



JAH-P-XIX

Seat No. _____

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

November - 2019

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

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

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

- 1** Attempt any seven short questions : **14**
1. List various point defects in solid
 2. Define Crystal Lattice and unit cell.
 3. What are color centres.?
 4. Draw (111) and (001) planes in cubic unit cell.
 5. What are the Brillion zone ?
 6. Define Bravais and Non Bravais lattices.
 7. What is isotope effect in superconductor ?
 8. What is Meissner effect ?
 9. What are ferrites ?
 10. Define point group and Space group.
- 2** (A) Write answers of any TWO : **10**
1. Derive an expression for the concentration of Vacancy defects in crystalline Solid.
 2. Explain in detail, the formation of Schottky and Frenkel defects in solid
 3. Describe Type I and Type II superconductivity with suitable examples.
 4. Draw a well labelled diagram of NaCl unit cell and describe its features.

- (B) Write answer of any ONE : 4
1. What are Miller Indices.? How to find the Miller Indices of crystal plane making intercepts of $2x$ on X-axis, $3y$ on Y-axis and $2z$ on Z-axis.
 2. If the average energy required to create a vacancy in metal is 1 eV, calculate the ratio of vacancies created in metal at 1000 and 500 K.
- 3 (A) Write answers of any TWO 10
1. Prove that, zero resistance and perfect diamagnetism are necessary but independent properties of superconductor.
 2. Explain qualitatively, the BCS theory of superconductivity.
 3. Draw well labelled diagrams of seven crystal systems and write the relationships between lattice parameters and bond angles for them.
 4. Describe various X-Ray Diffraction methods with a detailed note on Powder diffraction method.
- (B) Write answer of any ONE 4
1. Define superconductivity and hence describe various applications of superconductivity.
 2. State and prove the Bragg's law of X-Ray diffraction.
- 4 (A) Write answers of any TWO 10
1. Draw a well labelled E-K diagram for cubic crystal and show the first and second Brillouin zones.
 2. Classify various magnetic materials giving suitable examples.
 3. Using Kronig-Penney model, describe the formation of allowed and forbidden energy bands in solids.
 4. Write a note on Antiferromagnetism and Ferrimagnetism.

- (B) Write answer of any ONE 4
1. Write a note: Paramagnetism in Rare earth group ions and Iron group ions.
 2. What are various symmetry elements in solid? Explain using proper diagrams.
- 5** (A) Write answers of any TWO **10**
1. What are Cooper pairs? Write a note on the properties of superconductor.
 2. Describe in brief various methods of energy band calculations.
 3. Derive an expression for the concentration of Schottky defects in solids.
 4. Explain the formation of Color Centres. Describe Edge and Screw Dislocation defects.
- (B) Write answer of any ONE 4
1. Prove the Bloch theorem for periodic potential and write the properties of Bloch function.
 2. Write a note on Effective Mass of Electron.
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