MACE 61058: Plasticity – Lab report: tensile

Lecturers: Dr. Henry Tan;   Operator: Mr David Mortimer and Mr Peter Hassall

Deadline: Friday 24/4/2009, 4pm
Submission: George Begg Coursework Box: Plasticity (Lab report - tensile)

Objective: Use uniaxial tensile test to study the mechanical behaviours of steel, aluminum and copper.

Specimen data
The specimens are 12.5mm in diameter. The initial gauge length is $l_0 = 375$mm .

Test data
The tensile test data can be downloaded from Blackboard: Your Study › Plasticity - theory › Lab report
      tensile-aluminium.txt
      tensile-copper.txt
      tensile-steel.txt
For each file, the first column is the data acquisition step number, the second column is the displacement in unit mm (millimetre), the third column is the load in unit kN (kilonewton).

Report requirement:
You may need software, such as Excel, for drawing the curves.

   (1) For copper, draw the engineering stress – strain curve and the true stress – strain curve in one figure, compare the difference between the two curves. [1 mark]

   (2) Draw the true stress – strain curves for aluminium, copper and steel in one figure, compare the stress-strain behaviours of three materials. [2 mark]

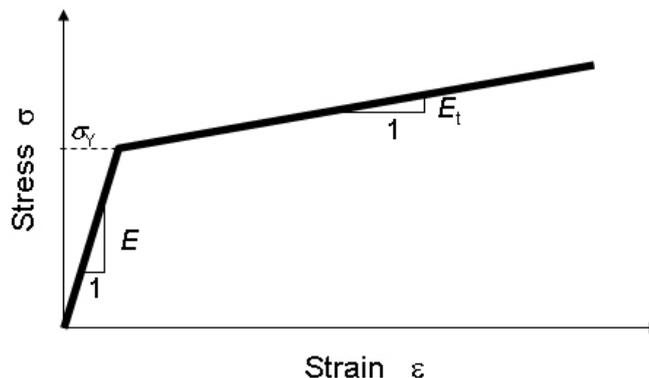   (3) Using the elastic – linear hardening model, as shown in Figure 1, to approximate the true stress-strain curves.

Figure 1. Stress (true) - strain (true) curve from a uniaxial test.

    Determine the values of yield stress (σ_Y), Young's modulus (E) and tangential modulus after yielding (E_t) for aluminium, copper and steel based on the experimental data. [4 mark]

Marking:
This report weights 7% of the overall final.