6.98 For the frame and loading shown, determine the components of all forces acting on member ABD.

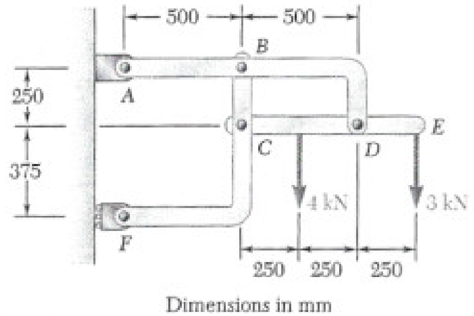

Fig. P6.98

6.99 For the frame and loading shown, determine the components of all forces acting on member $GBEH$.

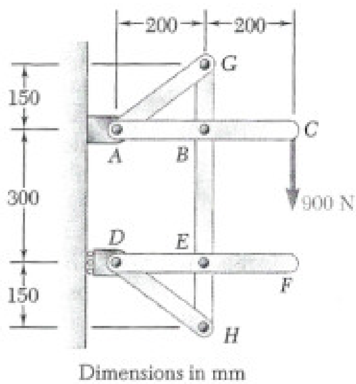

Fig. *P6.99*

6.100 For the frame and loading shown, determine the components of the forces acting on member ABC at B and C.

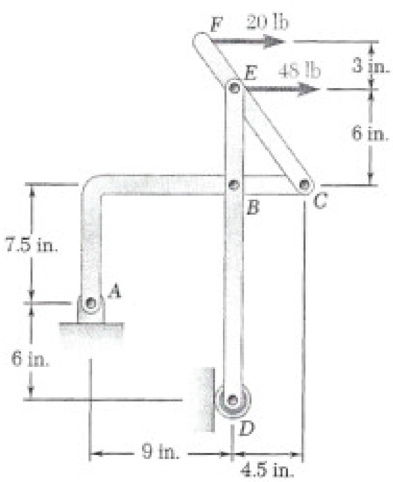

Fig. P6.100

4.84 Using the method of Sec. 4.7, solve Prob. 4.25.

4.85 The uniform rod AB of mass m and length L is attached to two blocks which slide freely in circular slots as shown. Knowing that the rod is in equilibrium and that $L = 2R$, determine (*a*) the angle α that the rod forms with the horizontal, (*b*) the reactions at A and B.

*4.86 The uniform rod AB of mass m and length L is attached to two blocks which slide freely in circular slots as shown. Knowing that $\alpha = 45°$, determine (*a*) the largest value of L for which the rod is in equilibrium, (*b*) the corresponding reactions at A and B.

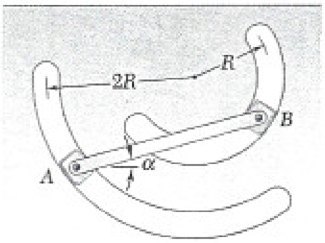

Fig. *P4.85* and P4.86

4.87 The total weight of a wheelbarrow filled with gravel is 120 lb. If the wheelbarrow is held on an 18° incline in the position shown, determine the magnitude and direction of (*a*) the force exerted by the worker on each handle, (*b*) the reaction at C. (*Hint*. The wheel is a two-force body.)

4.88 Solve Prob. 4.87 assuming that the slope of the incline is 18° downward.

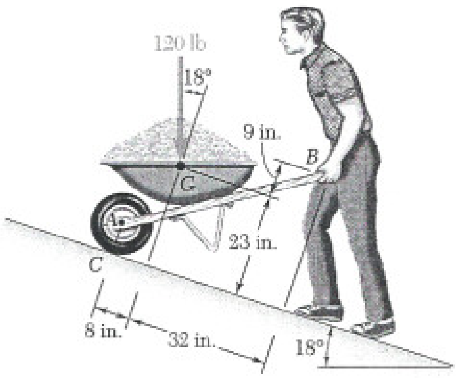

Fig. P4.87

4.89 A uniform slender rod 10 in. long and weighing 0.01 lb is balanced on a glass of inner diameter 2.8 in. Neglecting friction, determine the angle θ corresponding to equilibrium.

