



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc., DEGREE EXAMINATION – PHYSICS

SIXTH SEMESTER – NOVEMBER 2013

PH 6610/PH 6606 – SOLID STATE PHYSICS

Date : 11/11/2013
Time : 1:00 - 4:00

Dept. No.

Max. : 100 Marks

PART – A

Answer **ALL** questions:

(10x2=20 marks)

1. Define lattice translation vector.
2. Calculate the atomic packing factor of a face centered cubic structure.
3. List the Laue's equations defining x-ray diffraction.
4. What is Gruneisen relation?
5. State the significant advantages of powder method of x-ray diffraction.
6. State the value of specific heat according to classical theory. What is the draw back?
7. What were the modifications implemented by Sommerfield in obtaining an expression for electrical conductivity?
8. State Wiedemann Franz law.
9. What is superconductivity? Give an example.
10. What is a cooper pair?

PART – B

Answer any **FOUR** questions:

(4x7.5=30 marks)

11. What are symmetry operations? Explain any two symmetry operations with examples. (7.5)
12. Derive Bragg's law of X-ray diffraction. (7.5)
13. Obtain an expression for thermal conductivity of metals based on kinetic theory. (7.5)
14. Discuss the phenomenon of Hall Effect in metals. (7.5)
15. Explain Meissner effect. Differentiate between Type 1 and Type 2 superconductors. (2.5+5)

PART – C

Answer any **FOUR** questions:

(4x12.5=50 marks)

16. a) Describe the Bravais lattices belonging to cubic, tetragonal and monoclinic crystal systems in three dimension.
b) Draw the cubic crystal planes whose miller indices are (010), (110), (011) and (200). (10+2.5)
17. a) Explain the determination of crystal structure using Laue method.
b) In a Laue photograph of an FCC crystal whose lattice parameter is 4.5 \AA , determine the minimum distance from the centre of the pattern at which reflections can occur from the planes of maximum spacing, if the potential difference across the x-ray tube is 50kV and the crystal film distance is 5cm. (8.5+4)

18. What were the drawbacks of Einstein's model in obtaining the specific heat of solid? State the assumptions made by Debye and prove as to how the specific heat varies as a function of T^3 . (2.5+10)
19. Obtain an expression for the density of orbital for the free electron gas in a 3 dimensional box based on quantum theory. (12.5)
20. What do you understand by cooper pair tunneling? Explain DC Josephson effect. (2.5+10)

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