Q. Code:745063

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

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

Second Semester

PH22253 – ENGINEERING MATERIALS

(Common to AE, ME & MN Branches)

(Regulation 2022)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Demonstrate about the Phase diagrams of various alloys.	**3**
CO 2	Enhance knowledge about the heat treatment of alloys and alloy steels.	**3**
CO 3	Demonstrate an understanding of various properties of Semiconducting materials And their internal structure.	**3**
CO 4	Summarize basics of magnetism and superconductivity. Explore a few of their technological applications. Analyse the properties of dielectric materials and apply them in various fields.	**3**
CO 5	Develop an understanding about ceramics and various new engineering materials.	**2**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Enumerate the conditions of Hume-Rothery rule.	**1**	**2**
2.	Interpret the rule of Gibb's Phase.	**1**	**2**
3.	Examine the lever rule in Binary phases.	**1**	**2**
4.	Ni, Al & Cu have face cantered cubic structure yet Ni is soluble in copper whereas Al has only a limited solubility. Explain why it is so?	**1**	**3**
5.	What is phase transformation in metals?	**2**	**2**
6.	Compare between Annealing and Normalizing.	**2**	**2**
7.	List out the importance of tempering process.	**2**	**2**
8.	Find out the various types of case hardening.	**2**	**2**
9.	Sketch the energy band diagram pertaining to conductor, semiconductor and insulators.	**3**	**2**
10.	Distinguish between elemental and compound semiconductor.	**3**	**2**
11.	State the law of mass action in semiconductors.	**3**	**2**
12.	Evaluate Fermi function for energy K_BT above the Fermi energy.	**3**	**3**
13.	Intervene the significance of loss tangent.	**4**	**2**
14.	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).	**4**	**3**
15.	Point out the isotopic effect in superconductors..	**4**	**2**
16.	Why ferrites are advantageous for use as transformer cores?	**4**	**2**
17.	Mention the significance of ceramics.	**5**	**2**

18.	Define Pseudo-elasticity effect.	**5**	**2**
19.	Identify top down and bottom up approach in nanotechnology.	**5**	**2**
20.	List any four properties of nanoparticles.	**5**	**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21.(a)	With neat labeled sketches draw the iron unary phase diagram and discuss the various phases.	**(10)**	**1**	**3**
	(OR)			
(b)	Describe the Cu-Zn phase diagram and explain how cooling causes microstructural changes.	**(10)**	**1**	**3**
22.(a)	Paraphrase the iron-carbon phase diagram in terms of temperature and composition changes.	**(10)**	**2**	**3**
	(OR)			
(b)	Explain the various phases in TTT diagram for the eutectoid steel.	**(10)**	**2**	**3**
23.(a)	Derive an expression for density of electrons in the conduction band of an intrinsic semiconductor.	**(10)**	**3**	**3**
	(OR)			
(b)	What is Hall effect? Discuss the theory of Hall effect for a N-type semiconductor and derive an Expression for Hall coefficient.	**(10)**	**3**	**3**
24.(a)	Derive expression for Electronic and ionic polarization performed in a dielectric material.	**(10)**	**4**	**3**
	(OR)			
(b)	Compare and contrast using diagrams between type I and type II superconductors.	**(10)**	**4**	**3**
25.(a)	Describe the preparation, properties and applications of metallic glasses.	**(10)**	**5**	**2**
	(OR)			
(b)	Investigate the different properties and medical applications of Shape Memory Alloys.	**(10)**	**5**	**2**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Discuss the domain theory of Ferromagnetism and the energies involved in it.	**(10)**	**4**	**3**

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