1. Compare the values of the max shear stress and angle of twist developed in 304 stainless steel shafts having circular and square cross sections. Each shaft has the same cross-sectional area of 9 in$^2$, length of 36 in, shear modulus of $11.0 \times 10^3$ ksi and is subjected to a torque of 4000 lb-in.

2. Determine the reactions at the supports $A$ and $B$ using method of superposition.

3. Determine the principal stresses associated with the following state of stress (in MPa). $\sigma_x = \sigma_y = \sigma_z = 0$, $\tau_{xy} = \tau_{yz} = \tau_{zx} = 100$

4. The solid 1.25 in diameter shaft is used to transmit the torques applied to the gears. If it is supported by smooth bearings at $A$ and $B$, which do not resist torque, determine the shear stress developed in the shafts at points $C$ and $D$.

5. The composite beam is made of 6061-T6 aluminum ($A$) and C83400 red brass ($B$). If the height $h = 40$ mm, determine the maximum moment that can be applied to the beam if the allowable bending stress for the aluminum is $(\sigma_{allow})_{al} = 128$ MPa and for the brass $(\sigma_{allow})_{br} = 35$ MPa. $E_{al} = 68.9$ GPa and $E_{br} = 101.0$ GPa.
6. Determine the equivalent state of stress if an element is oriented $30^\circ$ clockwise for the element shown. Use Mohr’s circle. You can check your answers with the equations.

7. The stress at a point is shown on the element. Determine the principal stresses.

8. The steel channel is used to reinforce the wood beam. Determine the maximum stress in the steel and in the wood if the beam is subjected to a moment of $M = 850$ lb-ft, $E_{S_t} = 29 \times 10^3$ ksi, $E_{W} = 1600$ ksi.

9. The solid shaft is fixed to the support at $C$ and subjected to the torsional loadings shown. Determine the shear stress at points $A$ and $B$.

10. The 20 mm diameter A-36 steel ($G = 75$ GPa) shaft is subjected to the torques shown. Determine the angle of twist of the end $B$. 