

CBCS SCHEME

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18ME34

Third Semester B.E. Degree Examination, July/August 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. Calculate ADF of BCC crystal structure. (06 Marks)
- b. Discuss briefly edge dislocation in crystals. (06 Marks)
- c. State and explain Fick's laws of diffusion. Also explain factors affecting diffusion. (08 Marks)

OR

- 2 a. Explain with the help of stress-strain diagram stiffness, yield strength, ductility and toughness. (08 Marks)
- b. Deduce the relation between true stress and engineering stress. (06 Marks)
- c. A tensile load of 500N applied on a carbon steel rod of 10mm diameter, the diameter after elongation reduces to 9mm. Find true stress, engineering stress, true strain and engineering strain. (06 Marks)

Module-2

- 3 a. Discuss ductile and brittle fracture with clear differences. (06 Marks)
- b. What is fatigue? Explain R.R. Moore fatigue testing method with S – N diagram. (07 Marks)
- c. What is creep? Explain three stages of creep with neat graph also explain why 2nd stage is very important. (07 Marks)

OR

- 4 a. Explain Hume-Rothery rules for the formation of substitutional solid-solution. (06 Marks)
- b. Draw the Iron-Carbon diagram and label all the phases, temperatures and invariant points on it. (07 Marks)
- c. Derive the expression for critical radius in homogeneous nucleation. (07 Marks)

Module-3

- 5 a. Superimpose CCT diagram on TTT diagram and explain the importance of both the diagrams. (07 Marks)
- b. Explain Annealing and Normalising with necessary figures. (06 Marks)
- c. Discuss Martempering and Austempering processes with neat figures. (07 Marks)

OR

- 6 a. With the help of Aluminium – Copper phase diagram discuss age hardening process. (07 Marks)
- b. Discuss Gray cast iron composition, properties and uses. (07 Marks)
- c. Discuss Induction hardening and Flame hardening with neat diagrams. (06 Marks)

Module-4

- 7 a. What is composite? Classify the composites. (06 Marks)
- b. State the advantages, disadvantages and applications of composites. (08 Marks)
- c. Explain any one process of manufacturing composites. (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.

OR

- 8 a. Deduce the expression for iso-stress and iso-strain conditions of composites of Young's modulus. (08 Marks)
- b. Explain fultrusion process with neat sketch. (06 Marks)
- c. Briefly explain metal matrix and ceramic matrix composites. (06 Marks)

Module-5

- 9 a. Explain properties and different types of ceramics. (06 Marks)
- b. With the help of neat sketch explain injection moulding process. (06 Marks)
- c. State the applications and advantages of ceramics and polymers. (08 Marks)

OR

- 10 a. What is shape memory alloy? Discuss the same. (07 Marks)
- b. Discuss the optical and thermal materials. (06 Marks)
- c. Discuss the fiber optics, piezo – electrics and smart materials. (07 Marks)
