CBCS SCHEME

USN | | | | | | | | | | |

21MR33

Third Semester B.E. Degree Examination, June/July 2024
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. Differentiate between crystalline and non-crystalline solids. **(06 Marks)**

b. Explain the following terms with sketches whenever required:
i) Unit cell
ii) Space Lattice
iii) Co-ordination number. **(06 Marks)**

c. Derive an expression for APF for BCC unit cell with sketch. **(08 Marks)**

OR

2 a. Calculate the APF for HCP unit cell. **(10 Marks)**

b. What are crystal imperfections? Explain point defects in detail with sketches. **(10 Marks)**

Module-2

3 a. Sketch and explain the stress-strain graph for mild steel showing the salient features. **(10 Marks)**

b. With a neat sketch, explain the stages in ductile fracture. **(10 Marks)**

OR

4 a. Define fatigue. Explain the mechanism of fatigue with sketches. **(07 Marks)**

b. Briefly explain the factors affecting fatigue life. **(05 Marks)**

c. With a neat sketch, explain the various stages of creep. **(08 Marks)**

Module-3

5 a. Briefly explain the different types of solid solutions, with sketches. **(08 Marks)**

b. Explain the Hume-Rothery rules for the formation of solid solutions. **(06 Marks)**

c. Differentiate between Eutectic and Eutectoid systems of a phase diagram. **(06 Marks)**

OR

6 a. With a neat sketch explain the $F_{e_3} - C$ diagram. Show the salient features also write the reactions at the different phases. **(12 Marks)**

b. Explain the differences between the homogeneous and heterogeneous nucleation. **(08 Marks)**

Module-4

7 a. Explain the properties, composition and uses of S.G. iron. **(10 Marks)**

b. Explain the different types of copper and aluminium alloys. **(10 Marks)**

OR

8 Write a note on:

a. Permanent joints
b. Adhesives and bonding
c. Corrosion control
d. Protective coatings. **(20 Marks)**

Module-5

9 a. With a neat sketch explain T-T-T diagram for Eutectoid steel. **(10 Marks)**

b. Explain the following:
   i) Carburizing
   ii) Induction hardening. **(10 Marks)**

OR

10 a. Define heat treatment process. Enumerate the broad classification of heat treatment process. **(06 Marks)**

b. Differentiate between Austempering and Martempering with cooling curve. **(06 Marks)**

c. With neat sketch explain Joming Hardenability test. **(08 Marks)**

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