

B.E./B.TECH. Degree Examination, December 2020

Second Semester

PH18252- Physics of Materials

(Regulation 2018)

Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. First material known to be used by man (a) cotton (b) Bronze (c) Iron (d) rock.
2. Two or more identical fermions cannot occupy the same quantum state within a quantum system simultaneously (a) Variational Principle (b) Pauli's exclusion principle (c) Hund's rule (d) Uncertainty principle.
3. Hall probe is made up of (a) metals (b) non-metals (c) semiconductors (d) radio active materials.
4. A fullerene is any molecule composed entirely of the carbon not in the form of hollow (a) sphere (b) tube (c) ellipsoid (d) cuboid.
5. What are the sources of resistance in metals?
6. State the factors on which dielectric loss depends.
7. The transition temperature for a super conducting material is 3.7 K at zero magnetic field and critical field is 0.0306A/m at 0 K. calculate the critical field at 2 K.
8. List the types of carbon nano tubes.

PART B - (4 X16 = 64 marks)

9. (a) (i) Based on Drude and Lorentz theory derive the expression for ' σ ' and assuming the classical expressions for thermal conductivity, Derive expression for Wiedemann-Franz law. (12)
(ii) Derive microscopic form of ohm's law and state, whether the ohm's law is true for all temperature. (4)

(OR)

- (b) (i) Deduce an expression for the number of allowed electronic states per unit volume of a solid. (10)
(ii) Based on Fermi-Dirac statistics, state the nature of Fermi distribution function. How does it vary with temperature? (6)

10. (a) Explain the terms conduction band and valence band of an intrinsic semiconductor and derive an expression for density of charge carriers in intrinsic semiconductor. **(16)**

(OR)

- (b) Describe a theory and experimental procedure for the measurement of the Hall coefficient of a semiconductor and discuss its applications. **(16)**

11. (a) (i) Explain the working principle of applications of superconducting materials. **(8)**
(ii) Compare the superconductors based on the difference in magnetization exhibited by them. **(8)**

(OR)

- (b) (i) Classify the magnetic materials based on their magnetic moments and compare their characteristics. **(10)**
(ii) Explain hysteresis on the basis of Domain theory of Ferromagnetism. **(6)**

12. (a) Derive an expression for internal field in dielectric material and hence deduce the relation between polarisability and dielectric constant. **(16)**

(OR)

- (b) (i) How are the nano materials differ from bulk materials? Explain the preparation of nano materials by chemical vapour deposition method and write their important properties. **(10)**
(ii) Explain the creation of bucky ball and list its applications. **(6)**