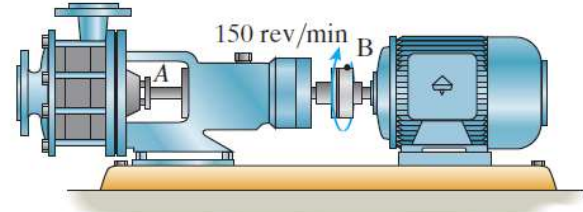


Torsion in Shafts. Question 5-32 Solution

Sunday, 9 March, 2025 09:01 AM

5-32. The pump operates using the motor that has a power of 85 W. If the impeller at B is turning at 150 rev/min, determine the maximum shear stress developed in the 20-mm-diameter transmission shaft at A.

*5-32. The pump operates using the motor that has a power of 85 W. If the impeller at B is turning at 150 rev/min, determine the maximum shear stress developed in the 20-mm-diameter transmission shaft at A.



Sol

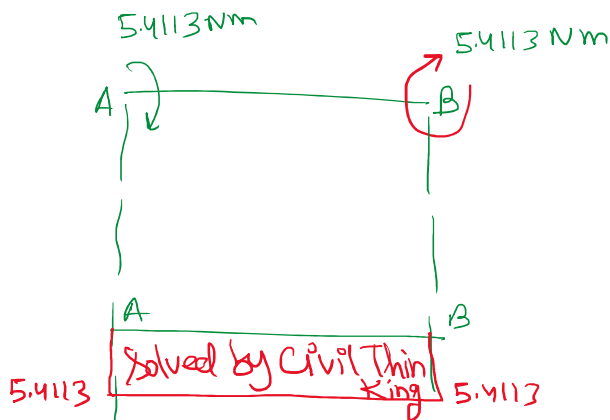
$$\sum T = 0 \Rightarrow R_A = T_B$$

$$T_B = \frac{P_B}{\omega} = \frac{85 \text{ Watt}}{2\pi \times \frac{150}{60}} = 5.4113 \text{ N}\cdot\text{m}$$

Civil

$$\Rightarrow R_A = 5.4113 \text{ N}\cdot\text{m}$$

Thinking



||

$$\tau_{\max, AB} = 5.4113 \text{ N}\cdot\text{m}$$

We know:

$$\frac{\tau}{R} = \frac{T}{J} \Rightarrow \tau_{max,A} = \frac{R}{J} \times T_{max,A}$$

$$\Rightarrow \tau_{max,A} = \frac{0.020\text{ m}/2}{\frac{\pi}{2} \left(\frac{0.020}{2}\right)^4} \times 5.4113 \text{ N}\cdot\text{m}$$

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$$\Rightarrow \tau_{max,A} = 3.44 \text{ MPa}$$

Ans.
Thinking

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