BE Full time Degree End Semester Examination 2011
Materials Science and Engineering Branch
Regulations 2008 Semester VI
ML 9352 Creep and Fatigue Behaviour of Materials

27

Time three hours **Max 100 Marks**

Answer All Questions

Part A 10 x 2 = 20 Marks

Write short explanations

Question 1. Which microstructural element produces plastic deformation (at low temperature)?

Question 2. How is the microstructure changed by "cold working" of a metal?

Question 3. Below which temperature Creep is not observed. What is this temperature for Aluminium?

Question 4. In which way is anelastic deformation and creep deformation similar or different?

Question 5. Why does the Activation Energy for self diffusion and creep deformation often have the same value?

Question 6. What is the main use of the Larson Miller Parameter?

Question 7. In the creep rate equation, what is the significance of n (Norton Exponent)?

Question 8. How are surface extrusions and intrusions formed by plastic deformation?

Question 9. What causes chevron (V-shaped) marks?

Question 10. How are "Striations" formed?

Part B 5 x 16 = 80 marks

Question 11 Grifitth' Theory of Brittle fracture. What are the main features and what are the limitations of this approach describing fracture behaviour of materials.

Question 12a. When describing the stress and temperature dependence of the secondary creep rate, which equation can be used? The parameters and values also give an indication of the mechanism of creep that is active in the respective range. Correlate values and mechanisms.

or

Question 12b How do the strain rate vs. strain plot differ for constant true stress and constant load tests? Which parameter can be obtained from constant load tests in this plot?

Question 13 a Three regions of fatigue behaviour can be identified. Which are these and what are the processes in these regions.

or

Question 13 b The microstructures (not fracture surface!!) of fatigued samples are typical. Please explain

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Question 14a For fatigue samples, a stress strain plot can be plotted and compared with one obtained n uniaxial testing. Discuss the differences and common features.

or

Question 14b Superplasticity is a special case of high temperature deformation. In which way is it different from creep? Please elaborate.

Question 15 a What can be identified in a fracture surface that has failed due to fatigue. Which are typical microstructural features?

or

Question 15b How can creep damage of a microstructure be analysed. What is the procedure and what are typical microstructural features of creep damage?