

7. (a) Discuss the Kroning-Penney model for the motion of electrons in a periodic potential. **8**
- (b) Derive an expression of diamagnetic susceptibility on the basis of classical theory. **8**

Unit IV

8. (a) Explain the London theory of superconductivity. **8**
- (b) What is Flux Quantization ? Explain. **8**
9. (a) Discuss the BCS theory of superconductivity. **8**
- (b) What are high T_c superconductors ? Give examples. **8**

Subject Code—53847

B.Sc. EXAMINATION

(Main) (Batch 2018 Onwards)

(Sixth Semester)

PHYSICS

CPL-601

Solid State Physics (Course-III)

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. All questions carry equal marks.

1. (a) What is Primitive Cell ?
- (b) What do you understand by symmetry operations ?
- (c) What is Debye T³ law ?
- (d) Discuss the concept of penetration depth in superconductors.

- (e) What do you mean by critical magnetic field ?
- (f) What is Curie's Law ?
- (g) What is free electron gas model ?
- (h) What is effective mass of electron ?

8×2=16

Unit I

- 2. (a) Explain the crystal structure of sodium chloride.
- (b) Draw a (110) plane in the unit cell of a cubic crystal. Find the $\langle 111 \rangle$ directions that lie on this plane.
- 3. (a) Discuss the Wigner Seitz Primitive Cell.
- (b) Show that the (hkl) plane is perpendicular to the $[hkl]$ direction in a cubic lattice.

8×2=16

Unit II

- 4. (a) Explain the concept of reciprocal lattice and its physical significance.

8

- (b) Describe the acoustical and optical mode in the vibration of diatomic lattice. **8**

- 5. (a) Derive Bragg's law in X-ray diffraction. **10**

- (b) Calculate the Bragg angle at which electrons accelerated from rest through a potential difference of 80 V will be diffracted from the (111) planes of an *fcc* crystal of lattice parameter 3.5 angstrom. **6**

Unit III

- 6. (a) Describe the nearly free electron model for determining the electron energy bands in metal. **8**
- (b) Draw a typical M-H curve for a ferromagnetic material and explain the different stages of magnetization process on the basis of domain theory. **8**