

# 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-Fe<sub>3</sub>C 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. Calculate 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)

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