CBCS SCHEME

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17AU32

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.

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-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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