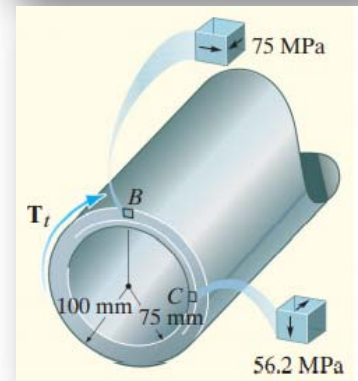
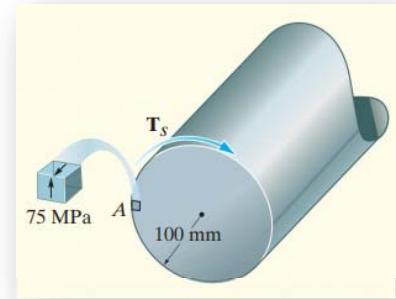


ME212 Strength of Materials 2021-2022

Chapter 5- Examples

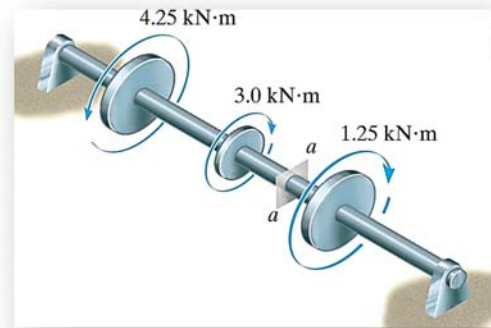
Exp. 1

The solid shaft and tube shown in the Figure are made of a material having an allowable shear stress of 75 MPa. Determine the maximum torque that can be applied to each cross section, and show the stress acting on a small element of material at point *A* of the shaft, and points *B* and *C* of the tube.



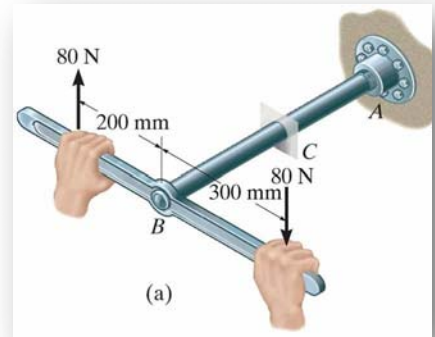
Exp. 2

The 0.075 m-diameter shaft shown in the Figure is supported by two bearings and is subjected to three torques. Determine the shear stress developed at points *A* and *B*, located at section *a – a* of the shaft.



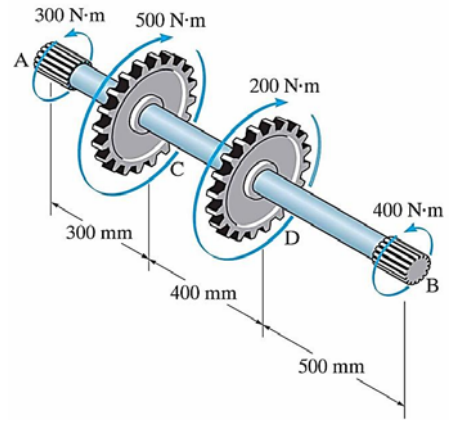
Exp.3

The pipe shown in Fig.a has an inner radius of 40 mm and an outer radius of 50 mm. If its end is tightened against the support at *A* using the torque wrench, determine the shear stress developed in the material at the inner and outer walls along the central portion of the pipe.



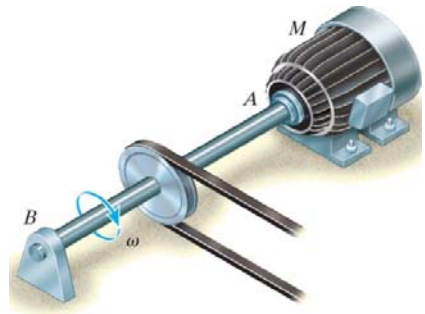
Exp.4

The solid 30-mm-diameter shaft is used to transmit the torques applied to the gears. Determine the absolute maximum shear stress on the shaft.



