



CBCS SCHEME

18AU33

USN

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024 Material Science and Metallurgy

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define Atomic packing factor. Calculate the APF for HCP structure. (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. Draw the Stress – Strain curve for ductile material with a labeling and explain. (08 Marks)
b. Define the following : i) Stress ii) Strain iii) Elasticity iv) Ductility
v) Toughness vi) Malleability. (06 Marks)
c. Differentiate Slip and Twinning. (06 Marks)

Module-2

- 3 a. Explain the cup and cone fracture, with a neat sketch. (07 Marks)
b. Explain the Griffith's theory for Brittle fracture. (07 Marks)
c. Define Fatigue. Explain the stages involved in fatigue failure (06 Marks)

OR

- 4 a. Explain the factors affecting Fatigue Life. (06 Marks)
b. Define Creep. Explain the three stages in creep with a neat sketch. (07 Marks)
c. Define Stress relaxation and derive the equation for the same. (07 Marks)

Module-3

- 5 a. Differentiate Homogeneous and Heterogeneous Nucleation. (05 Marks)
b. Define Homogeneous and Heterogeneous Nucleation. Obtain an expression for critical radius of nucleation. (08 Marks)
c. Explain Hume Rothery's rule. (07 Marks)

OR

- 6 a. Explain the Gibbs Phase rule. (05 Marks)
b. Draw the Iron - Carbon diagram with invariant reactions. (15 Marks)

Module-4

- 7 a. Explain the steps involved in constructing a TTT diagram. (07 Marks)
b. Differentiate between Normalizing and Annealing. (06 Marks)
c. With a neat sketch, explain the Flame hardening. (07 Marks)

OR

- 8 a. Define Ferrous materials and list them. (04 Marks)
b. Explain the composition, properties, microstructure and application of grey cast iron and mild steel. (16 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.

Module-5

- 9 a. Explain the following :
i) Copper alloys ii) Aluminum alloys. (14 Marks)
b. List out the advantages , disadvantages and applications of non – ferrous metals. (06 Marks)

OR

- 10 a. Define Composite Materials. Explain the role of matrix and reinforcement in a composite materials. (06 Marks)
b. List advantages and applications of composite materials and also classify the composite materials. (06 Marks)
c. Explain the filament winding process, with a neat sketch. Mention is applications. (08 Marks)
