

# CBCS SCHEME

USN

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

18ME34

## Third Semester B.E. Degree Examination, Feb./Mar. 2022 Material Science

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. State and explain Fick's laws of diffusion. (08 Marks)
- b. Sketch and explain Edge dislocations. (04 Marks)
- c. Distinguish between SC, BCC, FCC and HCP with respect to structure, number of atoms, Lattice constant, coordination number and APF. (08 Marks)

OR

- 2 a. Draw stress-strain diagram of Ductile material and explain plastic properties. (08 Marks)
- b. Derive expressions showing relationship between True Stress versus Engineering Stress and True Strain versus Engineering Strain. (08 Marks)
- c. Sketch and explain plastic deformation by Twinning. (04 Marks)

### Module-2

- 3 a. What is fatigue? Sketch and explain R.R. MOORE fatigue testing showing S-N curves. (08 Marks)
- b. What is Creep? Explain the stages of creep using creep curve. (08 Marks)
- c. Explain the application of Gibb's phase rule using binary phase diagram. (04 Marks)

OR

- 4 a. Draw Iron-Cementite diagram. Indicate phases, critical temperatures and explain invariant reactions. (12 Marks)
- b. Briefly explain the effect of alloying elements on Iron-Carbon diagram. (04 Marks)
- c. What is Solidification? Explain the mechanism of Solidification. (04 Marks)

### Module-3

- 5 a. What is heat treatment? Mention the classification. (06 Marks)
- b. Sketch and explain TTT diagram. (06 Marks)
- c. Differentiate between hardness and hardenability. Sketch and explain 'JOMINY END QUENCH' test to determine hardenability. (08 Marks)

OR

- 6 a. Sketch and explain Annealing heat treatment process. (06 Marks)
- b. What is Age hardening? Explain the Age hardening of Al-Cu alloys using phase diagram. (06 Marks)
- c. Explain the composition, properties and applications of Gray Cast Iron, White Cast Iron, Malleable iron and S.G. Iron. (08 Marks)

### Module-4

- 7 a. What are composites? How do you classify them? (06 Marks)
- b. Sketch and explain the fabrication of MMC's using stir casting process. (08 Marks)
- c. Explain the functions of matrix and reinforcement. (06 Marks)

OR

- 8 a. Derive an expression for Elastic modulus of the composite under iso-strain condition. (06 Marks)
- b. List advantages, disadvantages and applications of composite materials. (08 Marks)
- c. Sketch and explain the fabrication of CMC's using "slurry infiltration process". (06 Marks)

Module-5

- 9 a. Briefly explain Thermoplastics, Thermosets and Elastomers. (06 Marks)
- b. Sketch and explain the processing of plastics by "injection molding". (08 Marks)
- c. What are ceramics? Mention the classification. (06 Marks)

OR

- 10 a. Briefly explain optical and thermal materials. (06 Marks)
- b. What are smart materials? Explain briefly the types of smart materials. (08 Marks)
- c. Write a brief note on Non-Destructive methods used for residual life assessment. (06 Marks)

\* \* \* \* \*