

Register No.: ..... Name: .....

## **SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)**

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

**THIRD SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023**

**MECHANICAL ENGINEERING**

**(2020 SCHEME)**

**Course Code : 20MET205**

**Course Name: Metallurgy and Material Science**

**Max. Marks : 100**

**Duration: 3 Hours**

### **PART A**

***(Answer all questions. Each question carries 3 marks)***

1. Obtain the atomic packing factor for FCC crystal structure.
2. What is the difference between polymorphism and allotropy?
3. Give the significance of Burger's vector and Frank Read source in dislocation.
4. Explain Fick's law of diffusion.
5. Draw the phase diagram of any binary alloy.
6. Differentiate annealing and normalizing heat treatment processes.
7. How is hot working different from cold working?
8. Explain the properties that are affected by the alloying of Nickel on Steel.
9. List any three materials that are resistant to creep.
10. What are the three applications of Ni-based super alloys?

### **PART B**

***(Answer one full question from each module, each question carries 14 marks)***

#### **MODULE I**

11. Compare plastic deformation by slip and twinning with the help of neat sketches. (14)

**OR**

12. Describe Schmid's law and prepare brief notes on the concept of critically resolved shear stress. (14)

#### **MODULE II**

13. Explain the step-by-step procedure for the preparation of metallographic specimen. (14)

**OR**

14. With neat diagrams, compare the working of a Scanning Electron Microscope. (14)

**MODULE III**

15. Sketch the Iron-Carbon equilibrium diagram and explain the invariant reactions associated with it. (14)

**OR**

16. What is the significance of heat treatment in metals? Briefly explain the following processes. (14)
- (i) Flame hardening
  - (ii) Induction hardening

**MODULE IV**

17. With a sketch, explain the procedure for testing fatigue life. Draw the S-N curves for alloy steels (14)

**OR**

18. List any two classifications of Cast Iron . Explain the composition, properties and draw its micro structure. (14)

**MODULE V**

19. Classify ceramics with the practical applications of each. How do the properties of ceramics differ from that of metals? (14)

**OR**

20. What are composite materials? Write short notes on the classification of composite materials. Give proper examples. (14)

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