

CBCS SCHEME

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21MR33

Third Semester B.E. Degree Examination, June/July 2023 Materials Science

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Calculate the Atomic Packing Factor (APF) for FCC structure. (07 Marks)
- b. Discuss briefly edge dislocation in crystals. (07 Marks)
- c. Explain Crystalline and Non-crystalline solids. (06 Marks)

OR

- 2 a. Define the following :
(i) Unit Cell (ii) Space Lattice (iii) Atomic Packing Factor
(iv) Coordinate number. (06 Marks)
- b. Explain the surface imperfections in solids. (07 Marks)
- c. What are symmetry elements? Explain the types of symmetry elements. (07 Marks)

Module-2

- 3 a. With the help of engineering stress-strain diagram, explain the behavior of mild steel. (08 Marks)
- b. Define the following :
i) Yield Strength ii) Ductility iii) Toughness iv) Ultimate tensile strength
v) Stiffness (05 Marks)
- c. Explain Plastic deformation of single crystal by slip and twinning. (07 Marks)

OR

- 4 a. Explain ductile and brittle fracture. (07 Marks)
- b. What is fatigue? With neat sketch explain fatigue testing. (06 Marks)
- c. What is Creep? With neat sketch explain the creep mechanism. (07 Marks)

Module-3

- 5 a. What is solid solution? With neat sketch explain different types of solid solution. (08 Marks)
- b. Explain the following and write invariant reactions:
i) Eutectic system
ii) Eutectoid system
iii) Peritectoid system (06 Marks)
- c. Explain Hume – Rothery Rules for solid solution behaviour. (06 Marks)

OR

- 6 a. Draw the Iron-Carbon diagram and label all the phases, temperatures and invariant points on it. (07 Marks)
- b. Explain the homogeneous nucleation. Discuss the significance of critical radius of nuclei. (07 Marks)
- c. Write a short note on intermediate phases. (06 Marks)

Module-4

- 7 a. Mention the composition, properties and uses of
i) Cartridge brass ii) Muntz metal iii) Phosphor bronze (06 Marks)
b. Explain different forms of environmental degradation. (08 Marks)
c. Write a short notes on:
i) Intergranular corrosion ii) Pitting corrosion iii) Corrosion control (06 Marks)

OR

- 8 a. Explain self secured joints and permanent joints. (06 Marks)
b. Explain the properties of and parameters considered in fabrication and repair of systems and components. (08 Marks)
c. Discuss Gray Cast Iron composition, properties and uses. (06 Marks)

Module-5

- 9 a. Superimpose T-T-T diagram and CCT diagrams and explain the importance of both the diagrams. (10 Marks)
b. Define and classify heat treatment process and explain any one heat treatment process. (10 Marks)

OR

- 10 a. Explain age hardening of Al – Cu alloys. (10 Marks)
b. Write short note on Cyaniding and induction hardening. (10 Marks)
