Reg. No. : | | | | | | | | | | | | |

Question Paper Code: R2P05

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

Second Semester

Electrical and Electronics Engineering

R21UPH205 - PHYSICS FOR ELECTRONICS ENGINEERING

(Regulations R2021)

(Common to ECE Engineering branches)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. The electron moving with a drift velocity of 4 m/s from one end of the wire to other end due to the applied electric field 2 V/m .Calculate the mobility, CO3- App

   (a) 8 $m^2V^{-1}s^{-1}$ (b) 4 $m^2V^{-1}s^{-1}$ (c) 2 $m^2V^{-1}s^{-1}$ (d) 0.5 $m^2V^{-1}s^{-1}$

2. When the high resistivity material (Nichrome) is connected in AC current CO1- U

   (a) Heat produced (b) Cool (c) No effect (d) Melt the wire

3. The probability of occupancy of Fermi level at any temperature other than 0 K is CO1- U

   (a) Zero (b) one (c) infinity (d) 0.5

4. Semiconducting material has electrical conductivity between a good conductor and a CO1- U

   (a) Good insulator (b) Good dielectrics (c) Good alloys (d) None of these

5. Diamagnetic materials have ----- CO2- U

   (a) Permanent magnetic moment (b) High magnetic moment

   (c) Infinite permanent magnetic moment (d) No permanent magnetic moment

6. Magnetic tape is one of the most popular storage medium for ----- CO2- U

   (a) Call recording (b) Signal recording (c) Data recording (d) None of these

7. How does ionic polarization occur? CO2- U

   (a) Splitting of ions (b) Passing magnetic field

   (c) Displacement of cations and anions (d) Never occurs

8. All the dielectric materials are ----- materials CO2- U

(a) Conducting (b) Semi conducting (c) None of these (d) Insulating

9. Which one of the following nano materials comes under two dimensional? CO2- U

(a) Nanoparticles (b) Nanorods

(c) Nanofilms (d) Bundle of Nanowires

10. CNT is _____ CO2- U

(a) conductor (b) semiconductor

(c) insulator (d) impure material

PART – B (5 x 2= 10 Marks)

11. Find the relaxation time of conduction electrons in a metal of resistivity 1.54 x 10^{-8} Ω m if the metal has 5.8 x 10^{28} conduction electrons / m^3. CO3- App

12. What are the differences between intrinsic & extrinsic semiconductor. CO1- U

13. What are the energies involved in the formation of domain? CO2- U

14. Define dielectric constant. Is it a dimensionless quantity? CO2- U

15. Define ballistic transport. CO2- U

PART – C (5 x 16= 80 Marks)

16. (a) Deduce mathematical expressions for electrical conductivity and thermal conductivity of a conducting material and hence obtain Wiedemann-Franz law. CO3- App (16)

Or

(b) Derive an expression for density of electron states in a metal. Hence deduce the expression for Fermi energy at 0 K. CO3- App (16)

17. (a) Derive an expression for concentration of holes in valence band for a p-type semiconductor. CO3- App (16)

Or

(b) What is Hall effect? Show that for a p – type semiconductor the Hall coefficient R_H is given by 1/pe. CO3- App (16)

18. (a) Describe the ferromagnetic domain theory in detail and how will you account hysteresis of ferromagnetic material based on domain theory. CO2- U (16)

Or

	(b)	List and explain different types of energies involved in the formation of ferromagnetic domains.	CO2- U	(16)
19.	(a)	Derive an expression for Langevin-Debye equation.	CO5- App	(16)
		Or		
	(b)	Obtain an expression for electronic polarizability in terms of the radius of atoms and ionic polarizability in terms of mass of ions.	CO5- App	(16)
20.	(a)	Compare the quantum confinement and resulting structures like Quantum dots, quantum wells and their physical significance.	CO2- U	(16)
		Or		
	(b)	Explain in detail the properties and application of carbon nano tubes	CO2- U	(16)