

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 2023**ROBOTICS AND AUTOMATION****(2020 SCHEME)****Course Code : 20RBT201****Course Name: Processing and Properties of Materials****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Explain the characteristics of covalent and ionic bonds
2. List any three differences between Slip and Twinning.
3. Explain vacancy and interstitial diffusion with neat sketches.
4. State and explain Fick's first law.
5. State the Hume Rothery's rules for substitutional solid solution
6. Write short notes on hardenability.
7. What are the applications of Aluminium alloys?
8. List three functions of the matrix phase.
9. Explain (a) Ferromagnetic and (b) Ferrimagnetic materials.
10. Define (a) Refraction and (b) absorption

PART B***(Answer one full question from each module, each question carries 14 marks)*****MODULE I**

11. Explain the procedure for determining Miller indices for a plane and direction (14)

OR

12. a) Explain Schmid's law. Explain the difference between resolved shear stress and critical resolved shear stress. (7)
- b) The yield strength of mild steel with an average grain size of 0.05 mm is 137.9 MPa. The yield stress of the same steel with a grain size of 0.007 mm is 275.8 MPa. What will be the average grain size of the same steel with a yield stress of 206.9 MPa? (Assume the Hall-Petch equation is valid and that changes in the observed yield stress are due to changes in grain size.) (7)

MODULE II

13. Distinguish between edge and screw dislocation with the help of Burger's circuit. (14)

OR

14. a) Explain the various steps in metallographic specimen preparation. How will you determine microstructure using polishing and etching? (8)
- b) Briefly explain why small-angle grain boundaries are not as effective in interfering with the slip process as are high-angle grain boundaries. (6)

MODULE III

15. a) Sketch and label the Iron-Carbon equilibrium diagram and explain the three equilibrium reactions in it. (10)
- b) Explain the following: (i) Austempering (ii) Ausforming (4)

OR

16. a) Describe the process of Carburizing and Nitriding. (4)
- b) Justify the need of Heat treatment processes for metals. Explain with neat sketch TTT diagram for heat treatment of steel. (10)

MODULE IV

17. Write short note on Polymer Matrix Composites and Metal Matrix Composites (14)

OR

18. What are composites? What is the need for the development of composites? (14)

MODULE V

19. Compare the thermal conductivity of metals, ceramics and polymers (14)

OR

20. Why does the conductivity of a semiconductor change with impurity content? Compare this with the behavior of metallic conductors. (14)
