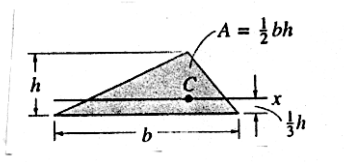
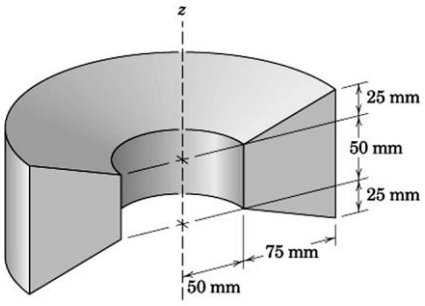
UFF – INSTITUTO DE FÍSICA
Mecânica Geral V – GFI 04.104
Prof. Cary Cassiano
1ª VE – 17/04/2012 – Turma A1

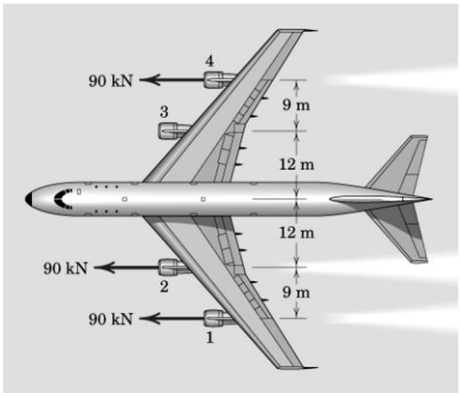
Nome: GABARITO

1. (2,5p) Calcule a massa da peça de alumínio mostrada.
Dados:
$\mu_{Al} = 2{,}69 \times 10^2$ kg/m³

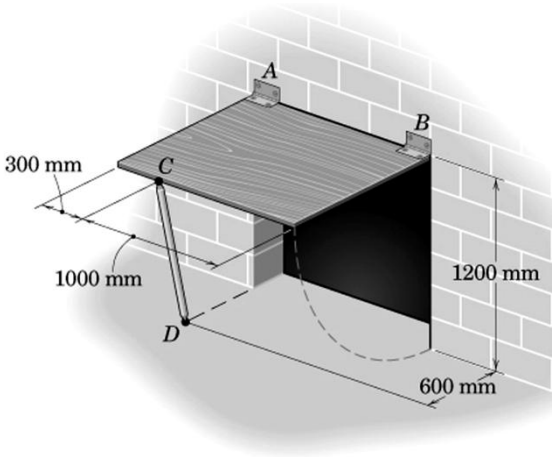




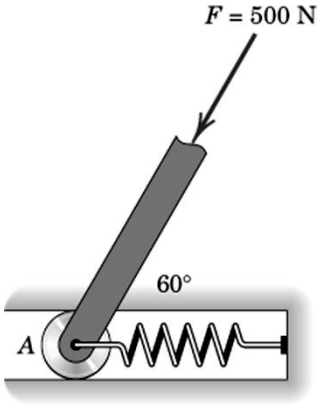
2. (2,5p) Um avião comercial com quatro turbinas a jato, cada uma produzindo um empuxo à frente de 90 kN, está em voo de cruzeiro, estacionário, quando o motor número 3 falha repentinamente. Determine e localize a resultante de empuxo dos três motores remanescentes.



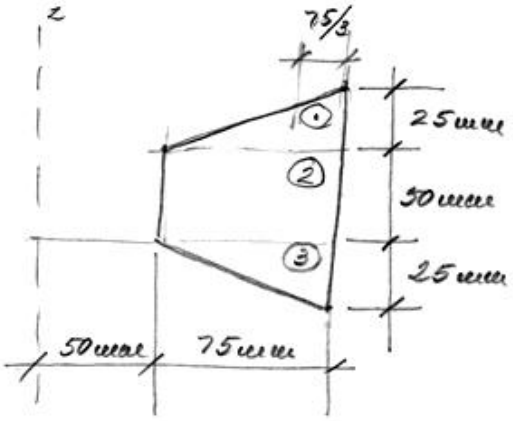
3. (2,5p) A porta retangular de acesso com 25 kg é mantida na posição aberta, a 90°, pelo apoio simples *CD*. Determine a força *F* no apoio e as reações nas dobradiças. A dobradiça *B* não exerce empuxo axial.
Utilize g = 9,81 m/s²

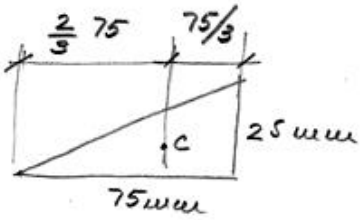


4. (2,5p) Determine o módulo F_s da força atuante na mola, para que a resultante de $\mathbf{F}_s$ e de $\mathbf{F}$ seja uma força vertical. Determine o módulo *R* desta força resultante vertical.



