MCL 132 METAL FORMING AND PRESS TOOLS
Minor Test – 1 (II Sem, 2014-15)

Time : 45min

Max. Marks: 30

1. a) Show that, in a uniaxial tensile test, true uniform strain is equal to the strain hardening exponent for a material obeying power law of strain hardening. (5)

   b) The strain hardening exponent and the strength coefficient of material A obeying power law of strain hardening are 0.15 and 450 MPa respectively and the corresponding values of material B are 0.38 and 600 MPa. Which of these materials can be used if the minimum required ultimate tensile strength is 300 MPa? (5)

2. a) The state of stress at a point is given by $\sigma_{11} = 70$ MPa, $\sigma_{22} = 120$ MPa, $\tau_{12} = 35$ MPa. If the uniaxial yield stress of the material is 125 MPa, determine whether yielding will occur according to a) Von-Mises yield criterion and (b) Tresca yield criterion. (6)

   b) Show that, for plane strain condition, the Von Mises yield criterion reduces to the following form:

   $$\sigma_1 - \sigma_2 = (2/\sqrt{3})\,\sigma_0$$

   (4)

3. a) Define effective strain. Show that, when a square plate is subjected to equi-biaxial stretching in the plane of the plate, the effective strain is equal to the true strain in thickness direction. (5)

   b) Explain the combined effect of strain rate and temperature on flow stress of a material with a figure. State the most suitable conditions for superplasticity in some Al and Ti alloys. (5)