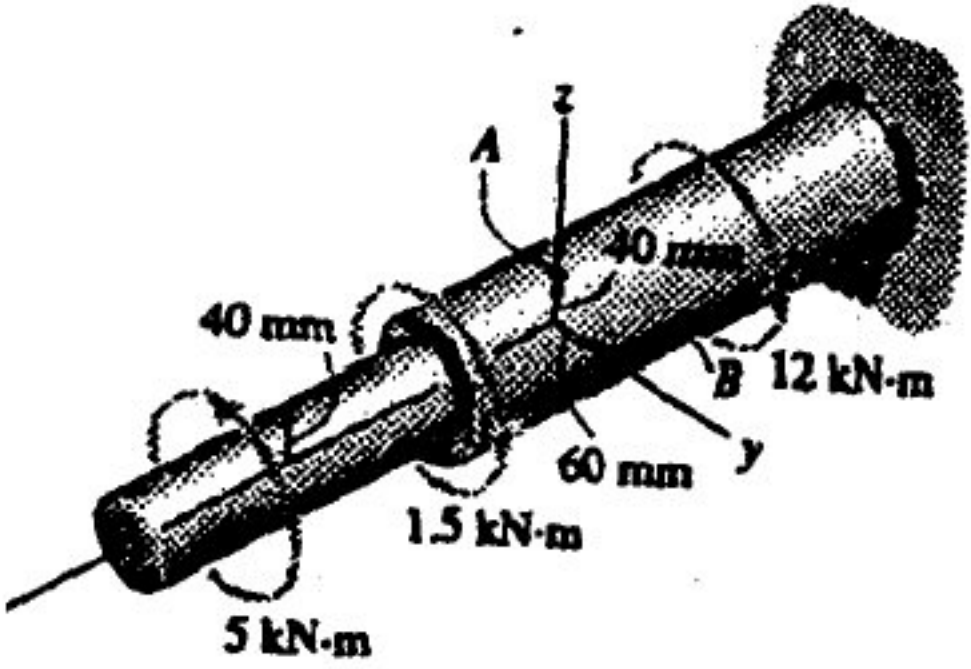
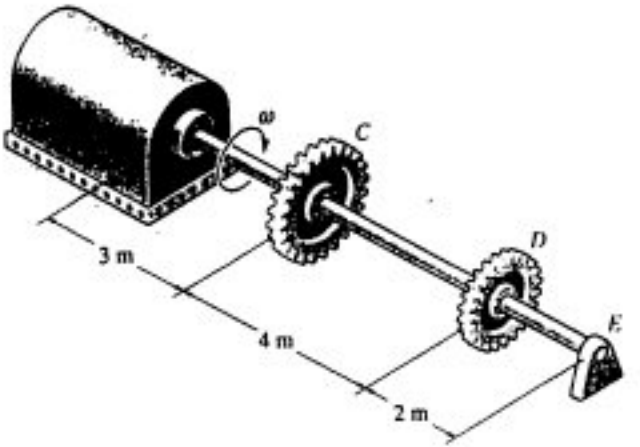
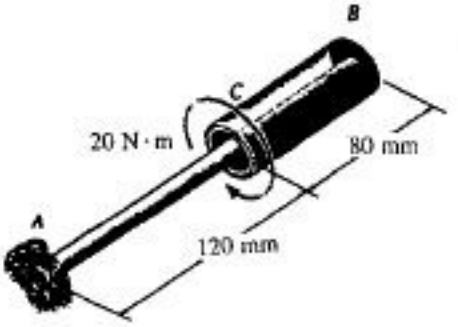
5–19. The steel shaft is subjected to the torsional loading shown. Determine the absolute maximum shear stress in the shaft and sketch the shear-stress distribution along a radial line where it is maximum.