1. (2,5 p)





$$\bar{x}A = x_1A_1 + x_2A_2 + x_3A_3$$

$$\bar{x}A = \left(50+\frac{2}{3}\times 75\right)\times\frac{25\times 75}{2} + \left(50+\frac{75}{2}\right)\times 50\times 75 + \left(50+\frac{2}{3}\times 75\right)\times\frac{25\times 75}{2}$$

$$\bar{x}A = 515.625\ mm^3$$

$$V = 2\pi\bar{x}A$$

$$V = 1.619.883,71\ mm^3$$

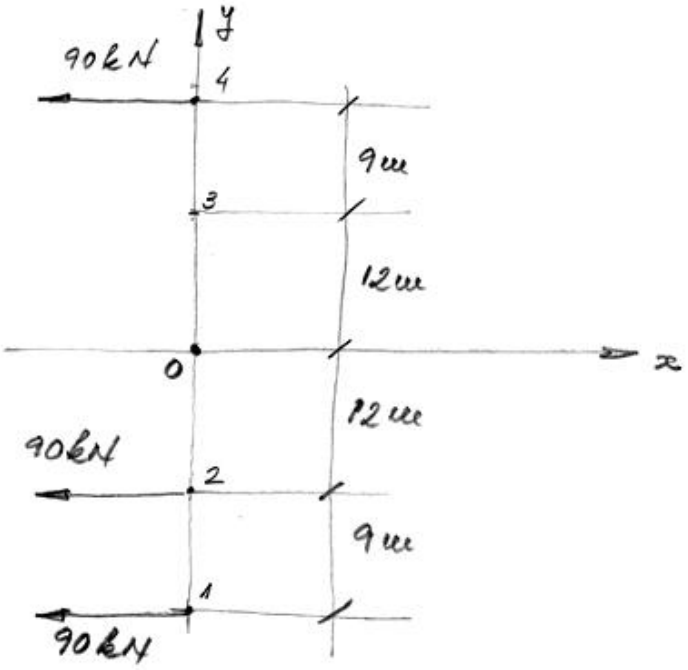
$$V = 0,0016\ m^3$$

$$\rho_{Al} = 2,69\times 10^2\ kg/m^3$$

$$\boxed{m_{Al} = 0,44\ kg}$$

$$\boxed{m_{Al} = 435.75\ g}$$

2. (2,5 ♦)

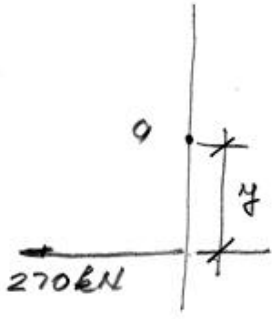


SISTEMA FORÇA-BINÁRIO EM O.

$$\vec{R} = -3\times 90\,\vec{j} = -270\ kN\,\vec{j}$$

$$(+) \quad M_0 = 90\times 12 + 90\times 21 - 90\times 21 = 1080\ kN\,m \quad (\circlearrowright)$$

