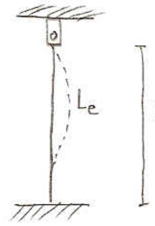
Pauta Examen

(P2) a) Para las condiciones

$L_e = 0.7\,L$

$L_e = 210$ mm (0.5)




Radio de giro sección transversal

$$r = \frac{b}{\sqrt{12}} = \frac{12}{\sqrt{12}} = 3.46 \text{ mm}$$ (0.5)

Razón de esbeltez (RE)

$$RE = \frac{L_e}{r} = 60.7$$ (0.5)

Constante de la columna (CC)

$$CC = \sqrt{\frac{2\pi^2 E}{\sigma_{fl}}} = \sqrt{\frac{2\pi^2 (207\times 10^9)}{414 \times 10^6}} = 99.35$$ (0.5)

RE < CC ⇒ se utiliza ecuación de Johnson (0.5)

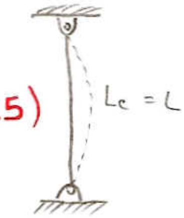
$$P_{CR} = b^2 \sigma_{FL} \left[ 1 - \frac{\sigma_{FL} (L_e/r)^2}{4\pi^2 E} \right]$$

$$P_{CR} = (144)(414) \left[ 1 - \frac{(414 \times 10^6)(60.7)^2}{4\pi^2 (207\times 10^9)} \right]$$

$P_{CR} = 48488$ [N] (0.5)

b) Para las condiciones

$L_e = L = 950 \text{ mm}$ (0.5)




Radio de giro sección transversal 

$$r = \frac{D}{4} = \frac{25}{4} = 6.25 \text{ mm} \quad (0.5)$$

Razón de esbeltez (RE)

$$RE = \frac{L_e}{r} = 152 \quad (0.5)$$

Constante de la columna (CC)

$$CC = \sqrt{\frac{2\pi^2 E}{\sigma_{fl}}} = \sqrt{\frac{2\pi^2 (207 \times 10^9)}{441 \times 10^6}} = 96.2 \quad (0.5)$$

RE > CC ⇒ se utiliza ecuación de Euler (0.5)

$$P_{CR} = \frac{\pi^2 E A}{(L_e/r)^2} \qquad A = \frac{\pi D^2}{4} = 491 \text{ mm}^2 = 491 \times 10^{-3} \text{ m}^2$$

$$P_{CR} = \frac{\pi^2 (207 \times 10^9)(491)}{(152)^2 (10^3)}$$

$$P_{CR} = 43400 \text{ [N]} \quad (0.5)$$

//