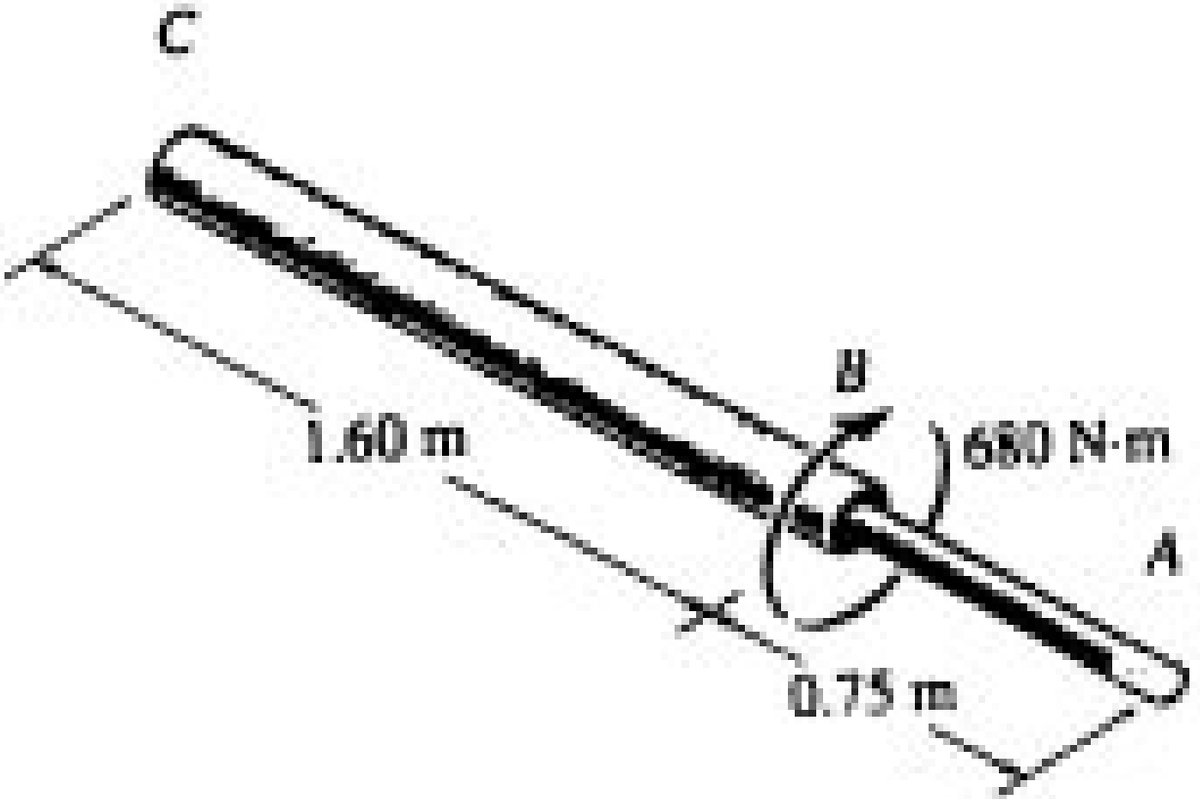
5-53. The turbine develops 150 kW of power, which is transmitted to the gears such that C receives 70% and D receives 30%. If the rotation of the 100-mm-diameter A-36 steel shaft is $\omega = 800$ rev/min, determine the absolute maximum shear stress in the shaft and the angle of twist of end E of the shaft relative to B. The journal bearing at E allows the shaft to turn freely about its axis. $G = 75$ GPa.



5-61. The A-36 steel assembly consists of a tube having an outer radius of 20 mm and a wall thickness of 2.5 mm. Using a rigid plate at B, it is connected to the solid 20-mm-diameter shaft AB. Determine the rotation of the tube's end C if a torque of 20 N · m is applied to the tube at this end. The end A of the shaft is fixed-supported. $G = 76$ GPa.



5-74. A rod is made from two segments: AB is steel and BC is brass. It is fixed at its ends and subjected to a torque of $T = 680\ \text{N} \cdot \text{m}$. If the steel portion has a diameter of 30 mm, determine the required diameter of the brass portion so the reactions at the walls will be the same. $G_{st} = 75\ \text{GPa}$. $G_{br} = 39\ \text{GPa}$.



5-79. The shaft is made from a solid steel section AB and a tubular portion made of steel and having a brass core. If it is fixed to a rigid support at A, and a torque of $T = 50\ \text{N} \cdot \text{m}$ is applied to it at C, determine the angle of twist that occurs at C and compute the maximum shear and maximum shear strain in the brass and steel. $G_{st} = 80\ \text{GPa}$, $G_{br} = 40\ \text{GPa}$.