

**B.TECH  
(SEM III) THEORY EXAMINATION 2022-23  
MATERIAL SCIENCE**

**Time: 3 Hours****Total Marks: 100****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- (a) What are equilibrium diagrams? What are their advantages and limitations?
- (b) Define phase. State the conditions for unlimited solid solubility for an alloy system.
- (c) What is the significance of TTT diagram?
- (d) Write the alloying elements in stainless steel.
- (e) Define creep and creep fracture.
- (f) Mention the salient features of Cup and Cone type of fracture.
- (g) Explain the magnetic materials with suitable examples.
- (h) What is superconductivity?
- (i) Distinguish between ceramics and composites.
- (j) How is a glass distinguished from other ceramic materials?

**SECTION B****2. Attempt any three of the following: 10x3=30**

- (a) Discuss the Hume-Rothery rules that govern the extension substitutional solid Solubility.
- (b) Draw and explain Fe-Fe<sub>3</sub>C phase diagram Indicate the carbon percentage range of steel.
- (c) Discuss in brief various mechanisms of strengthening in metals and Alloys.
- (d) Explain the practical importance of hysteresis curve for ferromagnetic materials?
- (e) What is tempered glass and how can it be produced?

**SECTION C****3. Attempt any one part of the following: 10x1=10**

- (a) State Gibb's phase rule. Mention the number of variables and the degree of freedom at the eutectic temperature of a binary phase diagram.
- (b) Draw eutectic phase diagram and explain it.

**4. Attempt any one part of the following: 10x1=10**

- (a) State Fick's laws of diffusion in details.
- (b) Explain Time-Temperature Transformation diagram in detail.

5. **Attempt any *one* part of the following:** **10x1=10**
- (a) Why creep is considered to be a high temperature property? Enumerate the metallurgical variables affecting the creep behavior of a material. Explain the effect of grain size on the creep strength of a material.
  - (b) Draw a neat diagram and explain behaviour of specimens under brittle and ductile fractures.
6. **Attempt any *one* part of the following:** **10x1=10**
- (a) Explain magnetism, diamagnetism, paramagnetism, and ferromagnetism.
  - (b) In terms of electron energy band structure, discuss the difference in Electrical conductivity between metals, semiconductors and insulators.
7. **Attempt any *one* part of the following:** **10x1=10**
- (a) What are glass ceramics? How are they formed? What are desirable characteristics of glass ceramics?
  - (b) What are nano materials? Discuss their engineering applications.

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