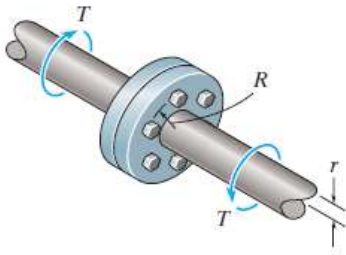**5–10.** The coupling is used to connect the two shafts together. Assuming that the shear stress in the bolts is *uniform*, determine the number of bolts necessary to make the maximum shear stress in the shaft equal to the shear stress in the bolts. Each bolt has a diameter *d*.

let n = number of bolts and F is the shear force in each bolt.

$$T - nFR = 0 \implies F = \frac{T}{nR}$$

$$\tau_{avg} = \frac{F}{A} = \frac{T/nR}{\frac{\pi}{4}d^2} = \frac{4T}{nR\pi d^2}$$

Max. Shear Stress for the Shaft:

$$\frac{\tau_{max}}{R} = \frac{T}{J} \quad [\text{Torque Equation}]$$

$$\implies \tau_{max} = \frac{TR}{J} = \frac{Tr}{\frac{\pi}{2}r^4} = \frac{2T}{\pi r^3}$$

$$\tau_{avg} = \tau_{max}; \quad \frac{4T}{nR\pi d^2} = \frac{2T}{\pi r^3}$$

$$\implies n = \frac{2r^3}{Rd^2} \quad \text{Answer By}$$

$$\Rightarrow \quad n = \frac{2\varepsilon}{Rd^2}$$

ANSWER BY

Er. ZULFY RAJAB

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