



# CBCS SCHEME

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18AU33

## Third Semester B.E. Degree Examination, Jan./Feb. 2021 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. Draw the FCC lattice and calculate its coordination number and explain atomic packing factors. (10 Marks)
- b. Explain the following:
- i) Fick's laws of diffusion
  - ii) Factors affecting diffusion. (10 Marks)

OR

- 2 a. Draw the Engineering Stress-strain diagram of mild steel and describe how the following properties can be obtained from the diagram:
- i) Yield strength
  - ii) Elastic modulus
  - iii) Ductility
  - iv) Toughness. (10 Marks)
- b. i) Explain linear and non linear property. (05 Marks)
- ii) Differentiate between slip and twinning. (05 Marks)

### Module-2

- 3 a. Differentiate between ductile and brittle fracture with neat graphical representation. (10 Marks)
- b. With the help of a graph, explain three stages of creep. (10 Marks)

OR

- 4 a. Explain different types of fatigue loading, with an examples. (10 Marks)
- b. What is Fatigue? Briefly explain fatigue testing and plot S-N curves for different materials. (10 Marks)

### Module-3

- 5 a. What is Solidification? Explain:
- i) Homogeneous and Heterogeneous nucleation
  - ii) Cast metal structure. (10 Marks)
- b. List the types of solid solutions and explain the rules governing of formation of substitutional solid solution. (10 Marks)

OR

- 6 a. i) Deduce phase diagram. Explain its significance. (05 Marks)
- ii) Write a short note on: i) Phase rule ii) Lever rule. (05 Marks)
- b. Explain construction and interpretation of eutectic phase diagram. (10 Marks)

**Module-4**

- 7 a. With neat sketches, explain the following: (10 Marks)  
i) TTT curves ii) Normalizing
- b. Write a short note on: (10 Marks)  
i) Carburizing ii) Flame hardening

OR

- 8 a. Briefly explain the structure, properties, composition and applications of grey cast iron. (10 Marks)
- b. Briefly explain types of cast iron and its applications. (10 Marks)

**Module-5**

- 9 a. List the non-ferrous materials and briefly explain copper alloys. (10 Marks)
- b. Enumerate the different uses of Aluminium alloys and explain the modification of Al-Si alloy. (10 Marks)

OR

- 10 a. What is Composite Material? How is it classified? (10 Marks)
- b. Briefly discuss the advantages and applications of FRP and MMC. (10 Marks)

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