LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

FOURTH SEMESTER – **APRIL 2015**

PH 4812 - SOLID STATE PHYSICS

Date : 20/04/2015 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

PART A

Answer **ALL** questions: **10 x 2 = 20 marks**

1. State the Extinction rule for FCC lattice.
2. Draw diagrams to illustrate rotation, mirror and inversion center symmetry operations.
3. Give the equations for Bloch function in 1D and 3D.
4. Explain the conditions to form a semimetal with energy band diagram.
5. Define mobility of electrons and holes.
6. Write the relation connecting dielectric constant and electric susceptibility.
7. State the reasons for the failure of independent electron approximation.
8. What are magnons?
9. Name the materials used for SQUIDs fabrication.
10. Mention the general formulae for any three chemical systems that are used as high T_c super conductors.

PART B

Answer any **FOUR** questions. **4 x 7.5 = 30 marks**

11. Based on the Ewald's construction, derive the Bragg's law in vector form.
12. With necessary diagrams, illustrate the procedure to form extended and reduced zone schemes.
13. Discuss the effect of magnetic field on the Fermi surface.
14. Highlight the essential features of ferrites and antiferromagnetic materials.
15. Explain the Meissner effect.
16. Discuss the construction of Bravais Lattices with suitable diagrams.

PART C

Answer any **FOUR** questions. **4 x 12.5 = 50 marks**

17. Discuss the lattice vibrations for a linear mono atomic lattice and obtain the equations for a standing wave, group velocity and force constant.
18. Derive the expressions for barrier potential and barrier width of a P-N junction.
19. With a suitable diagram, explain the Hall Effect in semiconductor and obtain the expression for Hall coefficient.
20. Discuss in detail the Langevin's quantum theory of Paramagnetism.
21. Highlight the important aspects of BCS theory.
22. Explain the origin of Domains and discuss the contributions of exchange energy, magnetic field energy and anisotropy energy in the formation of domains.

****