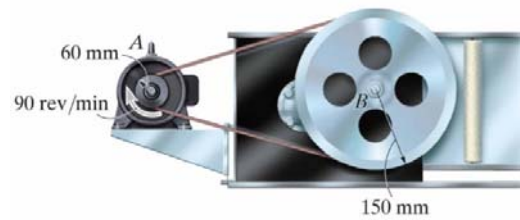
Exp.5

A solid steel shaft AB , shown in the figure, is to be used to transmit 3750 W from the motor M to which it is attached. If the shaft rotates at 175 rpm and the steel has an allowable shear stress of $\tau_{allow} = 100$ MPa determine the required diameter of the shaft to the nearest mm.



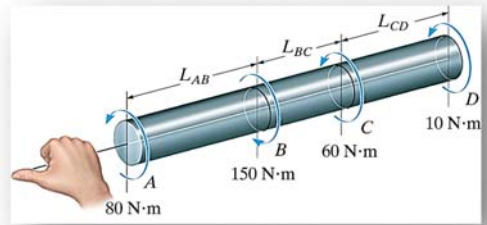
Exp.6

The motor *A* develops a power of 300 *W* and turns its connected pulley at 90 rev/min. Determine the required diameters of the steel shafts on the pulleys at *A* and *B* if the allowable shear stress is $\tau_{allow} = 85$ MPa.



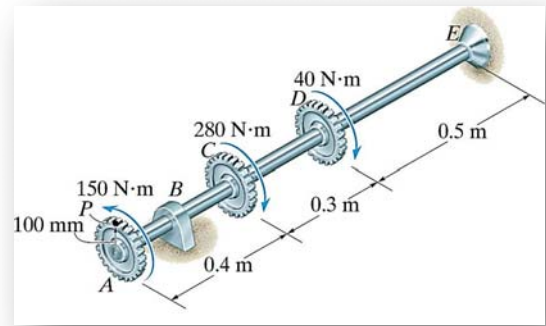
Exp.7

Determine the angle of twist of the end A of the A-36 steel shaft shown in the Figure. Also, what is the angle of twist of A relative to C ? The shaft has a diameter of 20 mm.



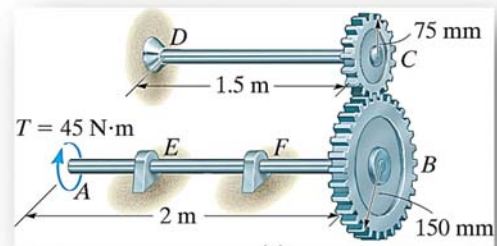
Exp.8

The gears attached to the fixed-end steel shaft are subjected to the torques shown in the figure. If the shear modulus of elasticity is $G = 80 \text{ GPa}$ and the shaft has a diameter of 14 mm , determine the displacement of the tooth P on gear A . The shaft turns freely within the bearing at B .



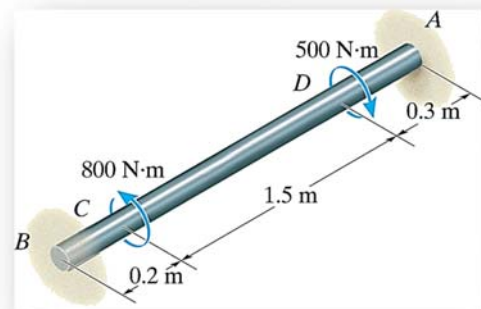
Exp.9

The two solid steel shafts are coupled together using the meshed gears. Determine the angle of twist of end A of shaft AB when the torque $T = 45 \text{ N} \cdot \text{m}$ is applied. Shaft DC is fixed at D . Each shaft has a diameter of 20 mm . $G = 80 \text{ GPa}$.



Exp.10

The solid steel shaft shown in figure has a diameter of 20 mm. If it is subjected to the two torques, determine the reactions at the fixed supports *A* and *B*.



Exp.11

The shaft shown in figure is made from a steel tube, which is bonded to a brass core. If a torque of $T = 250 \text{ N} \cdot \text{m}$ is applied at its end, plot the shear stress distribution along a radial line of its cross-sectional area. Take $G_{st} = 80 \text{ GPa}$, $G_{br} = 36 \text{ GPa}$.

