

Tema 4 - Ejercicio 1:

$$L1 := 3 \text{ m}$$

Sección 1

$$Dext1 := 10 \text{ cm}$$

$$L2 := 1 \text{ m}$$

$$Dint1 := 7 \text{ cm}$$

$$\lambda := 0.4 \text{ cm}$$

$$d := 60 \text{ cm}$$

$$G1 := 70 \text{ GPa}$$

$$\tau_{f11} := 14 \frac{\text{kN}}{\text{cm}^2}$$

$$CS := 1.6$$

Sección 2

$$Dext2 := 7 \text{ cm}$$

$$Dint2 := 3 \text{ cm}$$

$$G2 := 40 \text{ GPa}$$

$$\tau_{f12} := 10 \frac{\text{kN}}{\text{cm}^2}$$

$$CS := 1.6$$

$$\theta b := \frac{\lambda}{d} = 0.0067$$

$$\tau_{1adm} := \frac{\tau_{f11}}{CS} = 8.75 \frac{\text{kN}}{\text{cm}^2}$$

$$\tau_{2adm} := \frac{\tau_{f12}}{CS} = 6.25 \frac{\text{kN}}{\text{cm}^2}$$

$$Jp1 := \frac{\pi \cdot (Dext1^4 - Dint1^4)}{32} = 746.0301 \text{ cm}^4$$

$$Jp2 := \frac{\pi \cdot (Dext2^4 - Dint2^4)}{32} = 227.7655 \text{ cm}^4$$

$$(\theta 1 = \theta 2) = \theta b$$

$$\theta 1 := \frac{\lambda}{d} = 0.0067$$

$$\chi 1 = \chi 2$$

$$\frac{Mt1}{G1 \cdot Jp1} = \frac{Mt2}{G2 \cdot Jp2}$$

$$Mt1 := \frac{Mt2 \cdot G1 \cdot Jp1}{G2 \cdot Jp2}$$

$$\theta 1 := \frac{Mt1 \cdot L1}{G1 \cdot Jp1}$$

$$Mt1 := \frac{\theta b \cdot G1 \cdot Jp1}{L1} = 1.1605 \text{ kN m}$$

$$Mt2 := \frac{\theta b \cdot G2 \cdot Jp2}{L1} = 0.2025 \text{ kN m}$$

$$Mt1 := \frac{Mt2 \cdot G1 \cdot Jp1}{G2 \cdot Jp2} = 1.1605 \text{ kN m}$$

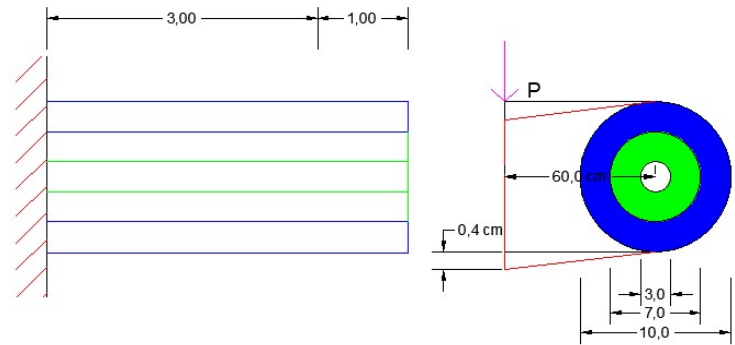
$$Mt := Mt1 + Mt2 = 1.3629 \text{ kN m}$$

$$P := \frac{Mt}{d} = 2.2716 \text{ kN}$$

$$\tau_{1ext} := \frac{Mt1 \cdot Dext1}{Jp1 \cdot 2} = 0.7778 \frac{\text{kN}}{\text{cm}^2}$$

$$\tau_{1int} := \frac{Mt1 \cdot Dint1}{Jp1 \cdot 2} = 0.5444 \frac{\text{kN}}{\text{cm}^2}$$

$$\tau_{2ext} := \frac{Mt2 \cdot Dext2}{Jp2 \cdot 2} = 0.3111 \frac{\text{kN}}{\text{cm}^2}$$



$$\tau_{2int} := \frac{Mt_2 \cdot D_{int2}}{J_{p2} \cdot 2} = 0.1333 \frac{\text{kN}}{\text{cm}^2}$$

$$\gamma_{1ext} := \frac{\tau_{1ext}}{G1} = 0.0001$$

$$\gamma_{1int} := \frac{\tau_{1int}}{G1} = 7.7778 \cdot 10^{-5}$$

$$\gamma_{2ext} := \frac{\tau_{2ext}}{G2} = 7.7778 \cdot 10^{-5}$$

$$\gamma_{2int} := \frac{\tau_{2int}}{G2} = 3.3333 \cdot 10^{-5}$$

$$Mt_{1max} := \frac{\tau_{1adm} \cdot J_{p1} \cdot 2}{D_{ext1}} = 13.0555 \text{ kN m}$$

$$Mt_{max} := Mt_{1max} \cdot \frac{Mt}{Mt1} = 15.3332 \text{ kN m}$$

$$\theta_{max} := \frac{Mt_{1max} \cdot L1}{G1 \cdot J_{p1}} = 0.075$$

$$\lambda_{max} := \theta_{max} \cdot d = 4.5 \text{ cm}$$