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Third Semester B.E. Degree Examination, June/July 2023 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. Draw stress-strain curves for mild steel and describe how to find each of the properties.
i) Yield strength
ii) Ductility
iii) Toughness
iv) Ultimate tensile strength
v) Fractures stress. (10 Marks)
- b. Define Atomic packing factor. Derive an expression for atomic factor for FCC and BCC structures. (10 Marks)

OR

- 2 a. Classify crystal imperfections in crystals. Explain in detail line imperfection. (10 Marks)
- b. Define :
i) Elastic strength
ii) Stiffness
iii) Resilience
iv) Toughness
v) Ductility. (10 Marks)

Module-2

- 3 a. With a neat sketch, explain slip and twinning deformation in materials. (10 Marks)
- b. With neat sketches, explain Ductile, Brittle and shear fracture. (10 Marks)

OR

- 4 a. Define Creep, with neat sketches, explain three stages of creep. (10 Marks)
- b. With neat sketches, explain the types of fatigue loading. (06 Marks)
- c. What are factors effecting fatigue life? (04 Marks)

Module-3

- 5 a. Explain the Solidification of PUN metals. (06 Marks)
- b. With neat sketch, explain cast metal structures. (06 Marks)
- c. What are solid solutions? Explain the different types of solid solutions. (08 Marks)

OR

- 6 a. With neat sketch, explain construction of phase diagram. (10 Marks)
- b. Classify phase diagram. Explain any two phase diagrams. (10 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-4

- 7 a. Draw Fe – C equilibrium diagram and label at the field. (05 Marks)
b. Define the following :
i) Ferrite
ii) Austenite
iii) Cementite
iv) Martensite
v) Pearlite. (05 Marks)
c. Explain the effects of alloying elements on the Fe – C diagram. (10 Marks)

OR

- 8 a. What is TTT diagram? Draw TTT diagram for an eutectoid steel and explain the various transformation products of austenite on cooling. (10 Marks)
b. What is heat treatment? Explain Hardening and Tempering. (05 Marks)
c. Write a note on surface Hardening process. (05 Marks)

Module-5

- 9 a. What are alloy steels? Explain the different types of alloy steels. (10 Marks)
b. Explain composition properties and uses of Aluminium alloys. (05 Marks)
c. Write a note on cast iron and its types. (05 Marks)

OR

- 10 a. Explain the fundamental of production of metal matrix composites. (10 Marks)
b. Write a note on :
i) Hand Lay – up process
ii) Applications of composites. (10 Marks)
