

Roll No. ....

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**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 ( $\rho$ ) = 7.19 mg<sup>3</sup>.m **8**
- (b) Differentiate between Edge and Screw Dislocation. **6**
- (c) Describe the effect of imperfections on Metal Properties. **6**

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## 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 one surface hardening process. **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**

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#### **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**