Q. Code:797572

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

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

Second Semester

PH18253 – MATERIAL SCIENCE

(Mechanical Engineering)

(Regulation 2018A)

Time: Three Hours **Maximum : 100 Marks**

CO1 Students will understand the thermal and magnetic properties of materials

CO2 Students will gain the ability to distinguish conducting, semiconducting & super conducting materials.

CO3 Students will get the exposure of the dielectric properties and material and its applications materials in various fields.

CO4 Students will analyze the requirements of advanced materials for different applications.

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	Compare Ferro and Ferri magnetic materials.	**1**	**2**
2.	Give some applications of Thermal expansion of solids.	**1**	**2**
3.	What is Lorentz number?	**2**	**2**
4.	Prove that superconductors are diamagnetic in nature.	**2**	**3**
5.	The intrinsic carrier concentration of Ge at 300K is $2.5*10^{19}$ m^{-3}. Calculate its conductivity if electron and hole mobilities are $0.39m^2V^{-1}S^{-1}$ and $0.19m^2V^{-1}S^{-1}$ respectively.	**3**	**3**
6.	Distinguish between N-type and p-type semiconductors.	**3**	**2**
7.	Define Polarisation Vector. Give its unit.	**4**	**2**
8.	What are different types of dielectric breakdown mechanism?	**4**	**2**
9.	Name any two biomaterials.	**5**	**2**
10.	What are nonlinear optical materials?	**5**	**2**

PART B - (5 X14 = 70 Marks)

11.	**(a)**	**(i)**	What are the energies involved in the domain formation?	**(6)**	**1**	**3**
		(ii)	Based on domain theory of ferromagnetism, explain Hysteresis curve.	**(8)**	**1**	**3**

(OR)

	(b)	What is coefficient of thermal expansion? Explain any four applications of thermal expansion.	**(14)**	**1**	**3**
12.	**(a)**	Derive an expression for electrical conductivity and Thermal Conductivity and hence Lorentz number.	**(14)**	**2**	**3**
		(OR)			
	(b)	**(i)** Classify and compare superconductors based on magnetisation.	**(8)**	**2**	**3**
		(ii) Explain Cryotron and Maglev.	**(6)**	**2**	**3**
13.	**(a)**	Derive an expression for intrinsic carrier concentration in a semiconductor applying law of mass action.	**(14)**	**3**	**3**
		(OR)			
	(b)	**(i)** What is Hall Effect? With necessary theory derive an expression for Hall co-efficient.	**(10)**	**3**	**3**
		(ii) With a neat diagram, discuss the experimental determination of Hall coefficient.	**(4)**	**3**	**3**
14.	**(a)**	Discuss various types of polarisation mechanism and hence derive Langevin's-Debye equation.	**(14)**	**4**	**3**
		(OR)			
	(b)	Derive an expression for Internal field in a dielectric material and deduce Clausius-Mosotti relation.	**(14)**	**4**	**3**
15.	**(a)**	Give a detailed account on metallic glasses, their method of production, properties and applications.	**(14)**	**5**	**2**
		(OR)			
	(b)	What are shape memory alloys? Write down their characteristics. List out any four applications of shape memory alloys.	**(14)**	**5**	**2**

PART C - (1 X10 = 10 Marks)

16.		What is Fermi Function? Explain how Fermi function varies with temperature.	**(10)**	**2**	**3**

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