CBCS SCHEME

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21ME33

Third Semester B.E. Degree Examination, June/July 2023
Material Science and Engineering

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. Classify Engineering Materials. Explain them with examples. **(08 Marks)**
b. Differentiate between crystalline and non-crystalline solids. **(07 Marks)**
c. Explain the various geometrical crystal rotation geometry operations. **(05 Marks)**

OR

2 a. Define unit cell and crystal lattice. Explain the cubic, tetragonal, orthorhombic and rhobhohedral unit cells with examples. **(10 Marks)**
b. Define atomic packing factor. Calculate APF of FCC unit cell. **(05 Marks)**
c. Define crystal imperfections in solids. Explain point imperfections. **(05 Marks)**

Module-2

3 a. Classify and explain solid solutions. What are intermediate phases? **(10 Marks)**
b. Explain Hume – Rothery rules. **(04 Marks)**
c. Explain (i) Gibb's phase rule (ii) Level rule. **(06 Marks)**

OR

4 a. Explain the eutectic system binary phase diagram for two metals completely soluble in liquid state but completely insoluble in solid state. **(10 Marks)**
b. Explain the two Fick's laws of diffusion. **(04 Marks)**
c. Explain the role of imperfections in diffusions. **(06 Marks)**

Module-3

5 a. Explain the homogeneous and heterogeneous nucleation process with a suitable sketch or graph or equations. **(10 Marks)**
b. Explain the plastic deformation by :
(i) Slip (ii) Twinning. **(06 Marks)**
c. Define and classify strengthening mechanisms. Explain anyone method. **(04 Marks)**

OR

6 a. Differentiate between Annealing and Normalising. **(05 Marks)**
b. With sketch, explain the flame hardening process. **(05 Marks)**
c. Explain the TTT diagram for 0.8% C eutectoid steel. **(10 Marks)**

Module-4

7 a. Classify surface coating methods. Explain the electrochemical coating method. **(08 Marks)**
b. Explain the various surface coating materials. **(06 Marks)**
c. What are the advantages and disadvantages of powder metallurgy? **(06 Marks)**

OR

8 a. Explain the characteristics of metal powders with regard to particle size and shape distribution. **(06 Marks)**

b. Explain : (i) Powder compacting process (ii) Powder sintering process. **(08 Marks)**

c. What are the applications of powder metallurgy? **(06 Marks)**

Module-5

9 a. Explain the evolution of engineering materials. **(06 Marks)**

b. Explain the design process with a suitable flow chart. **(08 Marks)**

c. With sketch, explain the design tools and materials data. **(06 Marks)**

OR

10 a. Classify engineering materials. Explain them with examples. **(10 Marks)**

b. Classify material property charts. Sketch and explain the Young's modulus – density chart. **(10 Marks)**

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