LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – APRIL 2017

PH 4812- SOLID STATE PHYSICS

Date: 25-04-2017 Dept. No. Max. : 100 Marks
09:00-12:00

PH 4812 - SOLID STATE PHYSICS

Section –A

Answer all the questions **(10 X 2 = 20)**

1. Mention the stepwise procedure for determining the Miller indices.
2. Explain the rotation symmetry operations.
3. Highlight the importance of high Tc superconductors.
4. List the applications of SQUID.
5. State and explain the Hund's rule.
6. Write a note on thermal excitation of magnons.
7. Outline the unique features of inhomogeneous semiconductors.
8. Draw the structure of Barium Titanate crystal.
9. Write the equation for effective mass of electrons and holes.
10. Define atomic polarizability.

Section – B

Answer any four questions **(4 X 7.5 = 30)**

11. With neat diagrams explain the point and space group symmetry elements.
12. Discuss the characteristic features of electron propagation in a crystal are based on Kronig-Penney model.
13. Discuss the effects of electric and magnetic field on Fermi surface.
14. Explain the concept of diamagnetism and derive the classical Langevin-Larmor equation for diamagnetism.
15. Discuss important aspects of BCS theory of superconductor.
16. Employing the Ewald construction, derive the Bragg's law in vector form.

Section – C

Answer any four questions. **(4 X 12.5 = 50)**

17. Based on the lattice vibrations for a linear diatomic lattice, derive the equations for transverse optical and transverse acoustical waves.
18. Discuss the procedure to construct extended, reduced and periodic zone schemes with suitable diagrams.
19. Explain the Hall Effect in arod shaped specimen with necessary diagram and derive the equations for 1. Hall coefficient and 2. Hall resistance.
20. a) With suitable diagrams explain the concepts of hysteresis. (6)
    b) Outline domain theory to obtain the total energy of a Ferromagnet. (6.5)

21. Derive the London's equations and obtain the conditions for penetration depth coherence length.

22. a) Explain atomic scattering factor and structure factor (7.5)

b) Write a note on Meissner effect (5)

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