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Question Paper Code : 20854

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Third / Fourth Semester

Mechanical Engineering

ME 8491 – ENGINEERING METALLURGY

(Common to : Automobile Engineering / Manufacturing Engineering /
Mechanical and Automation Engineering / Production Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by equilibrium phase diagram?
2. Distinguish between substitutional and interstitial solid solution.
3. What is the purpose of spheroidising treatment?
4. Which hardening treatment yield large case depth, plasma hardening or induction hardening? Why?
5. List any two types of cast iron and their applications.
6. What is precipitation strengthening?
7. What is the unique property of PSZ?
8. State the fundamental differences between Phenol formaldehydes and Polystyrene.
9. Distinguish between Rockwell hardness test and Brinell hardness test.
10. Define a slip system.

PART B — (5 × 13 = 65 marks)

11. (a) Draw an eutectic phase diagram and name the various zones. Explain the microstructure evolution for a hypoeutectic, eutectic and hypereutectic composition.

Or

- (b) Classify steel and brief on the properties and applications of any TWO types.

12. (a) Based on time-temperature-transformation (TTT) diagram, brief on austempering and martempering process.

Or

- (b) Discuss on hardenability evaluation from Jominy end quench test.

13. (a) Classify copper alloys and state their properties and typical applications.

Or

- (b) Classify tool steels and state their properties and typical applications.

14. (a) List the properties and applications of any six types of polymers.

Or

- (b) (i) List the properties and applications of SiC and Al₂O₃.
(ii) Classify composites and give an example for each kind.

15. (a) Discuss on the failure mechanism of fatigue.

Or

- (b) Draw the stress-strain curve and explain the various parameters and properties.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Suggest a type of alloy: cast alloy, heat treatable and wrought alloy, suitable for light weight structural application. Justify. (5)
(ii) Suggest material(s) for exhaust of diesel engine. (5)
(iii) Which types of testing are recommended for milling cutting tool development? Justify. (5)

Or

- (b) (i) Suggest a type of heat treatment: annealing, normalizing and stress relieving, suitable for cold working operation. Justify. (5)
- (ii) Suggest material(s) for marine structures. (5)
- (iii) Which types of testing are recommended for helmets? Justify. (5)
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