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.

(Compulsory Question)

1. (a) What do you understand by crystal direction and crystal planes ?   1

    (b) What is packing fraction ?   1

(c) List the rules to construct reciprocal lattice from space lattice. 2

(d) At what temperature the energy gap disappears in superconductors and why ? 2

(e) Explain application of Nano-technology in medicine. 2

Unit I

2. (a) Draw neat diagrams of the following structures : NaCl, Diamond and Zinc Sulphide. Give at least two examples of each structure. 5

(b) Lattice constant of a cubic lattice is 'a'. Calculate spacing between (011), (101), (112), (111) and (100) planes. 3

3. What are the various symmetry operations for a two dimensional crystal ? What is Bravais lattice and explain different types of Bravais lattice in two and three dimensions ? 8

Unit II

4. (a) What are reciprocal lattice vectors ? Discuss their properties and physical significance. 5

(b) In Bragg's reflection of X-rays a reflection was found at $30°$ glancing angle with lattice planes of spacing 1.87 Å if this is a second order reflection. Calculate the wavelength of X-rays. 3

5. What do you understand by diffraction of X-rays ? Describe a method in which materials are not required to be single crystal while studying its structure through X-ray's. 8

Unit III

6. (a) Discuss London's theory of superconductivity. 5

(b) Explain flux quantization. 3

7. (a) Discuss BCS theory of superconductivity in detail. 5

   (b) Write Pippards equation. 2

   (c) What is the effect of magnetic field on superconductivity ? 1

Unit IV

8. Write the importance of Nano-scale and Nano-technology. Explain history of Nano-technology. Discuss the vision and objective beyond Nano-technology. 8

9. Write in detail the benefits and challenges in molecular manufacturing. 8

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