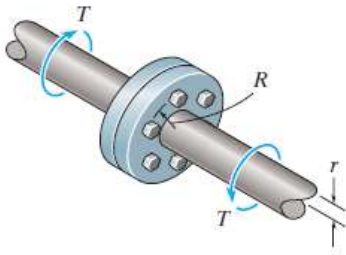


5-10. The coupling is used to connect the two shafts together. Assuming that the shear stress in the bolts is *uniform*, determine the number of bolts necessary to make the maximum shear stress in the shaft equal to the shear stress in the bolts. Each bolt has a diameter d .



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

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

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

Max. Shear Stress for the Shaft:

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

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

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

$$\Rightarrow n = \frac{2r^3}{Rd^2} \quad \text{Answer} \quad R4$$

$$\Rightarrow n = \frac{28}{Rd^2}$$

ANSWER BY

≡

Er. ZULFY RAJAB

≡

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

If you need solutions for **Strength of Materials** or any other **Civil Engineering** subject, contact us at:

solutions@civilthinking.com

You can also WhatsApp us at: +916005765266 to get

problem solutions.

Or submit your problem directly here:

 <https://civilthinking.com/getproblemsolutions>

Other Subjects We Cover:

- ☒ Structural Analysis
- ☒ Fluid Mechanics
- ☒ Geotechnical Engineering
- ☒ Transportation Engineering
- ☒ Construction Management
- ☒ Finite Element Analysis (FEA)
- ☒ Engineering Software (ANSYS, ETABS, MATLAB, Revit)

Let us help you solve your engineering challenges! 