CBCS SCHEME

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21MR33

Third Semester B.E. Degree Examination, Dec.2023/Jan.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. Define the following : i) Unit Cell ii) Space Lattice iii) Co-ordination number iv) Lattice v) Atomic packing factor. **(10 Marks)**

b. Derive an expression for APF of BCC unit cell. **(10 Marks)**

OR

2 a. What are Crystal imperfections? Explain the point defects in detail. **(10 Marks)**

b. Differentiate between Edge dislocation and Screw dislocation. **(05 Marks)**

c. Explain briefly about Surface defects. **(05 Marks)**

Module-2

3 a. Explain the following : i) Toughness ii) Resilience iii) Stiffness iv) Ductility v) Offset yield strength. **(10 Marks)**

b. With a neat sketch, explain Plastic deformation of single crystal by slip. **(10 Marks)**

OR

4 a. Sketch and explain the various stages in ductile fracture. **(08 Marks)**

b. State and explain the factors affecting Fatigue life. **(06 Marks)**

c. With a neat sketch, explain the Creep Curve. **(06 Marks)**

Module-3

5 a. What is Solid Solution? Explain the different types of Solid Solutions. **(08 Marks)**

b. Explain Hume – Rothery rules for Solid solution behaviour. **(06 Marks)**

c. State Gibbs Phase rule and explain each term. **(06 Marks)**

OR

6 a. Draw Fe – C equilibrium diagram and write the invariant reactions. **(10 Marks)**

b. Explain Homogeneous Nucleation. Derive an expression for the critical size of the nucleus for homogeneous nucleation. **(10 Marks)**

Module-4

7 a. Explain the properties , composition and uses of :
i) Grey cast iron ii) Aluminum alloys. **(10 Marks)**

b. Explain the different types of Corrosion. **(10 Marks)**

OR

8 a. Explain the properties, composition and uses of the following :
i) S G Iron ii) Copper and its alloys. **(10 Marks)**

b. Write a note on :
i) Permanent joints ii) Adhesive materials. **(10 Marks)**

Module-5

9 a. With a neat sketch, explain the construction of TTT curve. **(10 Marks)**

b. Define Annealing. Explain the different types of Annealing process. **(10 Marks)**

OR

10 a. With a neat sketch, explain the Induction Hardening process. **(08 Marks)**

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

c. Define Hardening. Explain why tempering is done immediately after hardening process for steel components. **(06 Marks)**

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