Strain sheet problems

1. The strength coefficient = 550 MPa and strain hardening exponent= 0.22 for a certain metal. During a forming operation, the final true strain that the metal experiences = 0.85. Determine the flow stress at this strain and the average ftow stress that the metal experienced during the operation.
2. A metal has a flow curve with parameters: strength coefficient = 850 MPa and strain hardening exponent= 0.30. A tensile specimen of the metal with gage length = 100 mm is stretched to a length = 157 mm. Determine the flow stress at the new length and the average flow stress that the metal has been subjected to during the deformation.
3. A particular metal has a flow curve with parameters: strength coefficient= 35,000 lb!in2 and strain hardening exponent = 0.26. A tensile specimen of the metal with gage length = 2.0 in is stretched to a length= 3.3 in. Determine the flow stress at this new length and the average flow stress that the metal has been subjected to during deformation.
4. The strength coefficient and strain hardening exponent of a certain test metal are 40,000 lb/in^2 and 0.19, respectively. A cylindrical specimen of the metal with starting diameter = 2.5 in and length = 3.0 in is compressed to a length of 1.5 in. Determine the flow stress at this compressed length and the average flow stress that the metal has experienced during deformation.
5. Derive the equation for average flow stress, Eq. (18.2) in the text.
6. For a certain metal, the strength coefficient= 700 MPa and strain hardening exponent= 0.27. Determine the average flow stress that the metal experiences if it is subjected to a stress that is equal to its strength coefficient *K.*
7. Determine c the value of the strain hardening exponent for a metal that will cause the average flow stress to be 3/4 of the final flow stress after deformation.

8. The strength coefficient= 35,000 lb/in2 and strain hardening exponent = 0.40 for a metal used in a forming operation in which the workpart is reduced in crosssectional area by stretching. If the average flow stress on the part is 20,000 lb/in2, determine the amount of reduction in cross-sectional area experienced by the part.
9. In a tensile test, two pairs of values of stress and strain were measured for the specimen metal after it had yielded: (1) true stress = 217 MPa and true strain = 0.35, and (2) true stress = 259 MPa and true strain = 0.68. Based on these data points, determine the strength coefficient and strain hardening exponent.
10. The following stress and strain values were measured in the plastic region during a tensile test carried out on a new experimental metal: (1) true stress= 43,608 lb/in2 and true strain = 0.27 in/in, (2) and true stress = 52,048 lb/in2 and true strain = 0.85 in/in. Based on these data points, determine the strength coefficient and strain hardening exponent. Strain Rate
11. The gage length of a tensile test specimen= 150 mm. It is subjected to a tensile test in which the grips holding the end of the test specimen are moved with a relative velocity = 0.1 m/s. Construct a plot of the strain rate as a function of length as the specimen is pulled to a length = 200 mm. 18.12. A specimen with 6.0 in starting gage length is subjected to a tensile test in which the grips holding the end of the test specimen are moved with a relative velocity= 1.0 in/sec. Construct a plot of the strain rate as a func~ tion of length as the specimen is pulled to a length = 8.0 in.
12. A workpart with starting height h = 1.00 mm is compressed to a final height of 50 mm. During the deformation, the relative speed of the plattens compressing the part= 200 mm/s. Determine the strain rate at (a) h = 100 mm, (b) h = 75 mm, and (c) h =51 mm.
13. A hot working operation is carried out at various speeds. The strength constant = 30,000 lb/in2 and the strain-rate sensitivity exponent= 0.15. Determine the flow stress if the strain rate is (a) 0.01/sec (b) 1.0/sec, (c) 100/sec.

14. A tensile test is performed to determine the parameters strength constant C and strain-rate sensitivity exponent min Eq. (18.4) for a certain metal. The temperature at which the test is performed = 500°C. At a strain rate = 12/s, the stress is measured at 160 MPa; and at a strain rate = 250/s, the stress = 300 MPa. (a) Determine C and *m.* (b) If the temperature were 600°C, what changes would you expect in the values of C and *m?*

15. A tensile test is carried out to determine the strength constant C and strain-rate sensitivity exponent *m* for a certain metal at 1000"F. At a strain rate= 10/sec, the stress is measured at 23,000 lb/in2; and at a strain rate = 300/sec, the stress= 45,000 lb/in2. (a) Determine C and *m.* (b) If the temperature were 900°F, what changes would you expect in the values of C and *m?*