JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- 2024
B.Tech-V Semester (CSE/IT/)

COURSE CODE (CREDITS): 18B1WPH532 MAX. MARKS: 35
COURSE NAME: Applied Materials Science
COURSE INSTRUCTORS: PBB, VSA, RRS, SKT, HAZ MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

Q.No	Question	CO	Marks
Q1	**(a)** Using the London second equation, derive the expression for London penetration depth and give its physical significance.	2	4
	(b) A given superconductor has critical fields 1.4×10^5 A/m and 4.2×10^5 A/m at 14 K and 13 K respectively. Calculate its transition temperature and the critical field for 4.2 K.	3	3
Q2	**(a)** Discuss the methods to introduce conductivity in polymers.	1	4
	(b) Polyethylene sample containing 3500 chains with molecular weights between 1000 and 4000 g/mol, 7500 chains with molecular weights between 6000 and 9000 g/mol, 6500 chains with molecular weights between 10,000 and 15,000 g/mol, and 1500 chains with molecular weights between 15,000 and 20,000 g/mol. Determine both number and weight average molecular weights & PDI.	3	3
Q3	(a) Using the M-H curve, discuss the types of superconductors. Also, highlight the failure of classical electromagnetic theory to explain superconductivity.	1	3
	(b) The density and associated percent crystallinity for two polytetrafluoroethylene materials are as follows:	3	

ρ (g/cm^3)	crystallinity (%)
2.144	51.3
2.215	74.2

	(i) Compute the densities of totally crystalline and totally amorphous polytetrafluoroethylene.		4
	(ii) Determine the percent crystallinity of a specimen having a density of 2.26 g/cm^3.		
Q4	(a) How many colours will be displayed by a 7-bit display? Also, discuss the working of a LCD using suitable schematic diagrams.	4	2
	(b) For displaying characters such as "A4" and "MW", optimize the segment display.	5	2
	(c) Discuss the concept of strain hardening using stress-strain curve.	5	3
Q5	(a) An atom of oxygen on being polarized produces a dipole moment of 0.5×10^{-22} C-m. If the distance of the centre of negative charge cloud from the nucleus be 4×10^{-17} m, calculate the polarizability of oxygen atom.	5	4
	Define loss tangent and give its physical significance.		3
	(b) The Curie temperature of iron is 1043 K. Assume that iron atoms have magnetic moment of 2-Bohr magnetons per atom. Iron is BCC with lattice parameter a = 0.286 nm. Calculate (i) Saturation magnetization, (ii) Curie constant, (iii) Weiss field constant.	3	

Constants: $\mu_B = 9.27 \times 10^{-24}$ Am^2; $k_B = 1.38 \times 10^{-23}$ J/K; $\varepsilon_o = 8.85 \times 10^{-12}$ F/m