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B.E/B.Tech (Full-Time) DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2019
MATERIALS SCIENCE AND ENGINEERING BRANCH
REGULATION 2012

ML8008 FRACTURE MECHANICS AND FAILURE ANALYSIS

Time: 3Hr

Max.Mark:100

Answer ALL Questions

Part -A (10x2=20 Marks)

1. Distinguish between crack and fracture.
2. What are the changes in the components when crack advances?
3. How does fracture toughness vary with respect to thickness of the specimen?
4. Write the necessary and sufficient condition for crack to propagate.
5. Define stress ratio and stress amplitude in fatigue.
6. Crack propagation is a slow process and fracture is an ultra-fast process: Justify this statement
7. How the creep life of the materials are improved?
8. What is the major difference in Larson–Miller parameter and Monkman–Grant relationship
9. Differentiate erosion wear and abrasive wear.
10. What is corrosive wear?



Part - B (5x16 = 80 Marks)

- 11 (i) Explain the characteristics features of (a) ductile fracture (b) brittle fracture (6)
- (ii) Derive an equation for energy release rate for constant loading and constant displacement conditions. (10)

- 12a (i) Comment on the Irwin-Orowan modifications on Griffith's approach to crack propagation and explain the crack propagation in high strength alloys by graphical approach. (16)

- OR
- 12b (i) What is pop-in phenomenon? Explain using R-curve (8)
- (ii) Explain the Crack branching phenomenon in brittle materials based on energy approach (8)

- 13a (i) Explain how improper design, defects in the raw materials and improper manufacturing process affect the failure (8)
- (ii) Explain the crack growth mechanism in fatigue and also explain how striation and beach marks are formed. (8)

- OR
- 13b (i) Draw and explain the schematic curve represents the crack growth rate(log scale) with respect to stress intensity factor(log scale) (8)

(ii) Explain the micro-mechanism involved in the environmental assisted fatigue fracture (8)

14a (i) Explain different stages in creep and discuss the effect of stress and temperature on the creep rate (16)

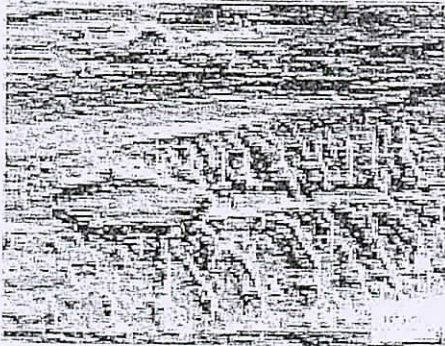
OR

14b (i) Explain the different mechanisms proposed for creep deformation in crystalline materials (16)

15a (i) What is stress corrosion cracking and explain the three different mechanism of stress corrosion cracking (16)

OR

15b (i) Identify the type of wear failure from the following SEM images shown and analyse the wear mechanism. (8)



(a)



(b)

(ii) Explain the factors that affect the wear at various size levels (8)