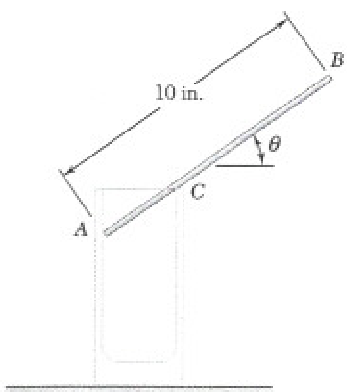

Fig. P4.89

4.90 A slender rod of length L and weight W is attached to collars which can slide freely along the guides shown. Knowing that the rod is in equilibrium, derive an expression for the angle θ in terms of the angle β.

4.91 A 10-kg slender rod of length L is attached to collars which can slide freely along the guides shown. Knowing that the rod is in equilibrium and that $\beta = 25°$, determine (*a*) the angle θ that the rod forms with the vertical, (*b*) the reactions at A and B.

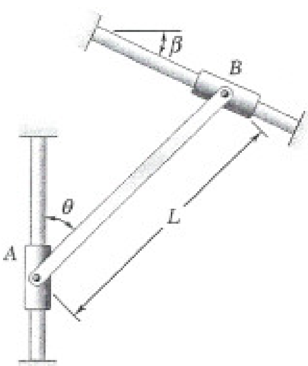

Fig. P4.90 and P4.91

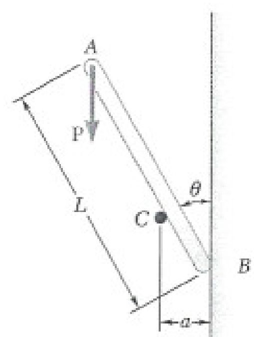

Fig. P4.92

4.92 A slender rod of length L is lodged between peg C and the vertical wall. It supports a load **P** at end A. Neglecting friction and the weight of the rod, determine the angle θ corresponding to equilibrium.

4.93 An athlete is doing push-ups on an inclined board. Neglecting friction between his shoes and the board, determine the value of θ if he wants to limit the magnitude of the total force exerted on his hands to 80 percent of his weight.

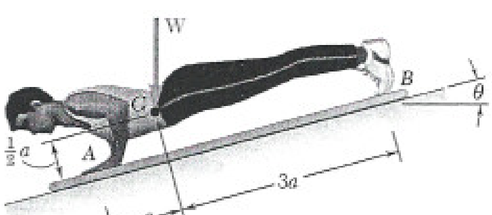

Fig. P4.93

Review Problems

7.147 A semicircular rod is loaded as shown. Determine the internal forces at point J knowing that $\theta = 30°$.

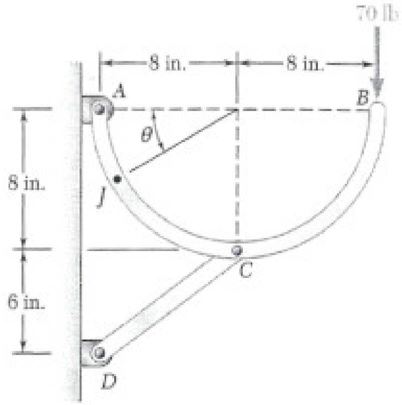

Fig. P7.147

7.148 Knowing that the radius of each pulley is 7.2 in. and neglecting friction, determine the internal forces at point J of the frame shown.

