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B.E / B.Tech DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2019

Material Science

III Semester

ML8302 – SOLID STATE PHYSICS

Regulation: 2012

Time: 3 Hours

Answer ALL Questions

Max. Marks 100

PART- A (10 x 2 = 20 Marks)

1. What are matter waves? How are they experimentally verified?
2. What is covalent bond? Give some examples.
3. Give Fermi -Dirac distribution function and plot it graphically.
4. What are extrinsic semiconductors? How are they obtained?
5. How does spontaneous polarization occur in barium titanate crystals?
6. What is dipolar relaxation?
7. Name the rules for determining the net spin of a nucleus.
8. What are magnons?
9. What is Josephson's effect?
10. What are cooper pairs? How are they formed in superconductors?



Part – B ( 5 x 16 = 80 marks)

24/4/19

11. i) What are superconductors? Mention the important property changes that occur in materials when they change from normal to superconducting state. (12)  
ii) Mention a few industrial applications of superconductors. (4)

12. a) i) Solve Schrödinger time independent wave equation for a free particle in a one-dimensional infinite potential well. (12)  
ii) Explain the significance of wave function. (4)

(or)

- b) Obtain the dispersion relation for elastic waves in a linear diatomic lattice. Explain the acoustic and optical modes of vibration. (16)

13. a) Derive the expression for electrical and thermal conductivities of a metal and hence deduce Wiedemann-Franz law. (16)

(or)

- b) Discuss Kronig- Penny model for the motion of an electron in a one dimensional periodic potential. (16)

14. a) Explain the different types of polarization mechanism in dielectrics. Write the expression for total polarization. (16)

(or)

- b) What is meant by local field in dielectrics? Derive Clausius -Mosotti relation. (16)

15. a) Explain Langevin theory of paramagnetism and derive an expression for paramagnetic susceptibility. (16)

(or)

- b) Explain briefly Weiss molecular field theory and domain theory of ferromagnetism. (8+8)

