



# CBGS SCHEME

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18AU33

## Third Semester B.E. Degree Examination, Jan./Feb. 2023 Material Science and Metallurgy

Time: 3 hrs.

Max. Marks: 100

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

### Module-1

- 1 a. Define Material Science. Classify materials based on their properties. (08 Marks)  
b. Define the following terms:  
(i) Unit Cell (ii) Co-ordination number (iii) Space lattice (04 Marks)  
(iv) Atomic Packing factor (08 Marks)  
c. Obtain the value of APF for HCP crystal structure. (08 Marks)

OR

- 2 a. List and explain the various defects of crystal structures. (08 Marks)  
b. State and explain Fick's laws of diffusion. (04 Marks)  
c. With the help of stress-strain curve. Explain the various mechanical properties for a ductile material. (08 Marks)

### Module-2

- 3 a. Define fracture. Explain the stages of ductile fracture. (12 Marks)  
b. Differentiate between ductile fracture and brittle fracture. (08 Marks)

OR

- 4 a. Describe the phenomenon of creep with the help of creep curve. Explain the three stages of creep. (12 Marks)  
b. Define fatigue. Explain the various factors affecting fatigue life. (04 Marks)  
c. Explain the significance of S-N curves in measuring the fatigue life of materials. (04 Marks)

### Module-3

- 5 a. Explain the mechanism of solidification. (06 Marks)  
b. Give a note on Heterogeneous and Homogeneous nucleation. (06 Marks)  
c. Define solid solution. List and explain the rules governing the formation of solid solutions. (08 Marks)

OR

- 6 a. Explain the types of phase diagrams. (06 Marks)  
b. With the help of phase diagram, explain lever rule. (10 Marks)  
c. List the various types of Binary Phase diagrams. (04 Marks)

### Module-4

- 7 a. Define heat treatment and list the various types of heat treatment processes. (08 Marks)  
b. What is the purpose of annealing? Discuss about types of annealing process. (06 Marks)  
c. With a neat sketch explain induction hardening. (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.

18AU33

OR

- 8 a. List the various surface hardening methods. Discuss the process of carburizing. (08 Marks)  
b. Give the properties, composition and applications of  
(i) Grey Cast Iron  
(ii) Spheroidal Graphite Iron (12 Marks)

Module-5

- 9 a. Discuss in brief about copper alloys. (08 Marks)  
b. Write short notes on :  
(i) Al – Cu alloys  
(ii) Al – Si alloys (12 Marks)

OR

- 10 a. Define composite. Classify the composites with respect to matrix and reinforcements. (08 Marks)  
b. Explain any one method of production of FRP's with a neat sketch. (08 Marks)  
c. List the applications of composites. (04 Marks)

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