LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – **NOVEMBER 2015**

PH 6610/PH 6606 - SOLID STATE PHYSICS

Date : 11/09/2015 Dept. No. Max. : 100 Marks
Time : 09:00-12:00

PART –A

Answer ALL questions: **(10x2 =20 Marks)**

1. Define unit cell.
2. What do you mean by crystalline material?
3. State Bragg's law of X-ray diffraction.
4. Write a note on neutron diffraction?
5. State Debye's T^3 law.
6. What is meant by heat capacity?
7. Define drift velocity of electron.
8. List out the drawbacks of classical free electron theory.
9. What is meant by Copper pair?
10. Define Meissner effect.

PART –B

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

11. What are Miller indices? Write the procedure for finding Miller indices of a given plane.
12. Derive Laue's equations.
13. What is Gruneisen relation? Explain the physical basis of this relation and give its significance. (2+5.5)
14. What is Hall effect? Describe an experiment for the determination of Hall coefficient. (2+5.5)
15. Explain Type I and Type II superconductors. Write a note on vortex state. (5+2.5)
16. a) Calculate energy of a x-ray beam of wavelength 1.5406×10^{-10}M. (5+2.5)

    b) X-ray wavelength 1.5406×10^{-10} m are disgraced by (1 1 1) plane in a cubic crystal at a glancing angle 30° in the first order. Calculate the interatomic spacing. (2+5.5)

PART – C

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

17. Describe the 14 types of Bravais lattice in three dimensions with suitable diagrams.
18. Explain the theory and experimental procedure to determine the crystal structure by powder X – ray diffraction method.
19. Discuss Einstein's theory of lattice heat capacity. Also discuss the special cases. (10+2.5)
20. Define mean free path of electrons in a solid. Derive an expression for the density of states and based on that calculate the carrier concentration in metals. (2+10.5)

21. a) Briefly outline BCS theory of superconductivity.
    b) Discuss a.c and d.c Josephson's effects and explain their importance. (5+7.5)

22. a) Explain free electron gas model of metals.
    b) Draw the (1 0 1) and (1 1 1) planes in a cubic unit cell.
    c) State and explain Wiedmann-Franz law. (4+4+4.5)

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