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B.E (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV 2013

MATERIAL SCIENCE AND ENGINEERING

THIRD SEMESTER

3

ML 8302 – SOLID STATE PHYSICS

(Regulations 2012)

Time: 3 Hours

Max. Marks 100

Answer ALL Questions

PART-A (10 x 2 = 20 Marks)

1. What are matter waves? Write the relation between wavelength and momentum.
2. Explain physical significance of wave function.
3. Define Hall effect.
4. Explain physical basis of effective mass.
5. What is Clausius Mossoti equation?
6. Define Ferroelectrics.
7. Define Curie-weiss law.
8. Write the principle of Nuclear Magnetic Resonance.
9. Write short notes on Josephson effect.
10. Difference between Type-I and Type-II superconductors.

Part – B (5 x 16 = 80 marks)

11. Derive the vibrational modes of a diatomic linear chain of atoms? Explain the branches with the curve in detail. (16 marks)
12. a) Derive the expression for density of states. (16 marks)
(OR)
b) Explain Bloch's theorem. Discuss the Kronig-Penny model for the motion of electrons in a periodic potential. Explain (E-K) graph in detail. (16 marks)

13. a) (i) Derive the expression for the various types of polarizability of molecules. (12 marks)

(ii) Write short notes on behaviour of dielectrics in an alternating field. (4 marks)

(OR)

b) (i) Derive an expression for internal field by using Lorentz method. (10 marks)

(ii) Explain classification of ferroelectric crystals. (6 marks)

14. a) (i) Explain Langevein theory of Paramagnetism. (12 marks)

(ii) Write short notes on rare earth elements. (4 marks)

(OR)

b) (i) Explain weiss theory of ferromagnetism (10 marks)

(ii) Explain the experimental determination by inelastic neutron scattering. (6 marks)

15. a) (i) Explain the properties of superconductors in detail. (12 marks)

(ii) Explain Giaver tunneling. (4 marks)

(OR)

b) (i) Derive London equations. (12 marks)

(ii) Explain BCS theory. (4 marks)