

Exercício 3.04.

$$A = \frac{\pi}{4} l^2 (1-d^2)$$

$$J_{xx} = J_{yy} = \frac{\pi}{64} l^4 (1-d^4)$$

$$W_{xx} = W_{yy} = \frac{\pi}{32} \cdot l^3 (1-d^4)$$

$$J_p = \frac{\pi l^4 (1-d^4)}{32} ; \quad W_p = \frac{\pi l^3 (1-d^4)}{16}$$

$$\bullet M_{f_{yy}AA} = (p \cdot l \cdot q) \cdot l$$

$$\sigma_{f_{AA}} = 0 ; \quad \sigma_{f_{BA-A}} = \frac{p \cdot l \cdot q \cdot l}{W_{yy}} ; \quad \sigma_{f_{CA-A}} = 0$$

$$\bullet M_{t_{AA}} = (q \cdot p \cdot l) \cdot \left(l - \frac{p \cdot l}{2} \right)$$

$$\tau_{M_{t_{AA}}} = \tau_{M_{t_{BA-A}}} = \tau_{M_{t_{CA-A}}} = \frac{M_{t_{AA}}}{W_p}$$

$$\bullet T_{AA} = q \cdot p \cdot l$$

$$\tau_{T_{AA-A}} = \tau_{T_{CA-A}} = \frac{T_{AA}}{A} \cdot \frac{4}{3} \left(1 + \frac{1}{\frac{1}{d} + d} \right)$$

$$\tau_{T_{BA-A}} = 0$$

$$\sigma_{1,2A} = \frac{\sigma_{f_{AA}}}{2} \pm \sqrt{\left(\frac{\sigma_{f_{AA}}}{2} \right)^2 + \left(\tau_{M_{t_{AA}}} - \tau_{T_{AA}} \right)^2}$$

$$\sigma_{1,2B} = \frac{\sigma_{f_{BB}}}{2} \pm \sqrt{\left(\frac{\sigma_{f_{BB}}}{2} \right)^2 + \left(\tau_{M_{t_{BB}}} \right)^2}$$