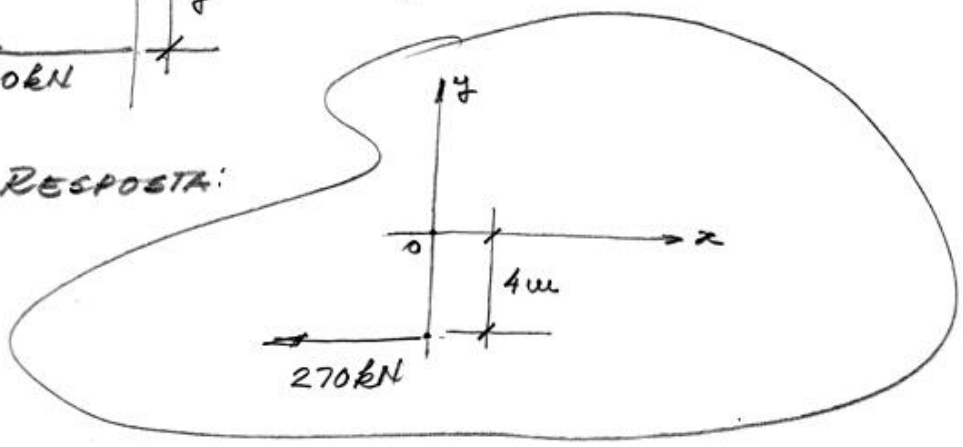
$$\vec{M}_0 = -1080\ kN.m\,\vec{k}$$



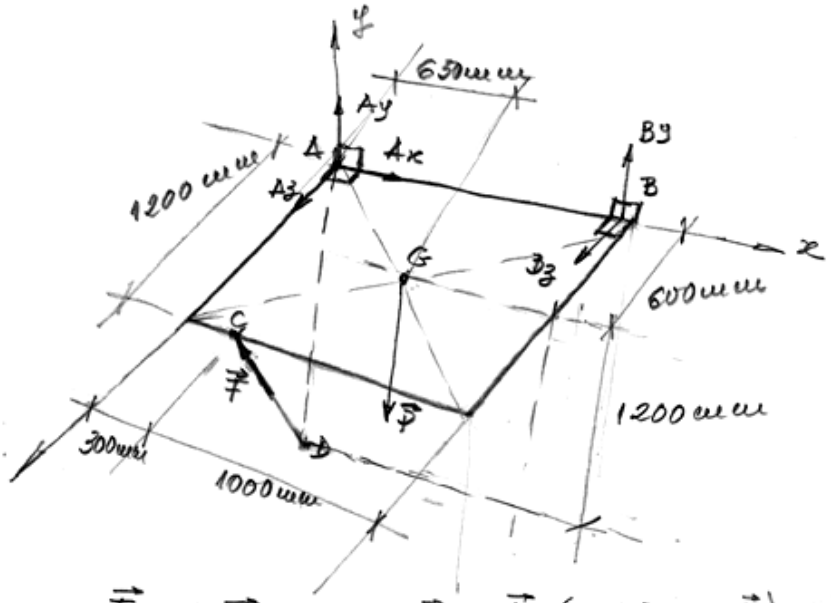
$$270\times y = 1080$$

$$y = 4{,}00\ m$$

RESPOSTA:



3. (2,5 ф)



$$\vec{F} = F\frac{\vec{DC}}{|\vec{DC}|} = F\frac{0{,}3\vec{i}+1{,}2\vec{k}-(-1{,}2\vec{j}+0{,}6\vec{k})}{|\vec{DC}|} = F\frac{0{,}3\vec{i}+1{,}2\vec{j}+0{,}6\vec{k}}{\sqrt{0{,}3^2+1{,}2^2+0{,}6^2}}$$

$$\vec{F} = 0{,}22F\vec{i} + 0{,}87F\vec{j} + 0{,}44F\vec{k}$$

$$\vec{P} = -[(25\times 9{,}81)N]\vec{j} = -(245{,}25\,N)\vec{j}$$

$$\vec{B} = By\vec{j} + Bz\vec{k}$$

$$\vec{A} = Ax\vec{i} + Ay\vec{j} + Az\vec{k}$$

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

$$\vec{AC}\wedge\vec{F} + \vec{AG}\wedge\vec{P} + \vec{AB}\wedge\vec{B} = 0$$

$$(0{,}3\vec{i}+1{,}2\vec{k})\wedge(0{,}22F\vec{i}+0{,}87F\vec{j}+0{,}44F\vec{k}) + (0{,}65\vec{i}+0{,}60\vec{k})\wedge(-245{,}25\vec{j}) +$$
$$+ 1{,}3\vec{i}\wedge(By\vec{j}+Bz\vec{k}) = 0$$

$$(-1{,}04F + 147{,}15)\vec{i} + (-0{,}27F - 1{,}3Bz)\vec{j} + (0{,}26F - 159{,}41 + 1{,}3By)\vec{k} = 0$$

$$-1{,}04F + 147{,}15 = 0 \longrightarrow F = 140{,}9\,N$$

$$-0{,}27F - 1{,}3Bz = 0 \longrightarrow Bz = -29{,}26\,N$$

$$0{,}26F - 159{,}41 + 1{,}3By = 0 \longrightarrow By = 94{,}44\,N$$

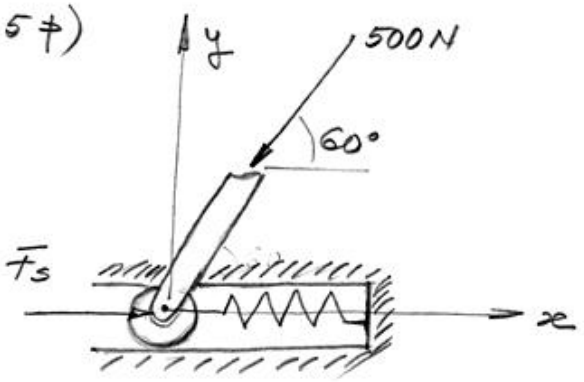
$$\Sigma Fx = 0 \longrightarrow 0{,}22F + Ax = 0 \longrightarrow Ax = -31\,N$$

$$\Sigma Fy = 0 \longrightarrow 0{,}87F - 245{,}25 + By + Ay = 0 \longrightarrow Ay = 28{,}23\,N$$

$$\Sigma Fz = 0 \longrightarrow 0{,}44F + Bz + Az = 0 \longrightarrow Az = -32{,}74\,N$$

$$F = 140{,}90\,N$$
$$\vec{A} = -(31{,}00\,N)\vec{i} + (28{,}23N)\vec{j} - (32{,}74N)\vec{k}$$
$$\vec{B} = (94{,}44N)\vec{j} - (29{,}26N)\vec{k}$$

4 (2,5 ♦)



R → vertical

$\overset{+}{\rightarrow} \Sigma F_x = 0$

$F_s - 500 \cos 60° = 0$

$$\boxed{F_s = 250\,N}$$

$R = \Sigma F_y$

$R = -500 \operatorname{sen} 60°$

$R = -433\,N$

$$\boxed{R = 433\,N \downarrow}$$