LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – APRIL 2011

# PH 6610/PH 6606 - SOLID STATE PHYSICS

Date : 07-04-2011 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**PART – A**

**Answer all questions. All questions carry equal marks. (10x2=20marks)**

1. Define crystal lattice?
2. What is coordination number?
3. Write Laue equations.
4. Why are X-rays used for diffraction studies in crystals?
5. Give the classical value of specific heat at high temperatures and at T = OK.
6. What is the basic difference between Einstein’s model and Debye model?
7. Mention the differences between free electron gas and ordinary gas?
8. What is Hall effect?
9. What is Meissner effect?
10. Explain Type I superconductor.

**PART – B**

**Answer any FOUR questions. (4x7.5=30marks)**

1. a) What are Miller indices?

b) Calculate the ratio of d100 : d110 : d111 for simple cubic structure.

1. Write a note on neutron diffraction.
2. Debye temperature of diamond is 1850 K. Calculate the molar specific heat for diamond at 20 K. Also compute the highest lattice frequency involved in the Debye theory.

(R = 8.4 J.mol- 1.K- 1 ,h = 6.62 X 10- 34 Js kb = 1.38 X 10- 23 J.K- 1 ).

1. Discuss the variation of density of states with energy for a free electron gas in 3-d.
2. Explain Josephson effect.

**PART – C**

**Answer any FOUR questions. (4x12.5=50marks)**

1. Describe three dimensional lattice types with suitable diagrams.
2. Explain the powder method of X-ray diffraction studies.
3. Derive an expression for the specific heat of a solid on the basis of Einstein’s theory.
4. Derive an expression for the paramagnetic susceptibility of a free electron gas.

20. Explain the occurrence of superconductivity based on BCS theory.

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