

CBCS SCHEME

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15ME32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020 Material Science

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full 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 Rothery's. (06 Marks)

OR

- 4 a. Lead (P_b) melts at 323°C and tin (S_n) melts at 232°C . Additions of S_n to P_b lowers the melting point P_b and addition of P_b to S_n also lowers the melting point of S_n at 180°C , Liquid of composition 61.9% S_n , alpha (α) phase of composition 19.2% S_n and beta (β) phase of composition 96.2% S_n are in thermal equilibrium. The solubilities of P_b in S_n and S_n in P_b at room temperature are negligible.
i) Draw the $P_b - S_n$ diagram ii) Identify the reactions occurring at 180°C
iii) Calculate the amount of phases in an alloy of composition 40% S_n 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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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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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