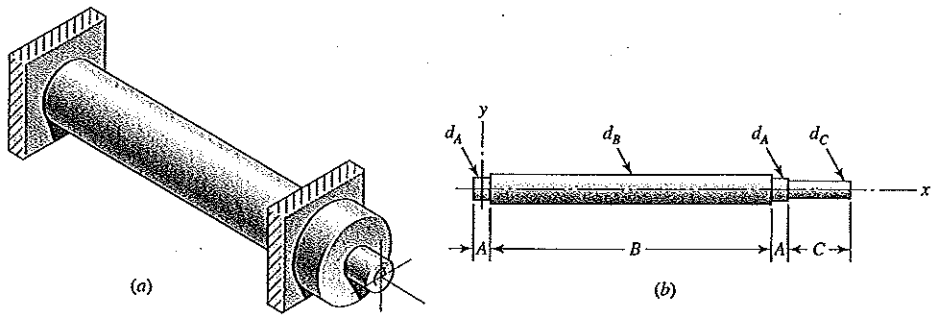
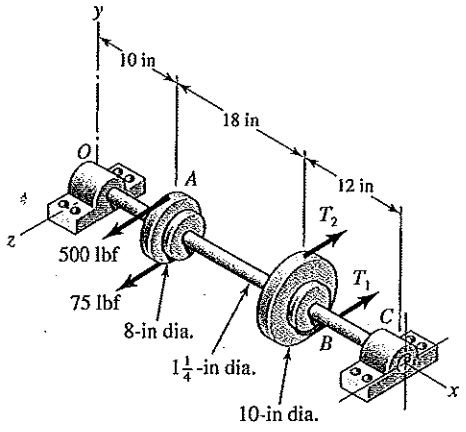
Problem 3–65



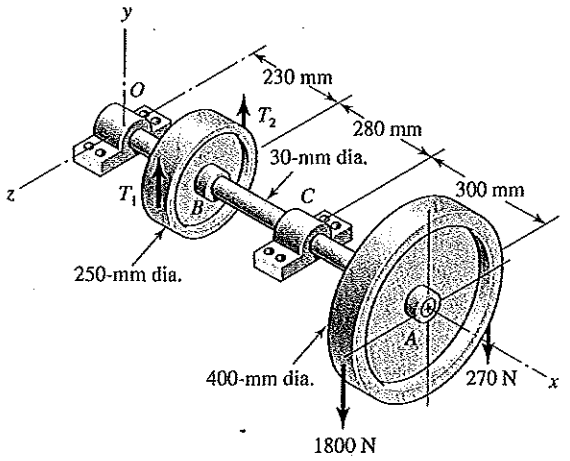
3-66 The conveyer drive roll in the figure for Prob. 3–65 is 5 in in diameter and is driven at 8 rev/min by a geared-motor source rated at 1 hp. Find a suitable shaft diameter d_C based on an allowable torsional stress of 15 kpsi.

3-67 Consider two shafts in torsion, each of the same material, length, and cross-sectional area. One shaft has a solid square cross section and the other shaft has a solid circular section.
(*a*) Which shaft has the greater maximum shear stress and by what percentage?
(*b*) Which shaft has the greater angular twist θ and by what percentage?

3-68* to 3-71* A countershaft carrying two V-belt pulleys is shown in the figure. Pulley *A* receives power from a motor through a belt with the belt tensions shown. The power is transmitted through the shaft and delivered to the belt on pulley *B*. Assume the belt tension on the loose side at *B* is 15 percent of the tension on the tight side.
(*a*) Determine the tensions in the belt on pulley *B*, assuming the shaft is running at a constant speed.
(*b*) Find the magnitudes of 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 3–68*



Problem 3–69*

Problem Number	Problem, Page Number Defining Shaft
4–23*	3–68, 137
4–24*	3–69, 137
4–25*	3–70, 137
4–26*	3–71, 137
4–27*	3–72, 138
4–28*	3–73, 138

4–29* to 4–34* For the steel countershaft specified in the table, find the slope of the shaft at each bearing. Use superposition with the deflection equations in Table A–9. Assume the bearings constitute simple supports.

Problem Number	Problem, Page Number Defining Shaft
4–29*	3–68, 137
4–30*	3–69, 137
4–31*	3–70, 137
4–32*	3–71, 137
4–33*	3–72, 138
4–34*	3–73, 138

4–35* to 4–40* For the steel countershaft specified in the table, assume the bearings have a maximum slope specification of 0.06° for good bearing life. Determine the minimum shaft diameter.

Problem Number	Problem, Page Number Defining Shaft
4–35*	3–68, 137
4–36*	3–69, 137
4–37*	3–70, 137
4–38*	3–71, 137
4–39*	3–72, 138
4–40*	3–73, 138

4–41* The cantilevered handle in the figure is made from mild steel that has been welded at the joints. For $F_y = 200$ lbf, $F_x = F_z = 0$, determine the vertical deflection (along the y axis) at the tip. Use superposition. See the discussion on p. 102 for the twist in the rectangular cross section in section BC.