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| 3-18, For each of the stress states listed below, find all three principal normal and shear stresses. Draw a complete Mohr’s three-circle diagram and label all points of interest.  (*a*) *x =* -80 MPa, *y* =-30 MPa, *xy* = 20 MPa cw        (*b*)  *x =* -30 MPa, *y* =-60 MPa, *xy =* 30 MPa cw  (*c*)  *x =* 40 MPa, *z =* -30 MPa, *xy =* 20 MPa ccw  (*d*)  *x =* 50 MPa, *z =* -20 MPa, *xy =* 30 MPa cw |  |

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| 3-44  For the beam shown, determine  (*a*) the maximum tensile and compressive bending stresses,  (*b*) the maximum shear stress due to *V*, and  (*c*) the maximum shear stress in the beam. |  |

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| 3-62 A 40-mm-diameter solid steel shaft, used as a torque transmitter, is replaced with a hollow shaft having a 40-mm OD and a 36-mm ID. If both materials have the same strength, what is the percentage reduction in torque transmission? What is the percentage reduction in shaft weight? |  |