1. The following data are collected during a tensile test in which the starting gage length =5.0 in. and the cross sectional area=0.1 in^2.

Load	0	4000	5600	6250	6400	6200	4600
Length	5	5.009	5.2	5.6	5.88	6.12	6.4

The maximum load is 6400 lbs and the final data point occurred immediately prior to failure.

(a) Plot the engineering stress-strain curve and the true stress-strain curve.
(b) Determine the yield strength Y and modulus of elasticity E.
(c) Determine the strength coefficient, K, and the strain hardening exponent based on true stress and strain. Be sure not to use the data after the necking point.
(d) Determine the true ultimate tensile strength TS.

2. Consider frictionless compression of a solid cylinder 50 mm high and 20 mm in diameter to a reduction in height of 50 percent.

(a) Calculate the maximum force needed if this operation was performed at room temperature (K=800 MPa, n=0.33).
(b) Calculate the maximum force needed if this operation was performed at 200ºC with the velocity of 10 mm/sec (C=400 MPa, m=0.02).

3. From a tensile test, the stress-strain relationship for material A was obtained. In the elastic region, the stress is linearly proportional to the stress and represented by

$$\sigma = E\varepsilon$$

with E=100 GPa. Beyond the yield point, the material shows plastic deformation according to

$$\sigma = K\varepsilon^n$$

Assuming that ε_y=0.02, ε_u= 0.5, ε_f= 0.6, K=315 MPa and n=0.50,

(a) calculate the modulus of resilience,
(b) calculate the ultimate tensile strength and
(c) calculate the toughness.

4. A cold-worked steel workpiece was tested with a Brinell hardness tester with a 10 mm ball and a surface load of 1500 kg. If the measured indentation diameter was 2.0 mm, determine

(a) Brinell hardness, Rockwell C hardness and Vickers values (use Figure 2.15 in the textbook),
(b) the length of the diagonal of the indentation if a Vickers hardness tester with P=10 kg was used,

(c) the modulus of resilience (see Example 2.2 of the textbook),
(d) the ultimate tensile strength of this material.