



CBCS SCHEME

15AU32

Third Semester B.E. Degree Examination, Aug./Sept.2020 Material Science and Metallurgy

Time: 3 hrs.

Max. Marks: 80

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

Module-1

- 1 a. Define Atomic Packing factor. Sketch the unit cell of a HCP crystal structure. Calculate the number of atoms per unit cell. Derive an expression for the density of atomic packing [Given $C = 1.633a$]. (08 Marks)
- b. With a neat sketch explain Edge and Screw dislocation. (08 Marks)

OR

- 2 a. Draw the stress strain curves for the following material :
(i) Mild steel (ii) Copper (iii) Aluminium (iv) Cast Iron.
Also explain plastic and elastic behavior of above materials. (08 Marks)
- b. Differentiate plastic deformation of single crystal by slip and twinning. (08 Marks)

Module-2

- 3 a. Define Fracture. Explain Cup and Cone fracture with a neat diagram. (08 Marks)
- b. Define Creep. Explain with a neat sketch creep curve. (08 Marks)

OR

- 4 a. Define fatigue. Explain RR Moore fatigue bending test with SN diagram. (08 Marks)
- b. Explain the mechanism of fatigue. Also explain the factors which influence fatigue. (08 Marks)

Module-3

- 5 a. Derive critical radius of homogeneous nucleation. (08 Marks)
- b. What is solid solution? Mention the types solid solution. Explain the factors given by Hume Rothery that govern the formation of solid solution. (08 Marks)

OR

- 6 a. Draw "Iron-Iron Carbide" phase diagram and show the region where the following reactions takes place : (i) Eutectic (ii) Peritectic (iii) Eutectoid.
Explain the structural changes taking place at 0.6% carbon. (10 Marks)
- b. Sketch and explain the equilibrium diagram when two components A and B are completely soluble in liquid state and partially soluble in solid state. Also mention an example. (06 Marks)

Module-4

- 7 a. Draw TTT diagram for 0.8% C and superimpose the cooling curves. Explain briefly. (08 Marks)
- b. With a neat sketch, explain hardening and tempering heat treatment processes. (08 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. List the properties, composition and applications of grey cast iron, malleable cast iron and S.G. Iron. (08 Marks)
- b. Write a short on Copper and Aluminium alloys. (08 Marks)

Module-5

- 9 a. Define Composite. Give its classification. (04 Marks)
- b. With a neat sketch explain pultrusion process. (08 Marks)
- c. What are the advantages and applications of composites? (04 Marks)

OR

- 10 a. Write a note on properties and applications of smart materials. (04 Marks)
- b. Explain working principle of optical fiber and piezo-electric materials. (08 Marks)
- c. What are the applications of shape memory alloys? (04 Marks)

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