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B.E /B.Tech (Full Time) ARREAR EXAMINATIONS, APR / MAY 2019

MATERIALS SCIENCE AND ENGINEERING

Elective

ML 8004 Creep and Fatigue behavior of Materials

(Regulation 2012)

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Specify the number of slip planes that can be observed in Edge and Screw dislocations.
2. What do you understand by mixed dislocation?
3. What is super plasticity?
4. Define the term creep strength
5. Mention the significance of endurance limit.
6. What is cyclic stress-strain curve?
7. What are the factors that influences fatigue strength?
8. State Miner's rule.
9. What do you understand by replica method?
10. Name any 2 methods of cleaning the specimen for failure analysis.



Part – B (5 x 16 = 80 marks)
(Question No.11 is Compulsory)

11. Write a brief note on the following
 - (i) Twinning in a polycrystalline material. (8)
 - (ii) Elastic property associated with edge dislocation. (8)
12. a) With an aide of neat sketch explain the method of conducting the creep test and various stages of the creep curve. Also, discuss any one of the life prediction methods in creep.

(OR)

b) What are deformation or fracture mechanism maps? Explain the various mechanisms involved in creep deformation.

13. a) Explain the method of determining the fatigue strength of a material by rotary-bend fatigue testing machine.

(OR)

- b) To find material constants for Paris law, it was found that an already nucleated centre crack grows from $2a = 5.6$ mm to $2a = 7$ mm in 10 000 cycles of constant amplitude load. When the same load is continued, the crack grows from $2a = 32$ mm to $2a = 36.8$ mm in 1400 cycles. If $\sigma_{\max} = 180$ Mpa and $\sigma_{\min} = 90$ Mpa, find the constants C and m.

14. a) Discuss the influence of stress intensity factor on fatigue crack growth in all the three regions.

(OR)

- b) Discuss in detail the micro-mechanism involved in the crack initiation of component subjected to cyclic stress.

15. a) Explain the usefulness of the replica techniques in image interpretation of failed component

(OR)

- b) Describe in detail the step by step procedure involved in component failure analysis.

