

CBCS SCHEME

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17ME32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019

Material Science

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Define APF and coordination number. Calculate the APF for HCP structure. (08 Marks)
b. Differentiate Edge dislocation and screw dislocation. (05 Marks)
c. State and explain Fick's I and II law diffusion. (07 Marks)

OR

- 2 a. List the mechanical properties in plastic range. Explain them briefly. (08 Marks)
b. With neat sketch, explain S-N diagram and creep curve. (12 Marks)

Module-2

- 3 a. Define solid solution. Explain the different types of solid solutions. (07 Marks)
b. Explain the factors affecting the formation of solid solution. (05 Marks)
c. Explain Lever rule and Gibbs phase rule with an example. (08 Marks)

OR

- 4 a. Draw Fe-Fe₃C diagram and indicate the phase temperatures and also write the invariant reaction. (12 Marks)
b. What is homogenous nucleation? Obtain an expression for critical radius of Nuclei. (08 Marks)

Module-3

- 5 a. Draw TTT diagram for 0.8% C and super-impose the cooling curves. Explain briefly. (10 Marks)
b. With neat sketch, explain hardening and tempering heat treatment processes. (10 Marks)

OR

- 6 a. Explain the Age hardening of Al-Cu alloys. (05 Marks)
b. With neat sketches explain Flame Hardening. (06 Marks)
c. List the properties and applications of Gray cast Iron, Malleable Cast Iron and S.G. Iron. (09 Marks)

Module-4

- 7 a. Define ceramics and what are its types? (06 Marks)
b. Enumerate Electrical and Mechanical properties of ceramics. (08 Marks)
c. Write the uses of plastics in the various field of engineering. (06 Marks)

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. Differentiate the thermo plastics and thermo setting plastics. (05 Marks)
 b. With a neat sketch explain the processing of plastics using injection moulding method. (10 Marks)
 c. Write a note on properties and applications of smart materials. (05 Marks)

Module-5

- 9 a. Define composites. Give its classification. (05 Marks)
 b. With a neat sketch, explain pultrusion process. (08 Marks)
 c. What are the advantages and applications of composites? (07 Marks)

OR

- 10 a. Derive an equation for Young's modulus of FRP composites using:
 i) Iso-strain condition
 ii) Iso-stress condition (14 Marks)
 b. Calculation the tensile modulus of elasticity of unidirectional carbon fibre reinforced composite material contains 62% by volume of carbon-fibres in
 i) Iso-stress condition
 ii) Iso-strain condition
 Take: $E_{\text{carbon fibre}} = 37.86 \times 10^4 \text{ N/mm}^2$
 $E_{\text{epoxy}} = 42 \times 10^2 \text{ N/mm}^2$ (06 Marks)
