CBCS Scheme

USN | 1 A Y 1 6 M T 0 3 8 | 15MT32

Third Semester B.E. Degree Examination, June/July 2018
Material Science and Technology

Time: 3 hrs.   Max. Marks: 80

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

Module-1

1 a. Draw the stress-strain curve, for mild steel and describe how the following properties can be obtained from the curve: (i) Elastic modulus   (ii) Yield strength   (iii) Ductility (iv) Toughness (v) Ultimate strength. **(08 Marks)**

   b. A cylindrical specimen of steel having an original diameter of 12.8 mm is tensile tested to fracture and found to have an engineering fracture strength σ_f of 460 MPa. If its cross sectional diameter at fracture is 10.7 mm determine: (i) The ductility in terms of percent area reduction. (ii) The true stress at fracture. **(08 Marks)**

OR

2 a. State and explain Flicks first law of diffusion. **(04 Marks)**

   b. Derive an expression for critical resolved shear stress for slip in a crystal structure. **(06 Marks)**

   c. State the factors that affect the fatigue strength of a metal. Explain them briefly. **(06 Marks)**

Module-2

3 a. Briefly explain the TTT diagram for eutectoid steel. **(08 Marks)**

   b. Explain carburizing and flame hardening, with figure. **(08 Marks)**

OR

4 a. Compare Grey cast iron with Malleable cast iron, with reference to their composition, structures, properties and uses. **(08 Marks)**

   b. Write a note on properties and composition of different types of brasses. **(08 Marks)**

Module-3

5 a. Explain homogeneous nucleation. Discuss the significance of critical radius of nuclei. **(08 Marks)**

   b. Two metals A and B are used to form an alloy containing 75% A and 25% B. A melts at 650°C and B at 450°C. When alloyed together A and B do not form any component or intermediate phase. The solid solubility of metal A in B and of B in A are negligible. The metal pair form an eutectic at 40% A and 60% B which solidifies at 300°C. Assume the liquidus and solidus lines to be straight. Draw the phase diagram for the alloy series and find:
   (i)   The temperatures at which the alloy starts and completes solidification.
   (ii)   The percentage of eutectic in the alloy at room temperature. **(08 Marks)**

OR

6 a. What is a solid solution? Mention the types of solid solution. Also enumerate Hume-Rothary rule governing the formation of solid solution. **(08 Marks)**

   b. Explain the Gibb's phase rule. **(04 Marks)**

   c. Derive the level rule for the binary phase diagram of two metals A and B completely soluble in each other. **(04 Marks)**

Module-4

7 a. Give the classification of composite materials. **(04 Marks)**
   b. List the applications of composite material. **(04 Marks)**
   c. With neat sketches, explain the production of FRP's using hand moulding technique.
      (08 Marks)

OR

8 a. Explain the production of FRP using,
      (i)   Spray up process.
      (ii)   Filament winding process **(08 Marks)**
   b. Explain the production of metal matrix composites. **(08 Marks)**

Module-5

9 a. What do you mean by ER fluid? Explain with examples, the application of ER fluids in different modes. **(08 Marks)**
   b. List the advantages of fibre optic sensors in smart structure. **(08 Marks)**

OR

10   Explain the following:
   a. Force sensors.
   b. Load cells.
   c. Torque sensors.
   d. Microphones. **(16 Marks)**

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