

# CBCS SCHEME

USN

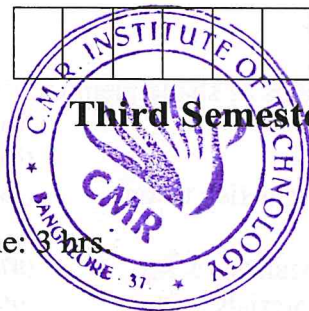
--	--	--	--	--	--	--	--	--	--

17ME32

## Third Semester B.E. Degree Examination, July/August 2021 Material Science

Time: 3 hrs

Max. Marks: 100



Note: Answer any FIVE full questions.

- 1 a. Define APF. Calculate APF for HCP cell. (06 Marks)  
b. Distinguish between Edge and Screw dislocations. (06 Marks)  
c. Explain the salient features of stress – strain curve for mild steel for tensile loading. (08 Marks)
- 2 a. Define Fracture. Explain the different types of fracture with neat sketches. (07 Marks)  
b. Explain the factors affecting the fatigue life of metallic components. (05 Marks)  
c. Define Creep. Explain the creep curve, with example. (08 Marks)
- 3 a. Explain the rules govern the formation of solid solution. (05 Marks)  
b. Explain the mechanism of solidification for pure metals and binary metallic solution. (08 Marks)  
c. Define Solid Solution. Explain the different types of solid solution. (07 Marks)
- 4 a. Write a note on Cast Metal structure. (05 Marks)  
b. Obtain an expression for critical radius of Nucleation. (05 Marks)  
c. Two metals A and B have their melting points at  $600^{\circ}\text{C}$  and  $400^{\circ}\text{C}$  respectively. These metals do not form any compound (or) inter-metallic phase. The maximum solubility in each other is 4% which remains the same until  $0^{\circ}\text{C}$ . An eutectic reaction takes place between 65% A and 35% B at  $300^{\circ}\text{C}$ .
  - i) Draw the phase diagram and label all the phases and fields.
  - ii) Find the temperature at which 20% A and 80% B starts and ends solidification.
  - iii) Find the temperature at which the same alloy contains 50% liquid and 50% solid.(10 Marks)
- 5 a. Draw TTT diagram for eutectoid steel and explain briefly. (06 Marks)  
b. Define Heat treatment. Give its classification. (06 Marks)  
c. Differentiate clearly between Normalizing and Annealing. Discuss Spheroidising Annealing with applications. (08 Marks)
- 6 a. Explain the Composition, Structure, Properties and Applications of 4 types of cast iron. (08 Marks)  
b. With a neat sketch, explain the Induction hardening process. Discuss the advantages, limitations and applications of the process. (08 Marks)  
c. Explain Age hardening of AL – CU alloys. (04 Marks)
- 7 a. State and explain the Mechanical and Electrical properties of Ceramic Materials. (08 Marks)  
b. What are Ceramics? Explain the types of Ceramics. (06 Marks)  
c. Define Smart Materials. Explain briefly the types of Smart Materials. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg,  $42+8 = 50$ , will be treated as malpractice.

- 8 a. Describe Shape Memory Alloys. Explain briefly the applications of shape memory alloys. (08 Marks)  
b. Differentiate between Thermo – Plastics and Thermoset Plastics. (06 Marks)  
c. Explain briefly the Fibre Optic Materials and use of non – destructive testing. (06 Marks)
- 9 a. Define Composites. Give the complete classification of composites. (07 Marks)  
b. What is the role of matrix and reinforcement in Composite materials? (06 Marks)  
c. With a neat sketch, explain the Injection Moulding process. (07 Marks)
- 10 a. List the advantages and applications of Composite Materials. (08 Marks)  
b. Explain the Pultrusion process with a neat sketch. List the merits and demerits. (08 Marks)  
c. Calculate the fraction of the load carried by the glass fiber reinforced epoxy resin composite, containing 60% by volume of  $E_{\text{glass}}$  fibers. Take  $E_f = 72$  GPa and  $E_{\text{matrix}} = 3$  GPa. (04 Marks)

CMRIT LIBRARY  
BANGALORE - 560 037

\* \* \* \* \*