

CBCS SCHEME

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Third Semester B.E. Degree Examination, Dec.2018/Jan.2019 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. Define atomic packing factor. Determine the APF for an FCC structure. (08 Marks)
b. Differentiate between edge and screw dislocations. (06 Marks)
c. State and explain Fick's laws of diffusion. (06 Marks)

OR

- 2 a. Draw the stress – strain diagram for a mild steel. Explain how the following properties are determined with the help of a stress-strain diagram.
i) Ductility ii) Yield strength iii) Ultimate tensile strength (08 Marks)
b. What are the linear elastic properties? Explain in brief. (06 Marks)
c. Describe plastic deformation of single crystal by slip and twinning with neat sketches. (06 Marks)

Module-2

- 3 a. Explain various stages of ductile structure (cup and cone type) with suitable sketches. (06 Marks)
b. Differentiate between ductile and brittle structures. (06 Marks)
c. Describe various types of creep with the help of a typical creep curve. (08 Marks)

OR

- 4 a. What are the different types of fatigue stress cycles? Explain in brief. (06 Marks)
b. Describe a rotating beam type fatigue test with a neat sketch. (08 Marks)
c. Discuss the various factors affecting fatigue life. (06 Marks)

Module-3

- 5 a. Define Homogeneous and Heterogeneous nucleation. Explain in brief. (08 Marks)
b. Explain different types of solid solutions with suitable sketches. (06 Marks)
c. State and explain Hume Rothery's Rules for the formation of substitutional solid solutions. (06 Marks)

OR

- 6 a. State Gibb's phase rule. Define the terms phases component and degree of freedom. (06 Marks)
b. Describe the construction of phase diagram by a thermal analysis method. (08 Marks)
c. Draw a Peritectic phase diagram and write the Peritectic reaction. (06 Marks)

Module-4

- 7 a. Draw the T.TT diagram for a eutectoid steel and explain different microstructures. (08 Marks)
b. Define hardenability. Explain Jominy End Quench Test of measuring hardnability. (06 Marks)
c. Explain flame hardening and induction hardening process with suitable sketches. (06 Marks)

OR

- 8 a. What are the properties, composition and uses of Gray cast iron? (08 Marks)
b. Explain different types of brasses in brief. (06 Marks)
c. Describe the properties, composition and uses of Aluminum Silicon alloys. (06 Marks)

Module-5

- 9 a. Describe the role of matrix and reinforcement in composite materials. (06 Marks)
b. Explain pultrusion process for the production of FRP's with a neat sketch. (08 Marks)
c. What are the advantages of composite materials? (06 Marks)

OR

- 10 a. What are the optical properties of materials? Explain in brief. (08 Marks)
b. Explain the biological applications of shape memory alloys. (06 Marks)
c. Describe the various requirements for the selection of materials. (06 Marks)

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