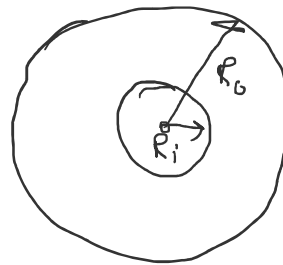
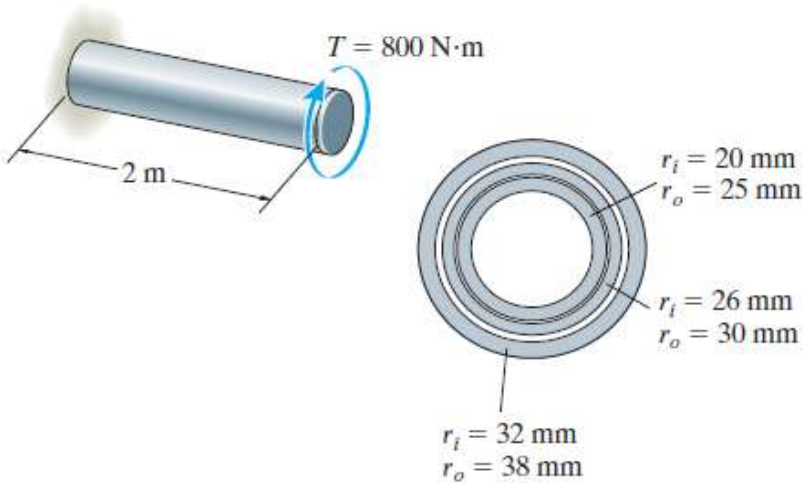


•5-9. The shaft consists of three concentric tubes, each made from the same material and having the inner and outer radii shown. If a torque of $T = 800 \text{ N}\cdot\text{m}$ is applied to the rigid disk fixed to its end, determine the maximum shear stress in the shaft.



$$J = \sum \frac{\pi}{2} (R_o^4 - R_i^4)$$

$$J = \frac{\pi}{2} (0.038^4 - 0.032^4) + \frac{\pi}{2} (0.03^4 - 0.026^4) + \frac{\pi}{2} (0.025^4 - 0.02^4)$$

$$J = 2.545 \times 10^{-6} \text{ m}^4$$

We know; Torque Equation:

$$\frac{T}{J} = \frac{\tau}{R} = \frac{C\theta}{L}$$

$$\Rightarrow \tau_{\max} = \frac{TR}{J} = \frac{800 \times 0.038}{2.545 \times 10^{-6}} = 11.9 \text{ MPa} \quad \underline{\text{ANS}}$$

This problem was solved by Civil Thinking (<https://civilthinking.com>)

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