Roll No. ..... **Total Pages : 03**

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**