Q. Code: 419741

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

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2023

Second Semester

PH22252 – PHYSICS OF MATERIALS

(Common to EC, EE)

(Regulation 2022)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Gain knowledge about conducting properties of materials which is very much useful to the branches of study	**3**
CO 2	Evaluate the concepts of semiconductors	**3**
CO 3	Inculcate the exposure of the dielectric properties and its applications in various fields.	**3**
CO 4	Summarize the basics of superconducting and magnetic properties. Explore few of their applications in engineering and technology	**3**
CO 5	Develop an understanding the characteristics of electronic devices and gain knowledge in designing of logic gates and construction of K-map	**4**

PART- A(20x2=40Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Mention mean free path in the conducting materials.	**1**	**2**
2.	Device the way to arrive at microscopic form of Ohm's law.	**1**	**2**
3.	The Fermi temperature of a metal is 24600 K. Calculate the Fermi velocity.	**1**	**3**
4.	Point out the significance of photo electric effect.	**1**	**2**
5.	Distinguish between intrinsic and extrinsic semiconductors.	**2**	**3**
6.	Analyse the significance of compound semiconductors.	**2**	**2**
7.	Mention the applications of Hall effect.	**2**	**2**
8.	Select the junctions of the Schottky diode.	**2**	**2**
9.	Report the difference between dielectric constant and dielectric loss.	**3**	**3**
10.	Corroborate the piezo electricity in dielectric materials.	**3**	**2**
11.	Calculate the electronic polarisability of Neon. The radius of Neon atom is 0.158 nm. (Given $\varepsilon_0 = 8.854 \times 10^{-12}$ F/m)	**3**	**3**
12.	Enlist the applications of ferroelectric materials.	**3**	**2**
13.	Express the transition temperature in superconductors.	**4**	**2**
14.	Prove that superconductors are perfect diamagnets with the relation, $\chi = -1$.	**4**	**3**
15.	Sketch the spin arrangement of Para and Ferro magnetic materials.	**4**	**2**
16.	Intervene the significance of magnetic semiconductors.	**4**	**2**
17.	Infer the basic principle of junction field effect transistor.	**5**	**2**
18.	Examine spintronics against the conventional electronics.	**5**	**2**
19.	Analyse the principle of single electron transistor.	**5**	**2**
20.	Interfere the concept of Karnaugh mapping.	**5**	**3**

PART- B(5x 10=50Marks)

			Marks	CO	RBT LEVEL
21. (a)		Derive the expression for electrical conductivity and thermal conductivity and hence prove Wiedemann-Franz law.	**(10)**	**1**	**3**
		(OR)			
(b)		Derive an expression for density of energy states in metal and hence deduce the expression of Fermi energy at zero Kelvin.	**(10)**	**1**	**3**
22. (a)	**(i)**	Obtain an expression for the concentration of electrons in the conduction band of an intrinsic semiconductor.	**(5)**	**2**	**3**
	(ii)	With necessary theory describe a method to determine the energy band gap of an intrinsic semiconductor.	**(5)**	**2**	**3**
		(OR)			
(b)		Describe a theory and experimental procedure for the measurement of the Hall coefficient of a semiconductor and discuss its applications.	**(10)**	**2**	**3**
23. (a)		Arrive at the expression for the local field in a dielectric for a cubic structure and deduce Clausius-Mosotti equation.	**(10)**	**3**	**3**
		(OR)			
(b)		Explain different types of dielectric breakdown mechanisms with remedies.	**(10)**	**3**	**3**
24. (a)	**(i)**	Compare and contrast between Type-I and Type-II superconductors.	**(5)**	**4**	**4**
	(ii)	Concatenate the principle how "MAGLEV" train is made to float above the rails?	**(5)**	**4**	**4**
		(OR)			
(b)		Discuss the various energies involved in domains of ferromagnetic materials and enlighten hysteresis by domain theory.	**(10)**	**4**	**4**
25. (a)		Illustrate the working mechanism of JFET with necessary diagram.	**(10)**	**5**	**4**
		(OR)			
(b)		Construct any two logic gates using transistor.	**(10)**	**5**	**4**

PART- C(1x 10=10Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Extrapolate the various characteristics of dia, para and ferro magnetic materials.	**(10)**	**4**	**5**