The University of Iowa
College of Engineering
53:242/58:255 Computational Inelasticity
Fall Semester 2005

Assignment #2: Due: 9/28/2005

Question 1: Consider the von Mises yield function $f = \|\mathbf{s}\| - \sqrt{2}k \le 0$ where: $\mathbf{s} = dev(\boldsymbol{\sigma})$ and k is a constant equal to 1 MPa. At what stress magnitude would this yield criterion predict material failure in a state of:

a. pure shear, $\tau_{12} = \tau_{21} \neq 0$, but all other stress components vanish?
b. uniaxial tension?
c. uniaxial compression

Question 2: For the Tresca model having $f = \left|\sigma_i - \sigma_j\right| - 2k \le 0$ for i ≠ j, with k=1Mpa, at what stress would a material specimen fail in a state of:

a. pure shear, $\tau_{12} = \tau_{21} \neq 0$, but all other stress components vanish?
b. uniaxial tension?
c. uniaxial compression?

Question 3: For the Mohr-Coulomb model $f = \left[\left|\sigma_i - \sigma_j\right| + (\sigma_i + \sigma_j)\sin(\phi)\right] - 2c\cos(\phi) \le 0$ for i ≠ j, with material parameters c=1MPa and $\phi = 30^o$, at what stress would a material fail in:

a. pure shear?
b. uniaxial tension?
c. uniaxial compression?

Question 4: For the Drucker-Prager criterion having $f = \|\mathbf{s}\| - \sqrt{2}\left[k - \mu I_1/\sqrt{6}\right] \le 0$ with material parameters k=1MPa and $\mu = 0.5$, at what stress would the material fail in:

a. pure shear?
b. uniaxial tension?
c. uniaxial compression?

Question 5: Using suitable plotting software, display each of these four yield surfaces in principal stress space.