CBCS SCHEME

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18ME34

Third Semester B.E. Degree Examination, Feb./Mar. 2022
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. State and explain Fick's laws of diffusion. **(08 Marks)**

b. Sketch and explain Edge dislocations. **(04 Marks)**

c. Distinguish between SC, BCC, FCC and HCP with respect to structure, number of atoms, Lattice constant, coordination number and APF. **(08 Marks)**

OR

2 a. Draw stress-strain diagram of Ductile material and explain plastic properties. **(08 Marks)**

b. Derive expressions showing relationship between True Stress versus Engineering Stress and True Strain versus Engineering Strain. **(08 Marks)**

c. Sketch and explain plastic deformation by Twinning. **(04 Marks)**

Module-2

3 a. What is fatigue? Sketch and explain R.R. MOORE fatigue testing showing S-N curves. **(08 Marks)**

b. What is Creep? Explain the stages of creep using creep curve. **(08 Marks)**

c. Explain the application of Gibb's phase rule using binary phase diagram. **(04 Marks)**

OR

4 a. Draw Iron-Cementite diagram. Indicate phases, critical temperatures and explain invariant reactions. **(12 Marks)**

b. Briefly explain the effect of alloying elements on Iron-Carbon diagram. **(04 Marks)**

c. What is Solidification? Explain the mechanism of Solidification. **(04 Marks)**

Module-3

5 a. What is heat treatment? Mention the classification. **(06 Marks)**

b. Sketch and explain TTT diagram. **(06 Marks)**

c. Differentiate between hardness and hardenability. Sketch and explain 'JOMINY END QUENCH' test to determine hardenability. **(08 Marks)**

OR

6 a. Sketch and explain Annealing heat treatment process. **(06 Marks)**

b. What is Age hardening? Explain the Age hardening of Al-Cu alloys using phase diagram. **(06 Marks)**

c. Explain the composition, properties and applications of Gray Cast Iron, White Cast Iron, Malleable iron and S.G. Iron. **(08 Marks)**

Module-4

7 a. What are composites? How do you classify them? **(06 Marks)**

b. Sketch and explain the fabrication of MMC's using stir casting process. **(08 Marks)**

c. Explain the functions of matrix and reinforcement. **(06 Marks)**

OR

8 a. Derive an expression for Elastic modulus of the composite under iso-strain condition. **(06 Marks)**
b. List advantages, disadvantages and applications of composite materials. **(08 Marks)**
c. Sketch and explain the fabrication of CMC's using "slurry infiltration process". **(06 Marks)**

Module-5

9 a. Briefly explain Thermoplastics, Thermosets and Elastomers. **(06 Marks)**
b. Sketch and explain the processing of plastics by "injection molding". **(08 Marks)**
c. What are ceramics? Mention the classification. **(06 Marks)**

OR

10 a. Briefly explain optical and thermal materials. **(06 Marks)**
b. What are smart materials? Explain briefly the types of smart materials. **(08 Marks)**
c. Write a brief note on Non-Destructive methods used for residual life assessment. **(06 Marks)**

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