

Roll No.
Printed Pages : 2

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BT-4 / M-14

MATERIAL SCIENCE

Paper-ME-204 E

Time allowed : 3 hours]

[Maximum marks : 100

Note : Attempt any five questions, selecting at least one question from each unit.

Unit-I

1. (a) Within a cubic unit cell, sketch the following directions :
 (i) $[\bar{1}10]$ (ii) $[\bar{1}\bar{2}1]$ (iii) $[012]$ (iv) $[133]$
 (v) $[\bar{1}03]$ 10
- (b) Sketch within a cubic unit cell the following planes :
 (i) $[0\bar{1}\bar{1}]$ (ii) $[11\bar{2}]$ (iii) $[10\bar{2}]$ (iv) $[1\bar{3}1]$
 (v) $[\bar{1}2\bar{3}]$ 10
2. Explain briefly the following :
 - (a) Frenkel defect vs. Schottky defect 5
 - (b) Tilt boundary and Twin boundaries 5
 - (c) Edge dislocation vs. Screw Dislocation 5
 - (d) Vacancies vs. Interstitial Imperfections 5

Unit-II

3. Explain with neat sketches the equilibrium diagrams for binary alloys forming eutectic systems with no solid no solubility and with partial solid solubility. 20

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4. Explain the following heat treatment processes over steel by showing their range of working temperatures on a modified Iron carbon diagram :
 - (a) Normalising 5
 - (b) Hardening 5
 - (c) Annealing 5
 - (d) Case Hardening 5

Unit-III

5. (a) Explain various mechanisms of plastic deformation. 10
 (b) Compare brittle fracture with ductile fracture. 10
6. What do you understand by the term "Fatigue"? How do you obtain fatigue curve? What is "fatigue strength" of a material? Explain briefly Orowan's theory of fatigue. 20

Unit-IV

7. What is creep? Describe a typical creep test equipment setup. Sketch and label the creep curve. How it is influenced by changing stress and temperature conditions? List the effect of metallurgical variables on creep. 20
8. (a) Discuss high temperature corrosion. Explain various methods of corrosion control and prevention. 10
 (b) Explain the process of formation of polymers. Discuss various types of polymers. 10

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