LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – **APRIL 2023**

UPH 6501 – SOLID STATE PHYSICS

Date: 29-04-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

Answer ALL Questions **(10 x 2 = 20 Marks)**

1. State Bragg's law of crystal diffraction.
2. Distinguish between crystalline and amorphous solids.
3. What is meant by phonon?
4. Differentiate acoustical and optical modes.
5. What is meant by band gap?
6. List out the applications of Hall effect.
7. Define magnetic susceptibility.
8. State Curie's law of paramagnetism.
9. Superconducting lead gas critical temperature of 6.2 K at zero magnetic field and a critical field of 0.064 MAm^{-1} at 0 K. Determine the critical field at 4 K.
10. What is meant by coherent length?

PART – B

Answer any FOUR questions **(4 x 7.5= 30 Marks)**

11. Explain how the crystal structure can be determined by rotating crystal method.
12. Obtain the expression for vibrations in one dimensional mono atomic lattice
13. Illustrate the differences between solids, insulators and semiconductors on the basis of band theory of solids.
14. Derive an expression for diamagnetic susceptibility based on classical theory.
15. Discuss the various properties of superconductors.
16. Distinguish between AC and DC Josephson effect.

PART – C

Answer any FOUR questions **(4 x 12.5= 50 Marks)**

17. (i) Obtain the Laue's equation for the X-ray diffraction. (7.5)
    (ii) Obtain the condition for diffraction to occur. (5)
18. Derive an expression for the specific heat of solids on the basis of Einstein's model. Also discuss its drawbacks.
19. (i) Distinguish between intrinsic and extrinsic semiconductors. (2.5)
    (ii) What is doping? Describe the working of p type and n type semiconductors. (10)
20. (i) Explain in detail Weiss's theory of ferromagnetism. (7.5)
    (ii) Explain the concept of hysteresis based on the domain theory. (5)
21. Write short notes on
    a. Type – I & Type – II superconductors (7.5)
    b. High temperature superconductors (5)
22. With suitable diagrams explain the fourteen crystal systems and write their lattice parameters.

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