LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

SIXTH SEMESTER – APRIL 2010

PH 6606 - SOLID STATE PHYSICS

Date & Time: 17/04/2010 / 9:00 - 12:00   Dept. No.   Max. : 100 Marks

PART A

Answer all questions. All questions carry equal marks.   **(10 x 2 = 20 marks)**

1. Define a unit cell.

2. What is meant by basis?

3. State Bragg law.

4. The Bragg angle corresponding to the first order reflection from (1,1,1) planes in a crystal is

    30°, when X-rays of wavelength 1.75Å are used. Calculate the interatomic spacing.

5. Define thermal Conductivity.

6. State two assumptions in the Einstein's theory of specific heat of a solid.

7. What is Hall effect?

8. State Weidemann-Franz law.

9. What is Meissner effect?

10. What is vortex state?

PART – B

Answer any four questions.   **(4 x 7.5 = 30 marks)**

11. Explain simple cubic crystal structure, with the help of a neat diagram.

12. Describe Laue method to determine the crystal structure.

13. Derive the expression for the coefficient of thermal expansion using Gruneisen relation.

14. Discuss the variation of density of states with energy for a free electron gas in 3-d.

15. Outline qualitatively Type I & Type II superconductors.

PART – C

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

16. a) What are Miller indices? How are they determined?

    b) The orthorhombic crystal has lattice parameters in the ratio 0.424 : 1 : 0.366. Find the Miller

       indices of crystal plane whose intercepts are in the ratio 0.212 : 1 : 0.183.

17. Describe how rotating crystal method can be used to determine crystal structure?

18. Derive an expression for the specific heat capacity of a solid using Debye model.

19. Explain the electrical conductivity using Sommerfeld theory.

20. Outline the Josephson's tunneling effect.

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