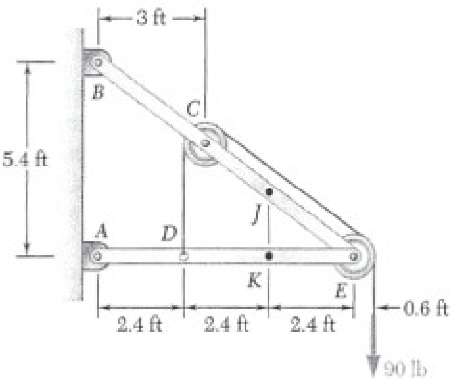

Fig. P7.148

7.149 A quarter-circular rod of weight W and uniform cross section is supported as shown. Determine the bending moment at point J when $\theta = 30°$.

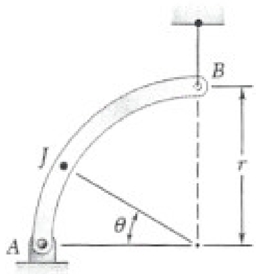

Fig. *P7.149*

7.150 For the beam and loading shown, (*a*) draw the shear and bending-moment diagrams, (*b*) determine the maximum absolute values of the shear and bending moment.

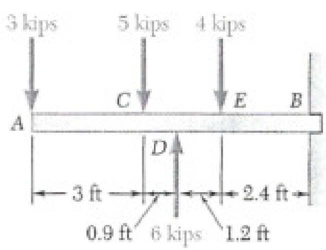

Fig. P7.150

9.47 and 9.48 Determine the polar moment of inertia of the area shown with respect to (a) point O, (b) the centroid of the area.

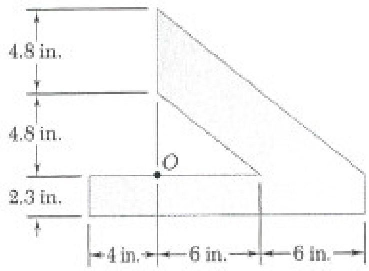

Fig. P9.47

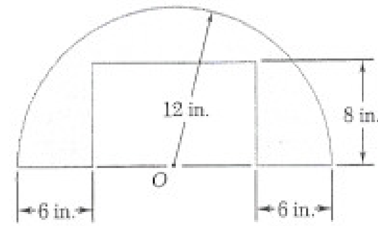

Fig. P9.48

9.49 Two $6 \times 4 \times \frac{1}{2}$-in. angles are welded together to form the section shown. Determine the moments of inertia and the radii of gyration of the section with respect to the centroidal axes shown.

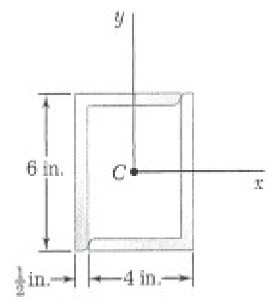

Fig. P9.49

9.50 Two channels and two plates are used to form the column section shown. Determine the moments of inertia and the radii of gyration of the combined section with respect to the centroidal axes shown.

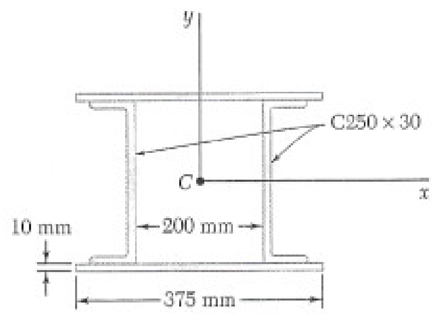

Fig. P9.50

9.51 Two C10 × 20 channels are welded to a 10 × 35 rolled S section as shown. Determine the moments of inertia and the radii of gyration of the combined section with respect to its centroidal x and y axes.

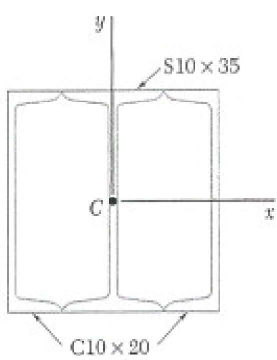

Fig. P9.51

9.52 Two channels are welded to a $d \times 300$-mm steel plate as shown. Determine the width d for which the ratio $\bar{I}_x/\bar{I}_y$ of the centroidal moments of inertia of the section is 16.

