



# CBGS SCHEME

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  $323^{\circ}\text{C}$  and tin ( $S_n$ ) melts at  $232^{\circ}\text{C}$ . 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  $180^{\circ}\text{C}$ , Liquid of composition 61.9 %  $S_n$ , alpha ( $\alpha$ ) phase of composition 19.2 %  $S_n$  and beta ( $\beta$ ) 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  $180^{\circ}\text{C}$   
iii) Calculate the amount of phases in an alloy of composition 40%  $S_n$  at  $1790^{\circ}\text{C}$ . (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)

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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