T73S06 Session 24 Homework - Relaxation

Last Update: 23/10/14

Mentor Guide Questions

Provide written answers to Mentor Guide K&S questions 2.1 and 2.2.

Numerical Questions

1) A uniform uniaxial specimen of 316ss is subject to a stress of 300 MPa at 510^{o}C. Use the RCC-MR deformation law in R66 to find how long the specimen remains in the primary phase of creep. (Assume best estimate creep data throughout).

2) A uniform uniaxial specimen of 316ss at 510^{o}C is subject to an applied displacement which produces an initial stress of 300 MPa. By integrating the RCC-MR 'forward creep' law in R66, plot the graph of stress versus time whilst primary creep prevails. Assume time hardening.

(The integration may be numerical or algebraic – and note that I have already done the latter for you in the Notes. But be careful about notation – my creep law gave a strain *rate* in absolute strain per hour whereas RCC-MR is formulated to give the creep *strain* in %).

3) In question (2), and in the derivation of Equ.(16) in the Notes of session 24, the assumption was that there was no elastic follow-up. This means that the sum of the elastic and creep strains is constant. If elastic follow-up occurs, the creep strain will exceed the reduction in the elastic strain by the follow-up factor, Z, i.e., $\varepsilon_c = Z(\varepsilon_0 - \varepsilon_{el})$. Assuming Z takes the constant value Z = 5, re-plot the relaxation curve. (The integration may again be either numerical or algebraic).

4) In questions 2 and 3, at what time does the transition from primary to secondary creep occur?