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APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
Third semester M.Tech Degree Examination December-2017

Branch: Mechanical Engineering
Stream : Machine Design

01ME7123 Mechanical Behaviour of Materials

Answer any two questions from each module.
Limit answers to the required points

Max Marks: 60 Duration : 3 hours

PART. A

1. (a) Calculate the Atomic packing factor, maximum linear and maximum planar density of a BCC crystal. (4)
   (b) Explain the defects in solids and its effects. (5)
2. (a) Find the yield stress of single crystal of a metal that has the FCC crystal structure is oriented such that a tensile stress is applied parallel to the direction [110], If the critical resolved shear stress for this material is 1.75 MPa, (5)
   (b) Derive the expressions for true stress and true strain. Plot these on stress- strain curve. (4)
3. (a) What are the effects of strain rate and temperature on the tensile property of the material? Explain. (4)
   (b) Briefly explain the various mechanical testing methods. (5)

PART B

4. (a) Explain the strengthening of an alloy by grain size reduction. (4)
   (b) Write notes on recovery, recrystallization and grain growth. Plot the variation of tensile strength and ductility during these three stages. (5)
5. (a) With the help of iron carbon phase diagram, state and explain eutectoid reaction. Show the micro structural changes while cooling liquid steel through eutectoid point. (5)
   (b) What is martensite? Explain martensite transformation with the help of TTT diagram. (4)
6. (a) Write notes on applications of different types of composite materials. (4)
   (b) Draw the atomic bonding structure of graphite. Discuss its properties and engineering applications. (5)

PART C

7. (a) Differentiate linear elastic and elasto plastic fracture mechanics. (6)

   (b) What is critical strain energy release rate? Explain. (6)

8. (a) Discuss any one fracture testing method. (6)

   (b) What is S-N curve endurance limit? Explain how this can be used to estimate the life of components during the design. (6)

9. (a) What are the parameters affect the creep phenomena? explain (6)

   (b) Explain, Larson-Miller parameter for predicting rupture life of a component. (6)

   Using the Larson–Miller data for the S-590 alloy shown in Figure 1, estimate its rupture life of a component that is subjected to a stress of 300 MPa at 650°C.

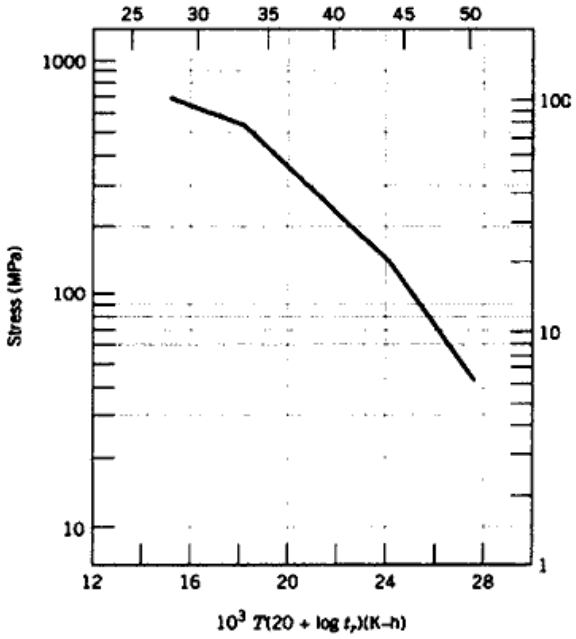

Fig. 1