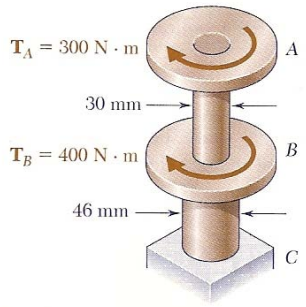

Fig. P3.9

3.9 The torques shown are exerted on pulleys A and B. Knowing that each shaft is solid, determine the maximum shearing stress (*a*) in shaft AB (*b*) in shaft BC.

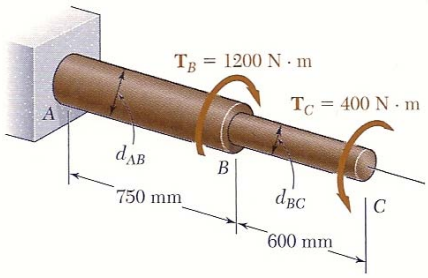

Fig. *P3.17*

3.17 The solid shaft shown is formed of a brass for which the allowable shearing stress is 55 MPa. Neglecting the effect of stress concentrations, determine the smallest diameters d_{AB} and d_{BC} for which the allowable shearing stress is not exceeded.

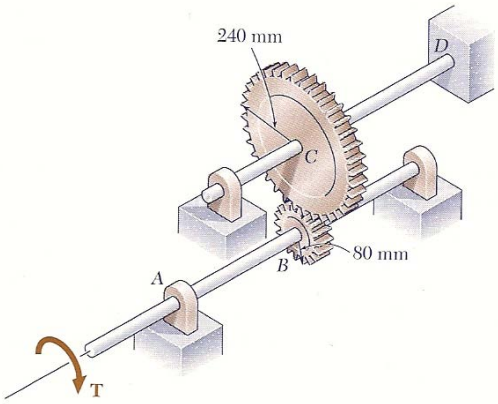

Fig. P3.23

3.23 Two solid steel shafts are connected by the gears shown. A torque of magnitude T = 900 N · m is applied to shaft AB. Knowing that the allowable shearing stress is 50 MPa and considering only stresses due to twisting, determine the required diameter of (*a*) shaft AB, (*b*) shaft CD.

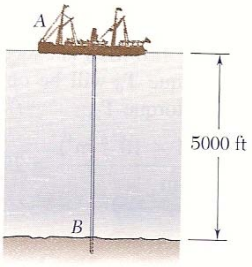

Fig. P3.33

3.33 The ship at A has just started to drill for oil on the ocean floor a a depth of 5000 ft. Knowing that the top of the 8-in.-diameter steel drill pipe ($G = 11.2 \times 10^6$ psi) rotates through two complete revolutions before the drill bit at B starts to operate, determine the maximum shearing stress caused in the pipe by torsion.

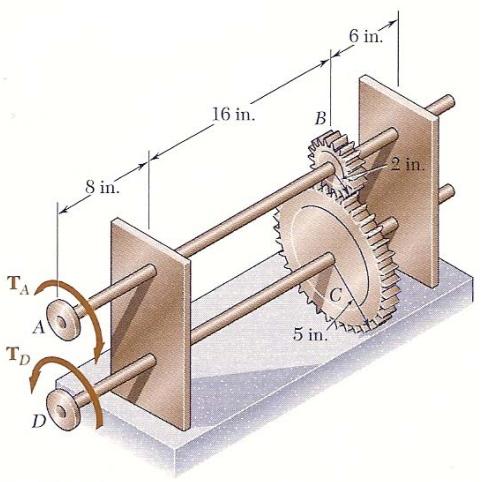

Fig. P3.47

3.47 The design specifications for the gear-and-shaft system shown require that the same diameter be used for both shafts and that the angle through which pulley *A* will rotate when subjected to a 2-kip · in. torque $\mathbf{T}_A$ while pulley D is held fixed will not exceed 7.5°. Determine the required diameter of the shafts if both shafts are made of a steel with $G = 11.2 \times 10^6$ psi and $\tau_{all} = 12$ ksi.

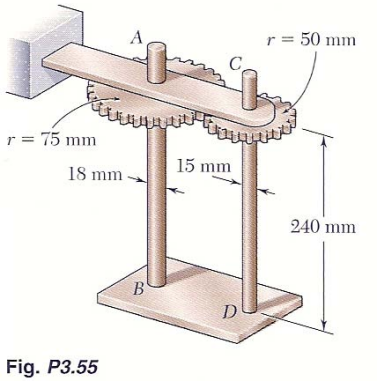

Fig. *P3.55*

3.56 Solve Prob. 3.55, assuming that the 80 N*m torque is applied to end C of shaft CD.

3.55 At a time when rotation is prevented at the lower end of each shaft, a 50 N*m torque is applied to end A of shaft AB. Knowing that G=77.2 GPa for both shafts, determine (a) the maximum shearing stress in shaft CD, (b) the angle of rotation at A.