

**VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA**  
**DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING**  
**SESSION 2017 - 18 (EVEN SEMESTER)**

Total Pages--4

(Set-V<sub>1</sub>)

**B.Tech-6th(M&M)**  
**Testing of Materials**

*Full Marks : 70*

*Time : 3 hours*

Answer six questions including  
Q.No.1 which is compulsory

*The figures in the right-hand margin indicate marks*

Symbols carry usual meaning

1. Answer *all* questions : 2 × 10
- (a) What is the effect of temperature on stress-strain behaviour of a material ? What is strain rate sensitivity ?
  - (b) What are intergranular and transgranular fracture ?
  - (c) What is theoretical cohesive strength of a material ?
  - (d) Write the effects of % C on impact toughness of plain carbon steel.

( Turn Over )

- (e) What are the fractographic features of a fatigue cracked region ?
- (f) What is plane strain fracture toughness and what is its importance ?
- (g) Write down the load and indenter used for Rockwell C hardness testing.
- (h) What is Vickers hardness testing ? Discuss its importance over other hardness testing methods.
- (i) Schematically draw S-N curves for ferrous and non-ferrous metals.
- (j) What is Griffith criterion for brittle fracture ? Explain.

2. (a) What are different stages of fatigue failure in metals ? Explain with suitable illustrations. 5

(b) Explain the effect of mean stress on fatigue life. 5

3. (a) Explain the engineering stress-strain and true stress-strain behaviour of a material. 5

(b) In the tension test of a metal, fracture occurs at maximum load. The conditions at fracture were :  $A_f = 100 \text{ mm}^2$  and  $L_f = 60 \text{ mm}$ . The initial values were :  $A_0 = 150 \text{ mm}^2$  and  $L_0 = 40 \text{ mm}$ . Determine the true strain to fracture using change in both length and area. Comment on the results obtained. 5

4. (a) Schematically draw a creep curve and explain different stages of creep. 5

(b) How creep rate varies with temperature and stress ? Show with schematic diagram and comment. 5

5. (a) What is crack tip plastic zone ? How does the stress state (plane stress and plane strain) affect crack tip plastic zone ? 5

(b) Describe plane strain fracture toughness test. What are major limitations of this test ? 5

6. (a) What is corrosion fatigue? Explain the difference between true corrosion fatigue and stress corrosion fatigue. 5
- (b) Differentiate between torsion and tension test of a metal. 5
7. Discuss any three non-destructive testing methods with their advantages and disadvantages for quality inspection and control. 10
8. Write short notes on any two : 5 × 2
- (i) Materials for high temperature
  - (ii) Ductile to brittle transition
  - (iii) Stress intensity factor
  - (iv) Ductile fracture.