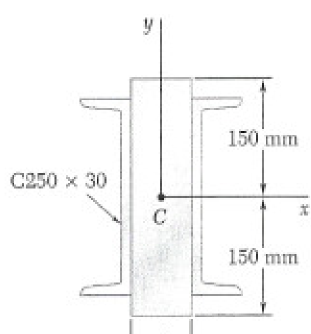

Fig. P9.52

9.129 Shown is the cross section of the wheel of a caster. Determine its mass moment of inertia and radius of gyration with respect to axis AA'. (The specific weight of bronze is 0.310 lb/in^3; of steel, 0.284 lb/in^3; and of hard rubber, 0.043 lb/in^3.)

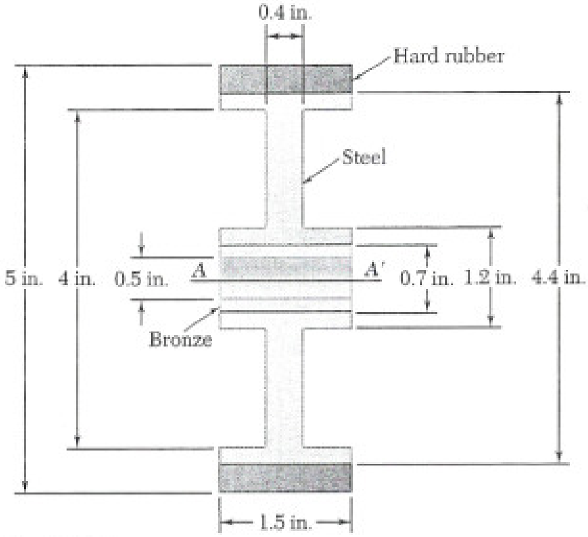

Fig. P9.129

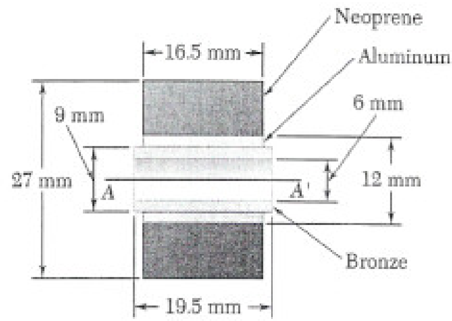

Fig. P9.130

9.130 Shown is the cross section of an idler roller. Determine its mass moment of inertia and its radius of gyration with respect to the axis AA'. (The density of bronze is 8580 kg/m^3; of aluminum, 2770 kg/m^3; and of neoprene, 1250 kg/m^3.)

9.131 Knowing that the thin hemispherical shell shown is of mass m and thickness t, determine the mass moment of inertia and the radius of gyration of the shell with respect to the x axis. (*Hint:* Consider the shell as formed by removing a hemisphere of radius r from a hemisphere of radius $r + t$; then neglect the terms containing t^2 and t^3 and keep those terms containing t.)

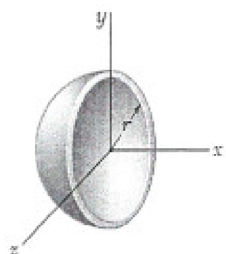

Fig. P9.131

9.132 For the homogenous ring of density ρ shown, determine (a) the mass moment of inertia with respect to the axis BB', (b) the value of a_1 for which, given a_2 and h, $I_{BB'}$ is maximum, (c) the corresponding value of $I_{BB'}$.

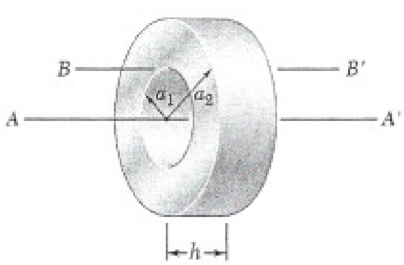

Fig. P9.132