

**Question Paper Code : 70148**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Third Semester

Mechanical Engineering

ME 3392 — ENGINEERING MATERIALS AND METALLURGY

(Common to B.E. Manufacturing Engineering/B.E. Mechanical Engineering  
(Sandwich))

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(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Compare peritectic and eutectoid reactions.
2. Define solid solution strengthening.
3. What is austempering?
4. Name any two shallow hardening processes.
5. Write the effects alloys adding on steel.
6. What are copper alloys? Give an example.
7. Distinguish between addition and condensation polymerization.
8. Describe metal matrix composites.
9. Define twinning process.
10. Distinguish between fatigue and creep.

PART B — (5 × 13 = 65 marks)

11. (a) Explain with a neat sketch of Eutectic phase equilibrium diagram.

Or

- (b) Explain the various classifications of steel and cast iron with microstructure, Properties and applications.

12. (a) Describe Jominy end quench test and its applications and state the objectives of surface hardening.

Or

- (b) Explain TTT diagram with neat sketch and indicate all the phases with microstructure.

13. (a) Explain the properties and the applications of the following :

- (i) Tool steels
- (ii) Maraging steels
- (iii) HSLA
- (iv) Grey cast iron.

Or

- (b) Discuss in detail, the age hardening of Al-Cu with help of phase diagram.
14. (a) Explain the strengthening mechanism of fiber-reinforced composites.

Or

- (b) Explain the properties and the applications of the following :

- (i) PE
- (ii) PET
- (iii) PVC
- (iv) PPO.

15. (a) Explain with neat sketch of Brinell and Rockwell hardness test.

Or

- (b) Discuss characteristics of ductile fracture and brittle fracture with neat sketch.

**PART C — (1 × 15 = 15 marks)**

16. (a) List the important engineering ceramic materials and discuss its general applications of ceramic materials in various engineering fields. What are the advantages and disadvantages of ceramics?

Or

- (b) Draw the binary phase diagram between A and B, if pure A melts at 1050°C, and pure B melts at 1900°C. At 1250°C, the solid solution  $\alpha$  (50% B), the solid solution  $\beta$  (80% B) and liquid (30 % B) are in three-phase equilibrium. At room temperature, the minimum solubility of B in A is 30%, and the maximum solubility of A in B is 10%. Label all areas of the diagram. Explain the solidification of the eutectic alloy.