LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION – **PHYSICS**

SIXTH SEMESTER – **APRIL 2019**

PH 6612– SOLID STATE PHYSICS

Date: 05-04-2019   Dept. No.   Max. : 100 Marks

Time: 09:00-12:00

PART – A

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

1. What a point group and space group symmetry operations? List the different point group symmetry operations.

2. Write the significance of Burger's vector.

3. List the particles that can be diffracted by crystals to study crystal structure.

4. How is Laue patterns produced by x-rays?

5. What was the drawback of classical theory in explaining the specific heat capacity of solids?

6. Explain the behaviour of specific heat of solids at low temperature according to Einstein's model.

7. Define density of states and write an expression for the same at Fermi energy.

8. Define Hall coefficient and write its expression.

9. What is Meissner effect?

10. Define coherence length. How is it related to energy gap?

PART – B

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

11. Obtain the atomic packing factor of an FCC structure.

12. Explain the rotating crystal technique of determining the crystal structure.

13. Outline the theory to explain thermal expansion of crystals.

14. State Weidemann Franz law. List the causes for the failure of free electron theory.

15. Draw the magnetization curve of Type I and Type II superconductors and explain their behaviour. When does a specimen exist in vortex state?

16. Illustrate with an example the determination of Miller indices of crystal planes. List the important features of Miller Indices.

1

PART – C

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

17. Discuss in detail the Bravais lattices in three dimension with necessary diagrams.

18. (a) Derive the Bragg's law for x-ray diffraction.

    (b) Give an account of Laue method of crystal structure analysis. **(5+7.5)**

19. Discuss the salient features of Debye's theory of specific heat and derive an expression for the specific heat of solids based on this model.

20. Derive an expression for the specific heat capacity of a free electron system.

21. (a) Discuss the BCS theory of superconductivity.

    (b)Write a few applications of superconductors**. (7.5+5)**

22. Write short notes on crystal imperfections.

★★★★★★