USN | | | | | | | | | | **18SM35**

Third Semester B.Tech. Degree Examination, Feb./Mar. 2022
Material Science and Processing Technologies

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define APF. Calculate APF for BCC cell. **(08 Marks)**
   b. Differentiate edge dislocation and screw dislocation. **(06 Marks)**
   c. State and explain Fick's I and II law of diffusion. **(06 Marks)**

OR

2 a. With a stress-strain diagram for mild steel, explain yield strength, ductility, toughness and ultimate tensile strength. **(08 Marks)**
   b. Discuss Type I, Type II and Type III fractures. **(08 Marks)**
   c. Explain three stages of creep process. **(04 Marks)**

Module-2

3 a. State and explain Hume Rothery Rules. **(08 Marks)**
   b. Sketch and explain the construction of Ni-Cu phase diagram using cooling curves. **(12 Marks)**

OR

4 a. Draw the Iron-Carbon diagram indicating the phase temperatures. Explain the different phases in Iron Carbon diagram. **(12 Marks)**
   b. Define homogeneous and heterogeneous nucleation. Obtain an expression for critical radius of homogeneous nucleation. **(08 Marks)**

Module-3

5 a. Define Heat Treatment and give its classification. **(06 Marks)**
   b. Explain how a TTT diagram is drawn. **(08 Marks)**
   c. Explain Austempering and Martempering. **(06 Marks)**

OR

6 a. Draw the TTT diagram for Eutectoid steel and explain it. **(07 Marks)**
   b. With neat sketch, explain induction hardening process. **(05 Marks)**
   c. Explain the composition, properties and uses of Gray Cast Iron, White Cast Iron, SG Iron and Malleable Iron. **(08 Marks)**

Module-4

7 a. Differentiate between thermoplastic and thermosetting plastics. **(06 Marks)**
   b. With neat sketch, explain processing of plastic by Injection moulding method. **(10 Marks)**
   c. What are the advantages of polymeric materials? **(04 Marks)**

OR

8 a. Explain types and properties of ceramics. **(08 Marks)**
    b. What are Smart Materials? Discuss the functioning of shape memory alloys. **(08 Marks)**
    c. What are the factors to be considered for the selection of materials? **(04 Marks)**

Module-5

9 a. What are composite materials? What are advantages limitations and applications of composite materials? **(08 Marks)**
    b. What is the role of (i) Matrix (ii) Reinforcement (iii) Interface in a composite? **(12 Marks)**

OR

10 a. Explain pultrusion process for manufacturing composites with neat sketch. **(08 Marks)**
    b. A composite material is mode using 10% by volume of Kevlar fibre and 90% epoxy matrix. If the elastic moduli of Kevlar is 130 GN/m^2 and 4 GN/m^2, calculate the:
      (i)   Young's modulus of composite in fibre direction
      (ii)   Young's modulus of composite in the transverse direction. **(12 Marks)**

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