

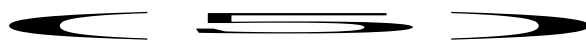
www.FirstRanker.com

PART B — (5 x 16 = 80 marks)

11. (a) (i) Obtain Wiedemann Franz law using the expressions of electrical and thermal conductivity and find the expression for Lorentz number. (6)

(ii) The 'density of Silver is $10.5 \times 10^3 \text{ kg/m}^3$ '. The atomic weight of silver is 107.9. Each silver atom provides- one conduction electron. The conductivity of silver at 20°C is $6.8 \times 10^7 \text{ ohm}^{-1} \cdot \text{m}^{-1}$. Calculate the density of electrons and also the mobility of electrons in silver. (5)

(iii) Calculate the electrical and thermal conductivities of a metal with the relaxation time of 10^{-14} second at 300 K. The electron density is $6 \times 10^{26} \text{ m}^{-3}$.



Or

(b) (i) Derive an expression for electrical conductivity based on Quantum theory. (8)

(ii) Write the expression for Fermi distribution function and explain with suitable diagram. How does it vary with temperature? (4)

(iii) Calculate the Fermi energy and Fermi temperature in a metal. The Fermi velocity of electrons in the metal is $0.86 \times 10^6 \text{ m/s}$. (4)

12. (a) (i) What is Fermi level in intrinsic semiconductor? And discuss the variation of Fermi level in intrinsic semiconductor with temperature. (8)

(ii) Derive the expression for electrical conductivity in an intrinsic semiconductor and explain the variation of it with temperature. (8)

Or

(b) (i) How the Fermi level changes its position with the temperature and impurity concentration in N-type semiconductors? (6)

(ii) Define Hall effect in semiconductors. How the Hall coefficient is determined? (10)

13. (a) (i) Explain the domain theory of Ferromagnetism and hence describe the magnetic hysteresis. (10)

(ii) What are Ferrites? Explain magnetic recording and read out mechanisms. (6)

Or

(b) (i) Describe the different properties of superconductors and also explain the classification of superconductors as Type I and Type II superconductors. (10)

(ii) Explain BCS theory of superconductors (6)