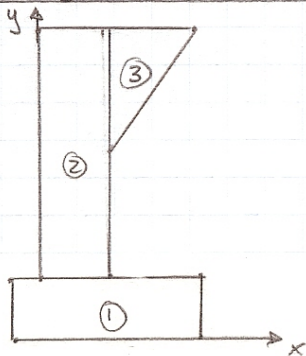
$\vec{M}_3 = \vec{r}_3 \times \vec{F}_3 = 60(12\hat{i} - 9\hat{j} + 12\hat{k})$ N.m

$\vec{M} = \vec{M}_1 + \vec{M}_2 + \vec{M}_3 = 720\hat{i} + 540\hat{j} + 720\hat{k}$ N.m

El sistema se reduce a un par de

fuerzas cuyo momento es \vec{M} .

3.-



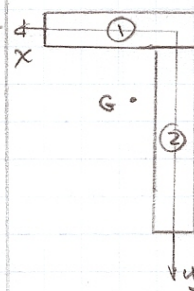
| | \bar{x}_i | \bar{y}_i | A_i | $\bar{x}_i A_i$ | $\bar{y}_i A_i$ |
|---|-------------|-------------|----------------------|----------------------|----------------------|
| | [pies] | [pies] | [pies ²] | [pies ³] | [pies ³] |
| ① | 2 | 1 | 12 | 24 | 12 |
| ② | 1 | 6 | 2(4+a) | 2(4+a) | 96 |
| ③ | 3 | 6.67 | $\frac{3a}{2}$ | $\frac{9a}{2}$ | 52 |

$\sum \bar{x}_i A_i = 32 + \frac{13a}{2}$; $\sum A_i = 20 + \frac{3a}{2}$

$\bar{X} = \frac{\sum \bar{x}_i A_i}{\sum A_i} = \frac{29}{17} \rightarrow a = 4$ pies,

$\Rightarrow \bar{y} = \frac{160}{34} = 4.70$ pies,

4.-



| | \bar{x}_i | \bar{y}_i | A_i | $\bar{x}_i A_i$ | $\bar{y}_i A_i$ |
|---|-------------|-------------|--------------------|--------------------|--------------------|
| | [cm] | [cm] | [cm ²] | [cm ³] | [cm ³] |
| ① | 2.5 | 0 | 6 | 15 | 0 |
| ② | 0 | 5 | 9 | 0 | 45 |

$\bar{x} = 1$ cm; $\bar{y} = 3$ cm

G(1, 3)

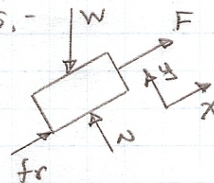
$\sum F_z = T_0 + T_A + T_B - 120 = 0$

Como $T_0 = T_A = T_B = T \Rightarrow T = 40$ N

$\sum M_{xx} = bT - 3W = 0 \Rightarrow b = 9$ cm,

$\sum M_{yy} = aT - W = 0 \Rightarrow a = 3$ cm,

5.-



$\sum F_x = \frac{1}{2}W - fr - F = 0$

$\sum F_y = N - \frac{\sqrt{3}}{2}W = 0$

$fr = \mu_s N$

$\Rightarrow F = \frac{1}{2}W - 0.5\left(\frac{\sqrt{3}}{2}W\right)$

$F = 6.69$ N

$F_h = \frac{\sqrt{3}}{2}F = 5.80$ N

$F_v = \frac{1}{2}F = 3.35$ N