

BCS SCHEME

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Third Semester B.E. Degree Examination, Dec.2 Material Science

Time: 3 hrs.

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Note: Answer any FIVE full questions, choosing ONE Int'l question from each module.

Module-1

- 1 a. Define the following : i) Unit cell ii) Lattice iii) Space lattice
iv) Co-ordination number v) Atomic packing factor. (05 Marks)
b. Differentiate between Edge and Screw dislocation. (05 Marks)
c. Explain factors affecting diffusion. (06 Marks)

OR

- 2 a. Explain surface defects with neat sketches. (05 Marks)
b. Explain cup and cone fracture, with neat sketch. (05 Marks)
c. Explain with neat stress - strain diagram, the mechanical properties of a material in plastic range. (06 Marks)

Module-2

- 3 a. Explain solidification in pure metals. (05 Marks)
b. Define Solid Solutions. Explain the types of solid solutions. (05 Marks)
c. What is Hume Rothery's rule? Explain all the rules of Hume Rother's. (06 Marks)

OR

- 4 a. Lead (Pb) melts at 323 °C and tin (Sn) melts at 232 °C. Additions of Sn to Pb lowers the melting point Pb and addition of Pb to Sn also lowers the melting point of Sn at 180 °C, Liquid of composition 61.9 % Sn, alpha (α) phase of composition 19.2 % Sn and beta (β) phase of composition 96.2 % Sn are in thermal equilibrium. The solubilities of Pb in Sn, and Sn in Pb at room temperature are negligible.
i) Draw the Pb - Sn diagram ii) Identify the reactions occurring at 180 °C
iii) Calculate the amount of phases in an alloy of composition 40% Sn, at 1790 °C. (08 Marks)
b. Draw the neat sketch of Iron - Carbon diagram. Indicate all phases and explain 3 invariant reactions. (08 Marks)

Module-3

- 5 a. Explain T - T - T diagram for eutectoid steel. (08 Marks)
b. With a neat diagram, explain continuous cooling transformation diagram. (08 Marks)

OR

- 6 a. Define Heat treatment. List its objectives. (05 Marks)
b. Write the classification of heat treatment. (05 Marks)
c. Explain age hardening heat treatment for non - ferrous materials. (06 Marks)

Module-4

- 7 a. What are Ceramics? List and explain processing of ceramics. (07 Marks)
b. Explain mechanical properties of ceramics. (05 Marks)
c. List advantages and applications of ceramics. (04 Marks)

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OR

- 8 a. What are Plastics? List processing of thermoplastics and explain any one method. (07 Marks)
b. Explain in brief the selection of engineering materials. (05 Marks)
c. Explain NDT method for Residual life assessment. (04 Marks)

Module 5

- 9 a. Define Composite Materials. List their classification based on matrix and reinforced constituents. (07 Marks)
b. Differentiate between thermoset and thermoplastic materials. (05 Marks)
c. Write a note on Metal Matrix Materials. (04 Marks)

OR

- 10 a. List and explain various fibers used in preparation of composite materials. (07 Marks)
b. Explain Powder metallurgy technique of production of composite materials. (05 Marks)
c. With neat sketch, explain Squeeze casting. (04 Marks)

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