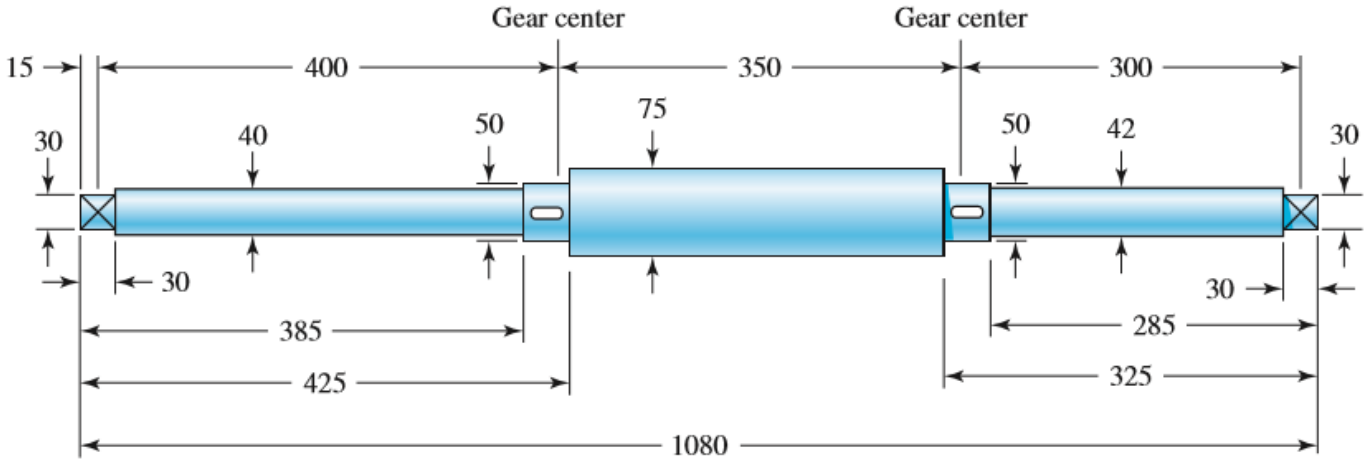
Exercise

Chapter 4

7–21* The shaft shown in the figure is proposed for the application defined in Prob. 3–73, p. 152. The material is AISI 1018 cold-drawn steel. The gears seat against the shoulders, and have hubs with setscrews to lock them in place. The effective centers of the gears for force transmission are shown. The keyseats are cut with standard endmills. The bearings are press-fit against the shoulders. Determine the minimum fatigue factor of safety using the DE-Gerber failure criterion.



*Problem 7–21**

All fillets 2 mm. Dimensions in mm.

3–72* to 3–73*

A gear reduction unit uses the countershaft shown in the figure. Gear A receives power from another gear with the transmitted force F_A applied at the 20° pressure angle as shown. The power is transmitted through the shaft and delivered through gear B through a transmitted force F_B at the pressure angle shown.

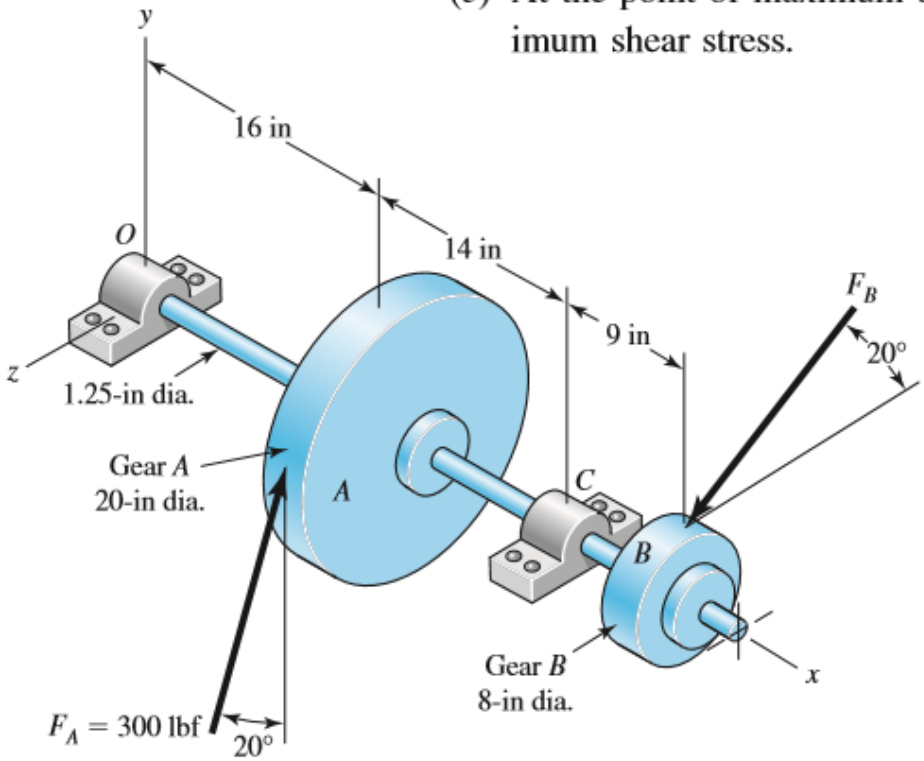
(*a*) Determine the force F_B, assuming the shaft is running at a constant speed.

(*b*) Find the bearing reaction forces, assuming the bearings act as simple supports.

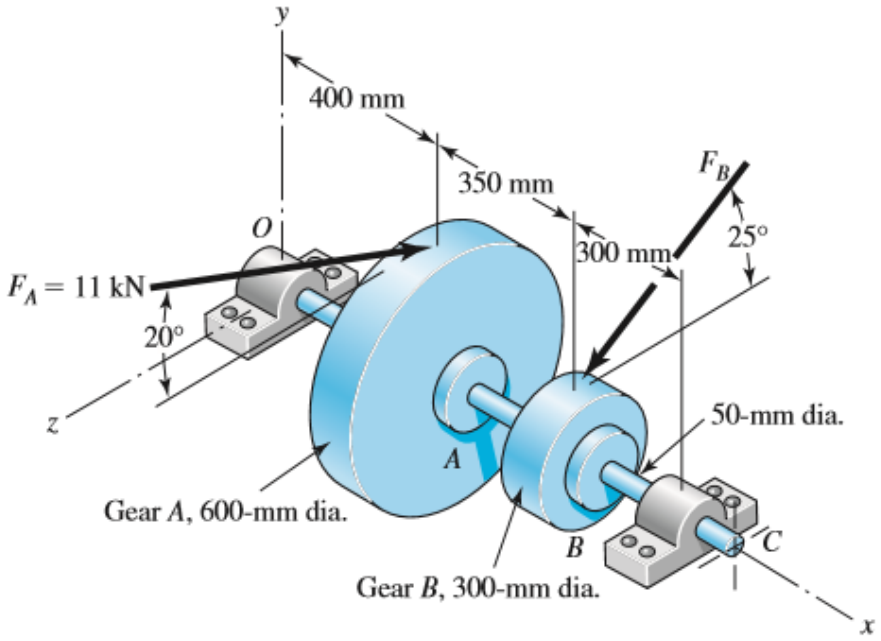
(*c*) Draw shear-force and bending-moment diagrams for the shaft. If needed, make one set for the horizontal plane and another set for the vertical plane.

(*d*) At the point of maximum bending moment, determine the bending stress and the torsional shear stress.

(*e*) At the point of maximum bending moment, determine the principal stresses and the maximum shear stress.



*Problem 3–72**



*Problem 3–73**