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Code No.: 21414 S

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. II Year (Mech. Engg.) I-Semester Supplementary Examinations, May/June-2017**

**Metallurgy and Material Science**

Time: 3 hours

Max. Marks: 70

*Note: Answer ALL questions in Part-A and any FIVE from Part-B*

**Part-A (10 X 2=20 Marks)**

1. Define the recovery process.
2. Sketch the modes of fracture.
3. Draw the creep curve showing various stages of creep.
4. State Fick's first law of diffusion and write the equation.
5. List the properties of plain carbon steels.
6. Classify Cast Irons based on carbon content.
7. Discuss the purpose of heat treatment.
8. What is Nitriding?
9. Categorize the high speed steels based on alloying elements.
10. Discuss the powder metallurgy process.

**Part-B (5 × 10 = 50 Marks)**

11. a) Discuss Critically resolved shear stress. Derive an expression and calculate its maximum value. [6]  
b) Differentiate between edge and screw dislocation. [4]
12. a) Describe RR Moore fatigue testing with the help of S-N Curve. [6]  
b) Discuss the factors to be considered for the improvement of fatigue life. [4]
13. a) Sketch and label Iron-Iron carbide equilibrium diagram and explain the three invariant reactions. [6]  
b) Sketch partial eutectic system type phase diagram and label the phases, points and lines of it. [4]
14. a) Construct and interpret T-T-T diagram for eutectoid steel. [5]  
b) List the differences between hardening and tempering of steels. [5]
15. a) Explain the method of production of copper from its ore. [7]  
b) Discuss the applications of composite materials. [3]
16. a) Discuss the Griffith theory of brittle fracture for the determination of fracture strength of a brittle material. [5]  
b) Discuss the effect of metallurgical variables on fatigue of metal. [5]
17. Answer any two of the following:
  - a) Explaining the procedure, construct the eutectic phase diagram with necessary assumptions and label the salient features. [5]
  - b) Discuss the process and applications of carbo-nitriding and age hardening. [5]
  - c) Discuss the types of stainless steels. [5]

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