QP CODE: 24803638

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, JUNE 2024

Fifth Semester

INTEGRATED MSC BASIC SCIENCE-PHYSICS

CORE - IPH5CR04 - SOLID STATE PHYSICS

2021 Admission Onwards

74064A0E

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Differentiate between single crystals and polycrystalline solids.
2. Write down the Miller indices of the six faces of a cube.
3. Give the relationship between the lattice parameter a and the atomic radius r in a simple cubic (sc) crystal structure.
4. What is Wiedemann-Franz law ?
5. State Bloch's theorem and explain the form of the Bloch wave function.
6. What is an extrinsic semiconductor?
7. How does polarization in a dielectric material influence its dielectric constant?
8. What is ionic polarization?
9. What are Type II superconductors?
10. What is super current quantum interference?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Differentiate between primitive cell and non primitive cell. How is a Wigner-Seitz cell constructed?
12. In the powder method to obtain the crystal structure, an X-ray of wavelength 1.54 Å gives rise to first order reflection by (322) planes at an angle 56 degree. Determine the lattice constant of the unit cell.

13. What is meant by the effective mass of an electron? What is its significance?

14. Derive expressions for carrier concentration for an intrinsic semiconductors.

15. Explain briefly an extrinsic semiconductor. Explain how fermi level varies with temperature for an n- type semiconductor.

16. Explain the principle of piezoelectricity and give examples of piezo electric materials.

17. What is Curie law for a paramagnetic material? Explain the significance.

18. What is Curie -Weiss law? Discuss its application for ferromagnetic materials.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Obtain Bragg's law in reciprocal lattice. Discuss Ewald construction.

20. Explain intrinsic and extrinsic semiconductors. Draw the energy level diagram for both type.

21. Draw and explain the B-H curve of a ferromagnetic materials. What are ferrites?

22. Obtain London equations. Discuss the term London penetration depth.

(2×5=10 weightage)