Unit IV

8. Write short notes on the following :

   (a) Variation of energy gap with temperature in a superconductor 5

   (b) Tunneling and Josephson effect. 10

9. Describe and discuss BCS theory of superconductivity. 15

Roll No. .....

(07/21-II)

11831

M. Sc. EXAMINATION

(For Batch 2017 & Onwards)

(Second Semester)

PHYSICS

PHY-201

Solid State Physics

Time : Three Hours *Maximum Marks* : 70

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

1. (a) What is Fermi-Dirac distribution ?

   (b) What are Brillouin zones ?

   (c) What are acoustical and optical modes of vibration ?

(d) What is coherence length in case of super-conductors ?

(e) What is Meissner effect ? 2×5=10

Unit I

2. What is the concept of reciprocal lattice ? Show that the reciprocal lattice for body centred cubic lattice is a face centred cubic lattice. 15

3. What are Laue equations for XRD by a crystalline solid ? Explain crystal rotating method for crystal structure. 15

Unit II

4. What is a monoatomic lattice ? Derive the dispersion relation and plot dispersion curve. Show that monoatomic lattice acts as a low pass mechanical filter. 15

5. What is a free electron Fermi gas ? Find out the energy values for a free electron gas in an infinite square well potential by the solution of Schrödinger wave equation. 15

Unit III

6. Discuss the Kronig-Penny monoatomic linear lattice model. Explain how does this lead to the formation of allowed and forbidden energy bands. 15

7. What is Hall effect ? Discuss and derive Hall Coefficient, Hall voltage for a specimen of thickness *d*, conductivity for *n* and *p*-type semiconductors, electron mobility and Hall angle. How can Hall effect be used to determine the sign of charge carriers ? 15