

(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 significance 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-5257**

**2**

**P.T.O.**

- (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) Discuss 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. <https://www.cdluonline.com> 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 nanotechnology. 4  
(b) Discuss the challenges in molecular manufacturing in context to nano. 4