LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – NOVEMBER 2016

PH 4812 - SOLID STATE PHYSICS

Date: 12-11-2016 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

PART A

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

1. Define atomic scattering factor.
2. Write a note on inelastic scattering of phonons.
3. Mention a few examples for high Tc superconductors.
4. Highlight the biomedical uses of a SQUID.
5. Write the expression for atomic polarizability.
6. What are magnons?
7. Distinguish between hard and soft ferrites.
8. Mention the causes for the failure of independent electron approximation.
9. Mention the effect of electric field on Fermi surface.
10. Distinguish between homogeneous and inhomogeneous semiconductors.

PART B

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

11. Discuss the formation of Bravais lattices with necessary diagrams and highlight the axial and angle rules.
12. Derive the Bragg's law in its vector form.
13. With necessary diagrams explain the AC Josephson Effect.
14. Derive the Clausius-Mossotti equation connecting the dielectric constant and polarizability.
15. With suitable diagrams, discuss the procedures for constructing the reduced and extended zone schemes.
16. Discuss the domain theory with necessary diagrams.

PART C

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

17. Discuss the Kronig-Penney model by considering characteristic features of electron propagation in crystals.
18. Derive the London's first and second equations and hence obtain the condition for coherence length.
19. Discuss the conditions for lattice vibrations of a linear diatomic lattice and illustrate the acoustical and optical branches.
20. Discuss the Weiss theory of ferromagnetism and with suitable plots, explain the variations of susceptibility/magnetization with temperature.
21. With neat sketch, discuss the Hall Effect in semiconductors and hence derive the expressions for Hall coefficient and Hall resistance.
22. Explain the energy band variations in a p-n junction and derive the equations for depletion region width and barrier potential.

****