B.Sc.-III (Physics)
Semester – VI **Physics – PH-601**

Paper – XI : Solid State and Nano Physics

Max. Marks: 40
Internal Assessment: 10
Time: 3 hours

Note:-

1. Nine Questions will be set in total.
2. Question number 1 will be compulsory and will be based on the conceptual aspects of entire syllabus. This question may have five parts and the answer should be in brief but not in Yes/ No.
3. For more questions are to be attempted, selecting one question out of two questions set from each unit. Each question may contain two or more parts. All questions will carry equal marks.
4. 20% numerical problems are to be set.
5. Use of scientific (non-programmable) calculator is allowed.

Unit I: Crystal Structure I

Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.

Unit II: Crystal Structure II

X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.

Unit III: Super conductivity

Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation, Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.

Unit IV: Introduction to Nano Physics

Definition, Length scale, Importance of Nano-scale and technology, History of Nan- technology, Benefits and challenges in molecular manufacturing. Molecular assembler concept, Understanding advanced capabilities. Vision and objective of Nano-technology, Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine.

References:

1 C. Kittel, *Introduction to Solid State Physics*, 7th Ed (1996) John Wiley & Sons, NewDelhi.

2 H. Ibach and H. Lüth, *Solid State Physics, An Introduction to Theory and Experiment*,Springer-Verlag, Berlin, 1991

3 Pillai O S, *Solid State Physics*, New Age International Publishers (2007) New Delhi4 Mark R and Denial R, *Nano-tecnology* – A Gentle Introduction to the Next Big Idea
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5 M. Tinkham, *Introduction to Superconductivity*, McGraw-Hill, New York, 19756 Dekkar A J, Solid State Physics (2000), Mc Millan India Ltd New Delhi

7 Ascroft N W and Mermin N D, Solid State Physics (2003) Harcourt Asia, Singapore8 Keer H V, Solid State Physics (1993), Wiley Eastern Ltd, New Delhi

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