LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – **APRIL 2016**

PH 4812 - SOLID STATE PHYSICS

(12TH BATCH ONWARDS)

Date: 15-04-2016 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

Section –A

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

1. Determine the Miller indices for the plane with an intercept of x, 2y, 3z.
2. Draw the diagrams to illustrate rotation and inversion symmetry operations.
3. Write the general formula of a few popular high Tc superconductors.
4. Distinguish between type I & type II semiconductors.
5. Taking Ce^{3+} as an example, explain the Hund's rule.
6. Mention the causes for the failure of independent electron approximation.
7. Write the equation for mobility of charge carriers in n & p type semiconductors.
8. Highlight the importance of Barium Titanate crystal.
9. Explain the concept of effective mass.
10. Outline the differences between homogeneous and inhomogeneous semiconductors.

Section – B

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

11. Discuss the essential conditions to develop Bravais lattices with necessary diagrams.
12. With neat sketch, discuss the procedures for constructing the reduced and extended zone schemes.
13. Obtain the Clausius-Mossotti equation relating the dielectric constant and polarizability.
14. Explain the domain theory of magnetic materials with necessary diagrams.
15. Draw the block diagrams of different types of SQUIDS and explain their working mechanism.
16. Discuss the effect of electric and magnetic fields on Fermi surface.

Section – C

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

17. Discuss the London's theory for superconductivity and obtain the condition for coherence length.
18. Derive the equations for depletion region width and barrier potential of a p-n junction.
19. With neat diagram, explain the Hall Effect in semiconductors and derive the expressions for Hall coefficient and resistance.
20. Discuss the Langevin's quantum theory of paramagnetism.
21. By considering the lattice vibrations for a linear diatomic lattice, obtain the conditions to form acoustical and optical branches.
22. a) Derive Bragg's law in its vector form **(7.5)**

    b) Write a note on Ferroelectricity **(5)**

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