Reg No.: _____ Name : _____

**Jyothi Engineering College(Autonomous)**

B. Tech Degree S2 (S) Examination, June 2026 (2025 Scheme)

**25MET205 - MATERIAL SCIENCE AND ENGINEERING**

**Total Mark: 60** **Total Time: 2hrs 30 min**

CO: MARK

## PART A

**(Answer All Questions. Each question carries 3 marks)**

1. Explain with reasons why metals have high electrical and thermal conductivity. CO1 (3)
2. What are Miller Bravais Indices? CO1 (3)
3. What is TEM? What are its applications? CO2 (3)
4. What is Zenner ring diffusion? CO2 (3)
5. What is superplasticity? CO3 (3)
6. Mention any three alloying elements used in steel and discuss their functions. CO3 (3)
7. Explain how alloys are classified with examples. CO4 (3)
8. What are surface hardening methods? Give example CO4 (3)

## PART B

**(Answer any one full question from each module, each question carries 9 marks)**

**Module - 1**

9. Explain the types of primary bonds with neat figures and distinguish them using any two characteristics. CO1 (9)

**OR**

10. Draw the following directions and planes. CO1 (9)
    **a.** [112] **b.** [$\bar{1}\bar{1}1$] **c.** [1 1 1]
    **d.** (111) **e.** (1 1 2) **f.** ($\bar{1}\bar{1}1$)

**Module - 2**

11. Explain the steps involved in metallographic examination to find out structure of grains and grain boundaries in a metal. CO2 (9)

**OR**

12. Explain diffusion couple and Fick's first law of diffusion. CO2 (9)

**Module - 3**

13. What are composite materials? Explain the classification of composite materials with suitable examples and applications. CO3 (9)

**OR**

14. Explain Fatigue test with a neat sketch and differentiate between fatigue and thermal fatigue. Also discuss the various methods to improve the fatigue life of materials. CO3 (9)

**Module - 4**

15. Explain the invariant reactions and the formation of austenite, pearlite, and ledeburite with the help of the Iron–Carbon equilibrium diagram. CO4 (9)

**OR**

16. What is an isomorphous system? Explain it with the help of the Copper–Nickel (Cu–Ni) phase diagram. CO4 (9)

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