Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40828

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Third/Fourth Semester

Mechanical Engineering

ME 8491 — ENGINEERING METALLURGY

(Common to Manufacturing Engineering/ Mechanical 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. Define a phase.

2. Apply phase rule for eutectic point, state the degree of freedom.

3. Define hardenability.

4. Which heat treatment yield finer microstructure Annealing or Normalizing? Why?

5. Define super alloys.

6. An α stabilizer, ———— (increases/decreases) eutectoid temperature and an example is ———— (Cr/Mn) in case of steel.

7. What is the unique property of SIALON?

8. State the fundamental differences between an alloy and composite.

9. How ductile fracture can be identified?

10. Define a slip system.

PART B — (5 × 13 = 65 marks)

11. (a) Draw Iron-Iron carbide phase diagram, name the various field, line and mention the invariant reactions.

Or

(b) Classify Cast Iron and brief on the properties and applications of any TWO types.

12. (a) Based on time-temperature-transformation (TTT) diagram, brief on hardening and tempering of steel.

Or

(b) Compare carburizing nitriding, cyaniding and induction hardening processes.

13. (a) Classify stainless steel and state their properties and typical applications.

Or

(b) List the properties of Aluminium Magnesium, Titanium and Bearing alloys.

14. (a) Briefly explain the properties and applications of any TWO engineering polymers under each of the classification of thermoset and thermoplastic polymers.

Or

(b) (i) Classify engineering ceramics and list properties and applications of PSZ and Al_2O3. (9)

(ii) List any two composites and state their applications. (4)

15. (a) Discuss on the mechanisms of plastic deformation of metallic materials.

Or

(b) (i) Compare Creep and fatigue failure mechanisms. (10)

(ii) Compare the hardness, impact and tensile testing. (3)

PART C — (15 marks)

16. (a) (i) What are the differences between phase diagrams and isothermal transformation diagrams? (4)

(ii) Suggest a material for a shaft of rear wheel axle of two wheeler, type of heat treatment and testing to be done before installation. (6)

(iii) Select the best material for wheel of a racing car from list: Aluminium alloy, Magnesium alloy, Carbon Carbon composite and HSLA, Justify your selection based on properties. (5)

Or

(b) (i) Discuss about metal matrix composites and mention their applications. (8)

(ii) Write short notes on Ni based super alloys in terms of their properties and industrial applications. (7)

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