

# CBCS Scheme

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Third Semester B.E. Degree Examination, June/July 2018

## Material Science and Metallurgy

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 lattice: (04 Marks)
- Unit cell
  - Space lattice
  - Atomic packing factor
  - Coordination number
- b. State and explain Fick's first law of diffusion. (04 Marks)
- c. What do you mean by crystalline imperfection? Explain briefly point and scalar/line defects. (08 Marks)

OR

- 2 a. Explain in detail the mechanical properties in elastic and plastic region. (08 Marks)
- b. Discuss how the slip phenomenon differs in case of a polycrystal to the single crystal. (08 Marks)

### Module-2

- 3 a. Define creep and discuss any two mechanisms for creep. (08 Marks)
- b. Discuss the basic modes of fracture with a neat sketch. List the difference between them. (08 Marks)

OR

- 4 a. What is fatigue? Draw the S-N curves for steel and aluminum. (08 Marks)
- b. Discuss the factors affecting the fatigue life of a component. (08 Marks)

### Module-3

- 5 a. Explain the homogeneous nucleation. Discuss the significance of critical radius of nuclei. (08 Marks)
- b. Define solid solution, and explain the different types of solid solution. (08 Marks)

OR

- 6 a. State the Gibb's phase rule and explain with a simple example. (08 Marks)
- b. Draw the eutectic and eutectoid phase diagram. Give the invariant reactions. (08 Marks)

### Module-4

- 7 a. Draw the iron-carbon equilibrium diagram and label all the fields. Write the different invariant reactions. (08 Marks)
- b. Explain the steps to construct TTT diagram. Draw a sketch of a TTT diagram, label all the fields for an eutectoid steel. (08 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 between SG iron, grey iron and white iron with respect to microstructure, composition, properties and applications. (08 Marks)
- b. What are brasses and bronzes? Give an account of composition and application of  $\alpha$  - brasses? (08 Marks)

Module-5

- 9 a. Explain the following for production of FRP:  
i) Spray layup process  
ii) Pultrusion process (08 Marks)
- b. Explain with a neat sketch production of MMC by using powder metallurgy process. (08 Marks)

OR

- 10 a. Define composite material and give the classification of composites. Enumerate important characteristics of composites. (08 Marks)
- b. Describe the features of Fibrous composites, laminated composites and particulate composites. (08 Marks)

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