1. A 25-mm diameter, 1-m long shaft is subjected to a torque cycling from $+T$ N-m to $-T$ N-m. The shaft is machined from 4340 steel with an $S_{ut}=965$ MPa, $S_y=855$ MPa.
   a. If its maximum torsional shear stress is 35 MPa, what are its static and fatigue safety factors?
   b. If its maximum torsional shear stress is 100 MPa, what are its static and fatigue safety factors?

2. A 42-mm-diameter 1020 steel shaft is subjected to a sinusoidal combined loading of $\pm 100$ MPa bending stress and steady torsional shear stress of 110 MPa.
   a. What are its static and fatigue safety factors?
   b. If the bending is raised to 150 MPa, what are its static and fatigue safety factors?

3. A long plate is machined from 4340 steel with an $S_{ut}=965$ MPa, $S_y=855$ MPa, and fracture toughness of 98 MPa-m$^{1/2}$. It has a 1mm crack at the edge. Crack growth parameters are $A=4\times10^{-9}$mm/cycle, $n=3$. If its maximum axial stress is $\pm 50$ MPa, what is its static safety factor, and how many cycles will it take to reach its critical crack size to failure?

4. A steel bar 0.75 inch x 1.0 inch in cross section is loaded axially in tension with $F(t) = \pm 8000$ lb. A 0.25-inch hole passes through the center of the 1-inch side. Find the safety factor for infinite life if the material has $S_{ut} = 70$ ksi.