

Reg. No.

Question Paper Code

12131

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2023

Second Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

20BSPH206 - PHYSICS FOR INSTRUMENTATION ENGINEERING

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

- | | <i>Marks,
K-Level, CO</i> |
|--|-------------------------------|
| 1. Define drift velocity and mobility. | 2,K1,CO1 |
| 2. Using the Fermi function, evaluate the probability of an electron in a metal with $E - E_F = 0.01$ eV at 200 K. | 2,K2,CO1 |
| 3. List out the characteristics of semiconductors. | 2,K1,CO2 |
| 4. Given an extrinsic semiconductor, how will you find whether it is n-type or p-type? | 2,K2,CO2 |
| 5. Show that the susceptibility of the superconductor is -1 and the relative permeability is 0. | 2,K2,CO3 |
| 6. Define critical temperature. | 2,K1,CO3 |
| 7. Iron has a relative permeability of 5000. Calculate its magnetic susceptibility. | 2,K2,CO4 |
| 8. Define magnetic flux density. | 2,K1,CO4 |
| 9. What is polarization in dielectrics? | 2,K1,CO5 |
| 10. Write down the temperature dependence of polarization. | 2,K1,CO5 |

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

- | | |
|---|-----------|
| 11. a) Deduce mathematical expression for electrical conductivity and thermal conductivity of a conducting material. | 13,K2,CO1 |
| OR | |
| b) Derive an expression for the density of states in metals. | 13,K2,CO1 |
| 12. a) Derive expressions for density of electrons and density of holes in intrinsic semiconductor. | 13,K2,CO2 |
| OR | |
| b) Derive an expression for the Hall coefficient for an n-type semiconductor. Also, deduce the Hall voltage in terms of Hall coefficient. | 13,K2,CO2 |

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

12131

13. a) (i) List out the differences between Type-I and Type-II superconductors. 8,K2,CO3
(ii) Write short notes on: Isotope effect, Persistent current. 5,K2,CO3

OR

- b) Explain briefly about the following phenomenon in superconductors.
(a) Meissner effect. 4,K2,CO3
(b) Effect of magnetic field. 3,K2,CO3
(c) Effect of temperature. 3,K2,CO3
(d) Josephson Effect and its types. 3,K2,CO3
14. a) Differentiate between dia, para and ferro magnetic materials. 13,K2,CO4
- OR**
- b) (i) Draw the B-H curve (hysteresis) for a ferromagnetic material and explain the same on the basis of domain theory. 8,K2,CO4
(ii) Bring out the differences between soft and hard magnetic materials. 5,K2,CO4
15. a) Obtain an expression for electronic and ionic polarization in dielectrics. 13,K2,CO5
- OR**
- b) What is meant by internal field? Obtain an expression for internal field using Lorentz method in dielectrics. 13,K2,CO5

PART - C (1 × 15 = 15 Marks)

16. a) What are metallic glasses? Describe the preparation, properties and applications of metallic glasses. 15,K2,CO6
- OR**
- b) Derive expressions for the density of states in a quantum well and quantum wire. 15,K2,CO6