Reg. No.															

Question Paper Code	13700

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

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 (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	According to classical free electron theory, the resistance of a metal increases with (a) increasing temperature (b) decreasing temperature (c) increasing electron concentration (d) decreasing electron concentration	1	K1	CO1
2.	The concept of effective mass is mostly useful in describing (a) the speed of the electron in free space (b) the behaviour of electrons in an external electric field (c) the spin of electrons (d) the charge of electrons	1	K1	CO1
3.	In semiconductors, what is responsible for their conduction? (a) Electrons (b) Holes (c) Both electrons and holes (d) Neither electrons nor holes	1	K1	CO2
4.	In an intrinsic semiconductor, the number of free electrons is equal to the number of (a) dopants (b) ions (c) holes (d) protons	1	K1	CO2
5.	Which of the following materials is a high temperature superconductor? (a) mercury (b) lead (c) ytrrium barium copper oxide (d) aluminium	1	K1	CO3
6.	At what temperature does the Meissner effect typically occur in a material? (a) below curie point (b) below critical temperature (c) at the melting point (d) below room temperature	1	K1	CO3
7.	In the ferromagnetic materials, the magnetic domains are (a) Randomly oriented (b) aligned with the applied magnetic field (c) completely aligned with one another (d) not present	1	K1	CO4
8.	Ferrites are a class of materials that are primarily composed of (a) iron and oxygen (b) iron and chromium (c) iron and aluminium (d) iron and manganese	1	K1	CO4
9.	Which of the following is an example for polar dielectric material? (a) Nitrogen (b) Water (c) Glass (d) Teflon	1	K1	CO5
10.	Which of the following is a type of liquid crystal phase? (a) smectic (b) crystalline (c) gas (d) plasmonic	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	What is Lorentz number?	2	K1	CO1
12.	What is meant by effective mass of an electron?	2	K1	CO1
13.	Sketch the energy band diagram for intrinsic semiconductors.	2	K2	CO2
14.	Define carrier concentration in intrinsic semiconductor.	2	K1	CO2
15.	What is critical temperature in superconductors?	2	K1	CO3
16.	What is Meissner effect?	2	K1	CO3
17.	State the electron spin alignment in dia, para and ferromagnetic materials.	2	K1	CO4

18.	List some properties of soft magnetic materials.	*2*	*K1*	*CO4*
19.	Define polarization.	*2*	*K1*	*CO5*
20.	What is electric susceptibility?	*2*	*K1*	*CO5*
21.	What are the types of liquid crystals?	*2*	*K1*	*CO6*
22.	Define metallic glasses.	*2*	*K1*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	What are the postulates of classical free electron theory? Based on that, derive the expression for electrical conductivity of a conducting material.	*11*	*K2*	*CO1*
		OR			
	b)	Obtain an expression for density of states in metal.	*11*	*K2*	*CO1*
24.	a)	Derive an expression for density of electrons in conduction band for an intrinsic Semiconductor.	*11*	*K2*	*CO2*
		OR			
	b)	State Hall Effect. Derive an expression for the Hall coefficient for p-type semiconductor.	*11*	*K2*	*CO2*
25.	a)	Draw and explain about the high temperature superconductors.	*11*	*K2*	*CO3*
		OR			
	b)	Summarize the differences between Type-I and Type-II superconductors.	*11*	*K2*	*CO3*
26.	a)	Explain about the hysteresis of a ferromagnetic material based on domain theory.	*11*	*K2*	*CO4*
		OR			
	b)	Describe the structure and properties of ferrites.	*11*	*K2*	*CO4*
27.	a)	Derive an expression for electronic polarization of a dielectric material.	*11*	*K2*	*CO5*
		OR			
	b)	Explain briefly about the elementary ideas about piezoelectric and ferroelectric materials.	*11*	*K2*	*CO5*
28.	a)	Explain the preparation and applications of metallic glasses.	*11*	*K2*	*CO6*
		OR			
	b)	Describe carbon nanotubes with types of structures, properties and applications.	*11*	*K2*	*CO6*