



Seat No. \_\_\_\_\_

## **HAK-XIX**

**B. Sc. / M. Sc. (Applied Physics) (Sem. V)**  
**(CBCS) Examination**

**May - 2023**

**Paper - XIX : Applied Condensed Matter Physics**  
*(New Course)*

Time :  $2\frac{1}{2}$  / Total Marks : **70**

### **Instructions :**

- (1) All questions are compulsory.
- (2) Numbers in the right indicate marks.

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|----------|--|----------|
| <b>1</b> | (A) Write Answers                            | <b>4</b> |
|          | 1. Define: Unit Cell                         |          |
|          | 2. Draw: Cubic Crystal                       |          |
|          | 3. What do mean by Lattice Plane?            |          |
|          | 4. Define : Diffraction in material science. |          |
|          | (B) Write Answer : (any one)                 | <b>2</b> |
|          | 1. Draw: NaCl structure                      |          |
|          | 2. Draw: CaCl Structure                      |          |
|          | (C) Write Answer : (any one)                 | <b>3</b> |
|          | 1. Explain: Miller Indices                   |          |
|          | 2. Write down Bragg ls Law                   |          |
|          | (D) Write Answer (any one)                   | <b>5</b> |
|          | 1. Explain: Powder. Method                   |          |
|          | 2. Explain: Laue`s Method                    |          |
| <b>2</b> | (A) Write Answers :                          | <b>4</b> |
|          | 1. Define: Crystalline materials             |          |
|          | 2. Define Defects                            |          |
|          | 3. Define : Primitive Unit Cell              |          |
|          | 4. What do you mean by plane defects?        |          |

- (B) Write Answer : (any one) 2
1. What are Line defects?
  2. What are Schottky defects?
- (C) Write Answer : (any one) 3
1. What are Frankel defects?
  2. What are color centers?
- (D) Write Answer : (any one) 5
1. Explain: Vacancy defects with necessary diagram.
  2. Compare and contrast Schottky defects and Frankel defects in crystals:
- 3** (A) Write Answers : 4
1. What is approximate value of bandgap in the semiconductor?
  2. Define: Valence band
  3. Define: Conduction band
  4. Define: Insulating material in the vicinity of bandgap.
- (B) Write Answer : (any one) 2
1. Explain: Origin of energy gap
  2. Explain: Effective mass of electron
- (C) Write Answer : (any one) 3
1. Explain: Bloch Theorem
  2. Differentiate: Metals and semiconductors in the vicinity of bandgap:
- (D) Write Answer : (any one) 5
1. Explain: Kronig-Penney model?
  2. Explain: Experimental technique for studying the band structure.
- 4** (A) Write Answers : 4
1. Define: Superconductivity
  2. Define: Para magnetism
  3. What is  $T_c$  in superconductivity?
  4. Draw : Hysteresis loop for magnetic material.

- (B) Write Answer : (any one) 2
1. What is critical magnetic field in the superconductivity?
  2. Explain: Any two properties of superconductor.
- (C) Write Answer : (any one) 3
1. Explain: Antiferromagnetism.
  2. Explain: Ferrimagnetism.
- (D) Write Answer : (any one) 5
1. Explain : Meissner effect.
  2. Explain: Discovery of superconductivity- in details.
- 5** (A) Write Answers : 4
- 1 What do you mean by bandgap?
  - 2 Define: Diamagnetism.
  - 3 Define: list out name of material used as coolant in superconductivity.
  - 4 List out name of rare earth elements.
- (B) Write Answer : (any one) 2
- 1 Explain: How to find crystal structure using Bragg's Method
  - 2 Draw: Lattice planes in cubic crystal.
- (C) Write Answer : (any one) 3
- 1 Explain impact of defect on material.
  - 2 Write down applications of Ferromagnetism.
- (D) Write Answer : (any one) 5
- 1 Categorize material in the vicinity of band diagram with necessary diagram.
  - 2 Explain: Various types of Superconductors.
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