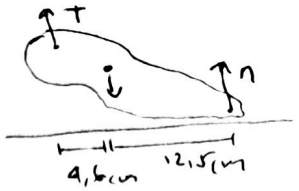
• ELASTICIDAD y FLUIDOS – PARCIAL 1 – SOLUCIÓN

1) $\Sigma \tau = 0$, $Y = \frac{T L_0}{A \Delta L} \rightarrow$ a)



b) $T(4,6) - n(12,5) = 0 \rightarrow T = n\left(\frac{12,5}{4,6}\right)$, $n = mg = 75 \cdot 9,8 = 735,7\ N$

$T \simeq 2000\ N \rightarrow T/n = 2,72$

c) $\Delta L = \frac{T L_0}{YA} = \frac{2000 \cdot 0,25}{1970 \cdot 78 \times 10^{6}} = 4,36\ mm$

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2) $I = \frac{1}{12} M L^2$, $K = \frac{1}{2} M V^2 = \frac{1}{2} I \omega^2$, $M_1 \omega_1^2 = M_2 \omega_2^2$

a) $I = 42,2\ kg \cdot m^2$, $\omega = 251\ rad/s \rightarrow K = 1,33\ MJ$

b) $\omega_2 = \omega_1 \sqrt{M_1/M_2} = 2400\ rpm \sqrt{\frac{M_1}{0,75 M_1}} = 2770\ rpm.$

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3) $\sigma = -F/A$, $A = \pi r^2$, $r = 0.1\ m$, $F = 1000\ kN = 10^6\ N$

a) $\sigma = -31,85\ MPa \rightarrow$ b) $T = \begin{bmatrix} \sigma & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$, c) $|\sigma| < \sigma_{lim} : 31,86 < 250$

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4) $\Delta V = -\frac{V_0 \Delta P}{B} = -\frac{(0,25)(1,6 \times 10^7)}{5 \times 10^9} = -8 \times 10^{-4}\ m^3 = 0,8\ L$

$\frac{\Delta V}{V} = -\frac{8 \times 10^{-4}}{0,25} = -0,0032 \rightarrow -0,32\ \%$

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5) a) $\frac{F_\perp}{A} = Y\left(\frac{\Delta L}{L_0}\right) \rightarrow F_\perp = (3 \times 10^{-4})(1,4 \times 10^{10})(0,01) = 4,2 \times 10^4\ N$

b) $F_{NET} = F'_\perp - mg$, $F'_\perp = 2 F_\perp \rightarrow F_{Net} = 8,4 \times 10^4 - (70)(9,8) = 8,33 \times 10^4\ N$

$F_{NET} = m a_y$, $\frac{1}{2} m v^2 = mgh \rightarrow a_y = 1,2 \times 10^3\ m/s^2 \rightarrow v_y = v_{oy} + a_y t$

$\rightarrow v_{oy} = -a_y \cdot t = (-1,2 \times 10^3)(0,03) = -35,7\ m/s$

$\rightarrow h = \frac{v_{oy}^2}{2g} = \frac{(-35,7)^2}{2(9,8)} = 65\ m$