

Homework 4. Review of Basic Stress Analysis
From Mott, Machine Elements in Mech. Des.
Assigned: 9/5/12, Due: 9/12/12

A tensile load of 5.00 kN is applied to a square bar, 12 mm on a side and having a length of 1.65 m. Compute the stress and the axial deformation in the bar if it is made from: (a) AISI 1020 hot-rolled steel, (b) AISI 8650 OQT 1000 steel, (c) ductile iron A536-88 (60-40-18), (d) aluminum 6061-T6, (e) titanium Ti-6Al-4V.

An aluminum rod is made in the form of a hollow square tube, 2.25 in outside, with a wall thickness of 0.120 in. Its length is 16.0 in. What axial compressive force would cause the tube to shorten by 0.004 in? Compute the resulting compressive stress in the aluminum.

Compute the forces in the two angled rods in Figure P3-9 for an applied force, $F=1500$ lb, if the angle, θ , is 45° .

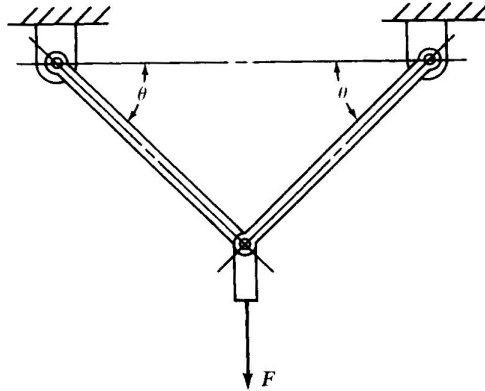


FIGURE P3-9

Compute the torsional shear stress in a circular shaft with a diameter of 50 mm that is subjected to a torque of 800 N·m. If the shaft is 850 mm long, and is made of steel, compute the angle of twist of one end in relation to the other.

Compute the maximum tensile stress in the bracket shown in Figure P3-51.

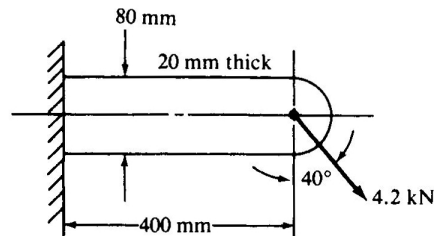


FIGURE P3-51

Figure P3-12 shows a small truss spanning between solid supports and suspending a 10.5 kN load. The cross-sections for the three main types of truss members are shown. Compute the stresses in all the members of the truss near their midpoints away from the connections. Consider all joints pinned.

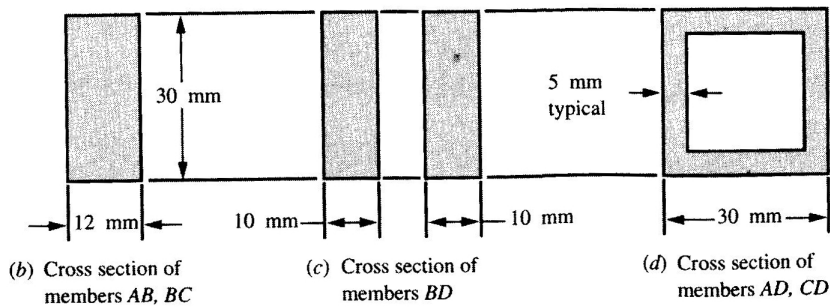
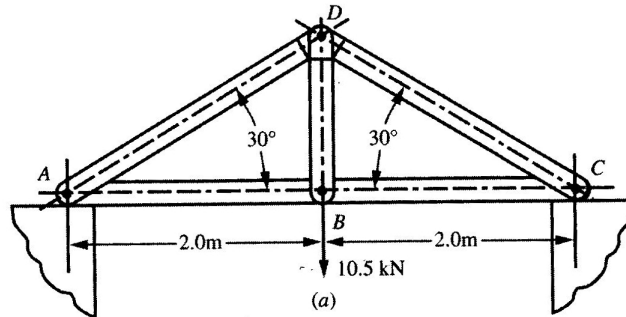


FIGURE P3-12

For the beam loading of Figure P3-34, draw the complete shearing force and bending moment of diagrams, and determine the bending moments at points A, B, and C.

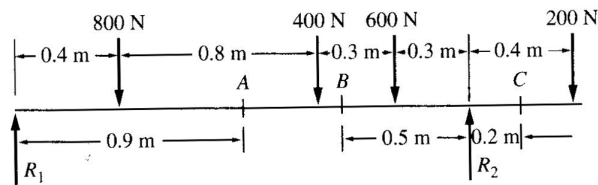


FIGURE P3-34