Torsion in Shafts. Question 5-33 Solution

Sunday, 9 March, 2025 09:22 AM

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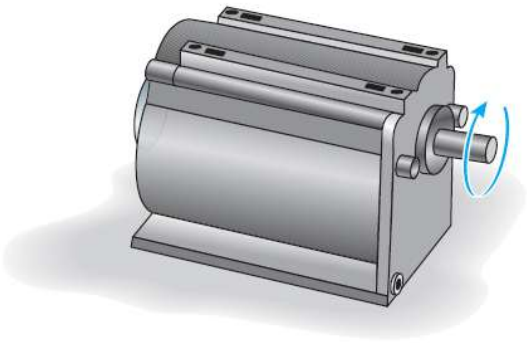

$T = \frac{P}{\omega}$

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$P = 2hp \times 550 = 1100\ ft \cdot lb/s$

$\omega = 2\pi N = 2\pi \times \frac{450}{60} = 15\pi\ rad/s$

$\Rightarrow T = \frac{1100}{15\pi} = 23.34\ lb \cdot ft = 280.11\ lb \cdot in$

$J = \frac{\pi}{2} 0.5^4 = 0.03125\pi$

We know!

$\frac{\tau_{max}}{R} = \frac{T}{J}$ [Torsion Equation]

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$\Rightarrow \tau_{max} = \frac{R}{J} \times T = \frac{0.5}{0.03125\pi} \times 280.11 = 1.43\ ksi$

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