Roll No. .....

(07/22-II)

5257

B.Sc. EXAMINATION

(Sixth Semester)

PHYSICS

Paper XI, PH-601

Solid State and Nano-Physics

Time : Three Hours *Maximum Marks :* 40

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) What do you mean by Unit Cell ? Which are the parameters required to describe a Unit cell ? Show with the help of a suitable diagram. 2

(b) What is the physical signifiance of reciprocal lattice ? 2

(c) Which pairs of electrons are responsible for superconductivity ? 2

(d) What do you mean by Nano on length scale ? Is Ohm's law applicable on nanowire ? 2

Unit I

2. (a) Explain in detail with appropriate sketch, the crystal structure of Sodium Chloride. 4

(b) What is interplanar spacing ? Derive a suitable expression for calculating the interplanar spacing. 4

3. (a) Draw a suitable diagram for explaining the crystal structure of Diamond. Also find out the packing fraction for the Diamond and comment about its structure. 4

(b) Determine the Miller indices of a plane which is parallel to x-axis and cuts intercepts of $2b$ and $c/2$ respectively along y and z-axis. 4

Unit II

4. (a) Derive Bragg's condition for diffraction of X-ray by a crystal. 4

(b) How the reciprocal lattice is constructed ? Explain. 4

5. (a) Discus in detail the experimental X-ray diffraction method. 5

(b) How is the K-space different from real space ? 3

Unit III

6. (a) Write the few features of superconductors. Distinguish between type I and type II superconductors. 4

(b) Explain the isotopic effect and Meissner effect. Also discuss that how the critical field varies with temperature in superconductors. 4

7. Discuss the BCS theory in detail for superconductivity. 8

Unit IV

8. (a) Write a note on history of Nanotechnology. Also discuss the importance of nano scale. 4

(b) Discuss the role of nanotechnology in the field of automobile and medicine. 4

9. (a) Explain the vision and objective of nano-technology. 4

(b) Discuss the challenges in molecular manufacturing in context to nano. 4