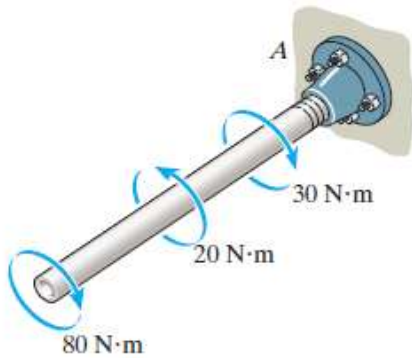
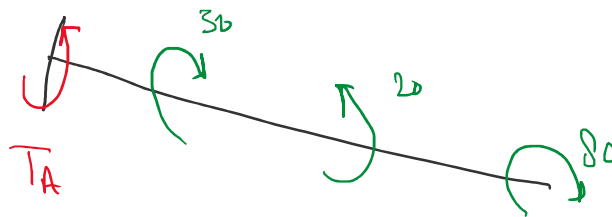


5-5. The copper pipe has an outer diameter of 40 mm and an inner diameter of 37 mm. If it is tightly secured to the wall at A and three torques are applied to it as shown, determine the absolute maximum shear stress developed in the pipe.



Solution :



$$\sum T = 0$$

$$80 - 20 + 30 - T_A = 0$$

$$\Rightarrow 90 - T_A = 0 \Rightarrow T_A = 90$$

$$\Rightarrow T_{max} = 90 \text{ N}\cdot\text{m}$$

$$\frac{\tau_{max}}{R} = \frac{T_{max}}{J} = \frac{90 \text{ Nm}}{\frac{\pi}{2} \left(\left(\frac{0.04}{2} \right)^4 - \left(\frac{0.037}{2} \right)^4 \right)} \quad (1)$$

Put $R = \frac{0.04}{2}$ in eqⁿ (1), we get

$$\tau_{max} = 26.7 \text{ MPa}$$

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

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