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

Question Paper Code : 30255

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023

Third/Fourth Semester

Manufacturing Engineering

ME 3392 – ENGINEERING MATERIALS AND METALLURGY

(Common to : Mechanical Engineering/Mechanical Engineering (Sandwich)/ Mechanical and Automation Engineering)

(Regulations – 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate between substitutional and interstitial solid solution.

2. What is an equilibrium phase diagram?

3. List the different types of annealing.

4. What is the significance of TTT diagram in the heat treatment of steel?

5. List four important alloying elements added in alloy steels.

6. Why does the aluminium replace the copper as an electrical conductor?

7. What are the characteristics of plastics which account for their wide use as engineering materials?

8. Name any four thermoplastics and thermosetting plastics.

9. Differentiate between ductility and malleability.

10. List the main parameters which may be determined in a tensile test.

PART B — (5 × 13 = 65 marks)

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

Or

(b) Explain the following invariant reactions with reference to a phase diagram.

(i) Eutectic reaction (7)

(ii) Eutectoid reaction (6)

12. (a) Write a short notes on the following:

(i) Full annealing (4)

(ii) Recrystallation annealing (5)

(iii) Normalizing (4)

Or

(b) Write short notes on the following surface heat treatment operations:

(i) Carburising and its types (9)

(ii) Nitriding (4)

13. (a) Write an engineering brief about the following steels

(i) Tool Steels (7)

(ii) HSLA steels (6)

Or

(b) Discuss the properties of any four copper alloys.

14. (a) (i) Differentiate between thermosetting and thermos plastics. (7)

(ii) Write a short note on PVC. (6)

Or

(b) What are the properties and application of Al_2O_3, SiC and Si_3N_4.

15. (a) Define fracture. List and explain the different types of fracture.

Or

(b) What is meant by Plastic deformation? Discuss the role of slip and twinning in plastic deformation of materials. Also differentiate between slip and twinning.

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the various types of titanium alloy, their composition, properties and applications.

Or

(b) Discuss the classifications of cast iron and draw its microstructure.

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