BT-4/M-20   **34024**

MATERIAL SCIENCE
ME-204E

Time : Three Hours]   [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit.

Unit I

1. (a) With neat sketches, evaluate Atomic Packing factor for BCC and FCC crystal lattice.   **10**

   (b) Explain with neat sketches, the various types of crystal imperfections.   **10**

2. (a) The unit cell of chromium is cubic and contains 2 atoms. Determine the dimension of the chromium unit cell when atomic weight (A) = 52 and density of chromium (ρ) = 7.19 mg m^{-3}.   **8**

   (b) Differentiate between Edge and Screw Dislocation.   **6**

   (c) Describe the effect of imperfections on Metal Properties.   **6**

Unit II

3. (a) What is the importance and objectives of Phase Diagram ? Draw and describe a binary phase diagram with suitable examples. **10**

   (b) Illustrate the application of Gibbs' Phase rule and Lever Rule with suitable examples. **10**

4. (a) Differentiate between Annealing and Hardening processes. **10**

   (b) Describe any *two* surface hardening processes. **10**

Unit III

5. (a) Differentiate between conventional and true stress strain curve for polycrystalline materials. **8**

   (b) Write short notes on the following :
      (i) Yield Point Phenomenon
      (ii) Baushinger Effect
      (iii) Strain Ageing. **12**

6. (a) Describe the process of Recovery, Recrystallization and Grain Growth. **10**

   (b) Describe various factors affecting Fatigue. Also illustrate the mechanism of Fatigue failure. **10**

Unit IV

7. Describe the impact of time and temperature on Creep. Draw creep curve and mechanism of creep failure. Describe various measures to prevent creep failure.

   20

8. Describe various types of properties and applications of Ceramics. Illustrate with sketches different ceramics forming techniques. **20**