Q. Code:987434

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

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Second-Semester

PH18252 – PHYSICS OF MATERIALS

(Common to EC & EE)

(Regulation 2018/2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Comprehend the behavior of electrons in solids.	**2**
CO 2	Demonstrate an understanding of various properties of Semiconducting materials and their internal structure	**3**
CO 3	Analyze the properties of dielectric materials and apply them in various fields.	**4**
CO 4	Summarize basics of magnetism and superconductivity. Explore a few of their technological applications.	**3**
CO 5	Develop an understanding the applications of Nano materials and new engineering materials in various fields.	**2**

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Give any two merits of classical free electron theory.	**1**	**2**
2.	What is Fermi level and Fermi Energy?.	**1**	**2**
3.	List any two important properties of semiconductors.	**2**	**3**
4.	The intrinsic carrier density at room temperature in Ge is 2.37 $x10^{19}$ /m^3. If the electron and hole mobilities are 0.38 and 0.18 m^2 V^{-1s-1} respectively, calculate the resistivity.	**2**	**3**
5.	Distinguish between dielectric loss and dielectric breakdown.	**3**	**3**
6.	Calculate the electronic polarizability of neon. The radius of Neon atom is 0.158nm.	**3**	**4**
7.	What are ‘coercivity’ and ‘retentivity’ of magnetic materials?	**4**	**3**
8.	Superconducting tin has a critical temperature of 3.7K at zero magnetic field and a critical field of 0.0306 Tesla at 0 K. Find the critical field at 2K.	**4**	**3**
9.	Sketch the two phases which occur in shape memory alloy.	**5**	**2**

			Marks	CO	RBT LEVEL
10.		List any two properties of carbon nanotubes.	**5**	**2**	

PART- B (5 x 14 = 70 Marks)

			Marks	CO	RBT LEVEL
11. (a)		Derive an expression for electrical and thermal conductivity of metals.	**(14)**	**1**	**2**
		(OR)			
(b)	**(i)**	Write the expression for Fermi distribution function and explain with suitable diagram. How does it vary with temperature.	**(10)**	**1**	**2**
	(ii)	Calculate the Fermi energy and Fermi temperature in a metal if the Fermi velocity of electrons in the metal is 0.86×10^6 m/s.	**(4)**	**1**	**2**
12. (a)	**(i)**	Derive an expression for the carrier concentration in an intrinsic semiconductor by assuming the densities of electron and hole.	**(10)**	**2**	**3**
	(ii)	Discuss the variation of Fermi level with temperature in intrinsic semiconductor.	**(4)**	**2**	**3**
		(OR)			
(b)	**(i)**	What is the Hall effect? Obtain expressions to find the Hall coefficient and Hall voltage.	**(10)**	**2**	**3**
	(ii)	Mention any two applications of the Hall effect.	**(4)**	**2**	**3**
13. (a)		Explain the different types of polarization mechanisms in dielectric materials and derive an expression for total polarization.	**(14)**	**3**	**3**
		(OR)			
(b)	**(i)**	Explain the temperature and frequency dependence of polarization.	**(8)**	**3**	**3**
	(ii)	Give an account on the use of dielectric materials in capacitors.	**(6)**	**3**	**3**
14. (a)	**(i)**	Explain the phenomenon of Hysteresis in ferromagnetic materials.	**(8)**	**4**	**3**
	(ii)	Describe the structure of Ferrites.	**(6)**	**4**	**3**
		(OR)			
(b)	**(i)**	Prove that all the superconductors are perfect diamagnets in the superconducting state.	**(4)**	**4**	**3**
	(ii)	Distinguish between Type-I and Type-II superconductors.	**(10)**	**4**	**3**
15. (a)		What are shape memory alloys? Discuss the characteristics and properties of shape memory alloys.	**(14)**	**5**	**2**
		(OR)			

(b)	How do nanomaterials differ from bulk materials? Explain the preparation of nanomaterials by Chemical Vapour Deposition method and give their important properties.	**(14)**	**5**	**2**

PART- C (1 x 110 = 10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Deduce the expression for internal field using Lorentz method.	**(10)**	**3**	**3**