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B.E / B.Tech DEGREE END SEMESTER EXAMINATIONS, APRIL/MAY 2014

Material Science

IV Semester

ML9255 – SOLID STATE PHYSICS

Regulation: 2008

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART- A (10 x 2 = 20 Marks)

1. State Heisenberg's uncertainty principle.
2. Distinguish between covalent and ionic crystals with examples.
3. State Wiedemann-Franz law.
4. What is Hall effect? Give its applications.
5. What is meant by dipole relaxation?
6. What are ferroelectric materials? Give some examples.
7. What is the principle of nuclear magnetic resonance?
8. What are spin waves?
9. What is London penetration depth?
10. What is the effect of isotope on superconductors?

Part – B (5 x 16 = 80 marks)

11. i) Explain the phenomenon of superconductivity. Explain the effect of magnetic field on superconductors. (8)
- ii) Explain type I and type II superconductors. (4)
- iii) Explain BCS theory of superconductivity. (4)
12. a) Solve Schrödinger time independent wave equation for a particle in a one-dimensional infinite potential well. Find the energy states of the particle. Plot the wave function of the particle in its lowest four energy states (16)
- (or)
- b) Obtain the dispersion relation for elastic waves in a linear monoatomic chain. Find the number of modes of vibration. (16)
13. a) Derive the expressions for electron and hole concentrations in an intrinsic semiconductor. Find the position of the Fermi energy level (16)
- (or)
- b) Discuss the Kronig- Penny model for the motion of an electron in a periodic potential. (16)
14. a) Explain the different types of polarization mechanism in dielectrics. (16)
- (or)
- b) What is meant by local field? Derive Clausius -Mosotti relation. (16)
15. a) Explain classical theory of diamagnetism and derive an expression for diamagnetic susceptibility. (16)
- (or)
- b) Explain domain theory of ferromagnetism. (16)