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TB246773T

Reg. No :.....

Name :.....

BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2024

2021 ADMISSIONS REGULAR

SEMESTER VI - CORE COURSE (PHYSICS)

PH6B12B18 - Condensed Matter Physics

Time : 3 Hours **Maximum Marks : 60**

Part A

I. Answer any Ten questions. Each question carries 1 mark **(10x1=10)**

1. Write a note on Miller indices.
2. Explain point group operations.
3. How is a direct lattice vector related to its corresponding reciprocal lattice vector?
4. Explain the significance of Fermi distribution function.
5. Discuss the difference in the nature of potential used in free electron theory and band theory
6. A p type semiconductor is a neutral material. Justify your answer.
7. Distinguish between intrinsic and extrinsic semiconductors.
8. Illustrate the features of Liquid Crystals.
9. Give an expression for Weiss field.
10. Explain the origin of diamagnetism.
11. Write a short note on Cooper pairs.
12. Give any three characteristics of superconductors.

Part B

II. Answer any Six questions. Each question carries 5 marks **(6x5=30)**

13. Find the ratio of interplanar distances of planes (100), (110) and (111) in a simple cubic lattice.
14. Calculate the glancing angle on the (100) plane of a crystal with spacing a= 4.51$\mathring{A}$ corresponding to first order diffraction maximum for x-rays of wavelength 1.54 $\mathring{A}$.
15. Show the dependence of velocity of an electron on wave vector as predicted by band theory and plot it.
16. Discuss the effect of temperature on Fermi function. Explain the significance in terms of the filling of energy levels.
17. The resistivity of a pure specimen of Ge at 300K is 0.47 ohm m and the electron and hole mobilities are 0.38 and 0.18 m^2/Vs. Calculate the number density of temperature generated charge carriers.
18. Discuss the band tailing effect in amorphous semiconductors.
19. Illustrate magnetization due to domain growth and domain rotation.
20. Explain the transition in the structure of Barium titanate according to the temperature and how does it behave as a ferroelectric crystal.
21. Lead in the superconducting state has critical temperature of 6.2K at zero magnetic field and a critical field of 0.624 T at 0K. Determine the critical field at 4K.

Part C

III. Answer any Two questions. Each question carries 10 marks **(2x10=20)**

22. Discuss the principle behind X-ray diffraction and explain powder method of X-ray diffraction.
23. Obtain an expression for the energy eigen values and wave function of an electron using Sommerfeld's free electron theory in one dimension.
24. Explain the term drift velocity. Obtain an expression for the electrical conductivity of intrinsic semiconductors.
25. Derive the Clausius- Mossotti Relation expressing the relationship between dielectric constant and atomic polarizability.