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B.E (FULL TIME) DEGREE END SEMESTER EXAMINATIONS, APR/MAY 2014

MATERIALS SCIENCE AND ENGINEERING

SIXTH SEMESTER

ML 9352 CREEP AND FATIGUE BEHAVIOUR OF MATERIALS

TIME: 3 Hrs.

Max. Marks: 100

Answer all questions

Part-A (10 x 2 = 20 marks)

1. What do you understand by cross slip?
2. Define "Burger vector".
3. What do you understand by elastic after effect?
4. Distinguish Creep and stress rupture.
5. Write GERBER's equation for determining the stress amplitude.
6. Distinguish HCF and LCF.
7. What are the limitations of S-N curve approach?
8. Why work hardening cause higher rate of crack propagation in environment assisted fatigue?
9. State any 2 methods for cleaning the specimen for macroscopic examination.
10. Mention the possible mode of fracture, if the fractured surface exhibit shiny grain boundary cracking.

Part - B (5x 16 = 80 marks)

11. (i) Describe the characteristics of Edge and Screw dislocations.
(ii) Explain the effect of Dislocation orientation on Peierl's stress

$$\tau = G_e \frac{2\sigma\sqrt{a}}{6b}$$

12. (a) Explain the method of evaluating the creep strength, presenting the creep data and its data extrapolation

(OR)

(b) What do you understand by Deformation mechanism map? Explain the mechanisms of creep deformation.

13. (a). Write a brief note on (I) Variable stress amplitude (10)

(ii) Strain –life approach on fatigue. (6)

(OR)

(b). (i) Explain the various stages involved in fatigue crack growth. (10)

(ii) Discuss briefly the methods of enhancing the fatigue life. (6)

14. (a) (i) Discuss briefly the factors influencing the endurance limit. (6)

(ii) Derive an expression for calculating the number of cycles from the smallest crack that can be detectable to grow upto the critical crack length. (10)

(OR)

14. (b) (i) Explain the method of evaluating the fatigue limit and the significance of S-N curve. (10)

(ii) Explain the micro-mechanisms in corrosion fatigue. (6)

15. (a) (i) Write a brief note on the capability of NDT techniques in failure analysis. (6)

(ii) Discuss the characteristics revealed by fractograph of ductile failure. (10)

(OR)

15. (b) Describe in detail the step by step procedure involved in preparing report on failure analysis of an industrial component.

*Surface Cracks
Size
used in
Creep Reliability*