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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 rule. **(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 900^0C and 700^0C respectively have unlimited mutual liquid solubilities. The solid solubility of B in A is 30% at eutectic temperature of 400^0C, which reduces to 20% at 0^0C. The solid solubility of A in B is 20% at eutectic temperature which reduces to 15% at 0^0C. The eutectic composition is 70%B and 30% A. Draw the phase diagram. Calculate the solid and liquid phases of 40% B alloy at 500^0C. **(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 Joming 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)**

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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