M.Sc DEGREE EXAMINATION,APRIL 2019
II Year IV Semester
Condensed Matter Physics

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. What are Miller indices?
2. State the essential condition required for the diffraction of X-rays.
3. What are phonons?
4. Define group velocity and phase velocity.
5. Compare the band structures of metals and semiconductors.
6. Define mobility.
7. State Hunds rule.
8. What are spin waves?
9. Give the state of electrons below and above the transition temperature of superconductors.
10. What is isotopic effect in superconductivity?
11. Define atomic packing factor.
12. What are free electrons?

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Obtain the atomic packing factor for hcp structure.
14. Explain about Umklapp scattering.
15. Show that the Hall voltage is directly proportional to the applied magnetic field and the current through the specimen for a fixed thickness of the specimen.
16. Give an account of ferromagnetic interactions based on exchange field and hence obtain the Curie-Weiss law.
17. Derive London equation.
18. Establish the relations between a, b, c and a^*, b^*, c^*.
19. Discuss about BCS theory.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. (i) Prove that the reciprocal lattice to BCC is FCC. (ii) Find the reciprocal lattice to FCC and hence find its first Brillouin zone.
21. Describe the Debyes theory of lattice heat capacity.
22. Obtain an expression for concentration of charge carriers in intrinsic semiconductors and find the intrinsic electrical conductivity.
23. Discuss in detail about quantum theory of para-magnetism.
24. Derive the expressions for current density in both dc and ac Josephson effects.

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