CBCS SCHEME

USN 17ME32

Third Semester B.E. Degree Examination, June/July 2019
Material Scinece

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define Atomic Packing Factor and calculate Atomic Packing Factor for FCC Crystal Structure. **(08 Marks)**

b. State and explain Ficks first law of Diffusion. **(06 Marks)**

c. Explain the different types of Point Imperfections, with neat sketches. **(06 Marks)**

OR

2 a. Draw Stress - Strain diagram for mild steel and caste iron. Explain its behaviour under uniaxial Tension until fracture. **(08 Marks)**

b. What is Fracture? How are they classified? **(04 Marks)**

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

Module-2

3 a. With a neat sketch, explain the construction of phase diagram. **(08 Marks)**

b. Explain Gibbs phase rule and Lever Wile. **(06 Marks)**

c. With a neat sketch, explain different cast metal structures. **(06 Marks)**

OR

4 a. Explain Homogeneous nucleation and discuss the significance of critical radius of nuclei. **(10 Marks)**

b. Two metals A & B of melting points 900 °C and 700 °C respectively have unlimited mutual liquid solubilities. The solid solubility of B in A is 30% at eutectic temperature of 400 °C, which reduces to 20?/ at 0 °C. The solid solubility of A in B is 20% at eutectic temperature which reduces to 15% at 0 °C. The eutectic composition is 70%B and 30% A. Draw the phase diagram. Calculate the solid and liquid phases of 40% B alloy at 500 °C. **(10 Marks)**

Module-3

5 a. Draw TTT diagram for eutectoid steel (0.83% C) and explain different micro structures. **(08 Marks)**

b. Sketch and explain Austempering and Martempering. **(08 Marks)**

c. Sketch and explain Flame hardening. **(04 Marks)**

OR

6 a. Define and list the types of Heat Treatment processes. **(05 Marks)**

b. With a neat sketch, explain .coming End Queuch test. **(08 Marks)**

c. Sketch and explain Nitriding process. **(07 Marks)**

Module-4

7 a. Define Ceramics and briefly explain the types of ceramics. **(08 Marks)**

b. Explain Powder Metallurgy technique for Ceramic processing. **(08 Marks)**

c. Differentiate between Thermoplastics and Thermoset plastics. **(04 Marks)**

Important Note :

OR

8 a. Briefly explain the characteristics of plastics. **(05 Marks)**
b. Define Smart Materials. Write a note on Piezoelectric materials. **(05 Marks)**
c. Write a note on Shape Memory alloys. List the Applications of Smart Materials. **(10 Marks)**

Module-5

9 a. Define Composites and classify them. **(05 Marks)**
b. Sketch and explain Filament winding process to produce composites. **(08 Marks)**
c. Write a note on Fibre reinforced plastic composites. (07 **Marks)**

OR

10 a. Derive an expression for Young's Modulus in a composite for longitudinal loading of fibre reinforced composite. **(08 Marks)**
b. Calculate the volume ratio of Aluminum and Boron in Aluminum — Boron composite having Young's Modulus equal to Iron. The Young's Moduli of Aluminum , Boron and Iron are respectively 71 GPa , 440 GPa and 210 GPa. **(08 Marks)**
c. State some Applications of composites. **(04 Marks)**

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