LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

SIXTH SEMESTER – **APRIL 2016**

PH 6612 – SOLID STATE PHYSICS

Date: 18-04-2016   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

PART – A

Answer **ALL** the questions: (10 x 2 = 20 Marks)

1. Define crystal lattice.
2. What is Schottky defect?
3. State Bragg's law.
4. Give the difference between neutron diffraction and X-ray diffraction.
5. Explain why the internal energy of a solid increases when the energy is supplied.
6. Define thermal expansion due to anharmonicity.
7. What is free electron gas?
8. State Wiedemann-Franz law.
9. What is levitation?
10. What is meant by single electron tunneling?

PART – B

Answer any **FOUR** questions: (4 x 7.5 = 30 Marks)

11. Explain the seven crystal systems along with its unit cell parameters.
12. Describe Laue method of X-ray diffraction.
13. Show that the Einstein's theory of specific heat of solids yields the Dulong-Petit's law at high temperature.
14. What are the assumptions and failures of free electron theory? Explain.
15. Give an account on BCS theory of superconductivity.
16. Derive an expression for coefficient of thermal conductivity of a solid.

PART – C

Answer any **FOUR** questions: (4 x 12.5 = 50 Marks)

17. (a) What are Miller indices? Sketch the (010), (110) and (111) planes of a cube. Find the Miller indices f a plane that makes an intercept 1 on a-axis, 2 on a b-axis and parallel to c-axis.   (7.5)
    (b) Discuss the one dimensional defects in solids.   (5.0)
18. Explain how are the interplanar spacings and crystal planes of a crystal determined by powder   X-ray diffraction method.
19. Derive an expression for specific heat capacity of solids on the basis of Debye model and also discuss the variation of specific heat with temperature.
20. Deduce the expressions for density of states and specific heat capacity of a three dimensional Fermi gas.
21. (a) What are Type I and Type II superconductors? Differentiate between them.   (5.0)
    (b) Discuss Josephson's effect in superconductors.   (7.5)
22. (a) Explain the symmetry elements of a crystalline solid.   (5.0)
    (b) Explain how the mobility of charge carriers can be determined in Hall effect.   (7.5)

$$$$$$$