JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-V Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WPH532 (03) MAX. MARKS: 25

COURSE NAME: APPLIED MATERIALS SCIENCE

COURSE INSTRUCTORS: PBB, VSA, SKT, SBA, HAZ MAX. TIME: 1 Hour 30 minutes

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems. Scientific Calculators are allowed.

Q.No	Question	CO	Marks
Q1	**(a)** When NH_3 molecules are used as dielectric material, then its total polarizability varies from $2.5x10^{-39}$ Fm^2 to $2x10^{-39}$ Fm^2, when its temperature changes from 300 K to 400 K. Calculate the deformation polarizability and orientational polarizability at each temperature.	3	3
	(b) Analyse the salient feature of stress-strain curve for ceramic materials.	5	2
Q2	**(a)** How the fundamental frequency (ω_o) of diamagnetic material changes when subjected to externally applied magnetic field (B).	1	3
	(b) A system of electron spins is placed in a magnetic field of 7 Tesla at any temperature T. If the number of spins parallel to the magnetic field is thrice as large as the number of antiparallel spins, determine the value of temperature.	3	2
Q3	**(a)** Give the reason for the shift of the origin of asymptotic paramagnetic susceptibility curve with temperature. Draw graphs to support your answer.	2	2
	(b) The Curie temperature of iron is 1000 K. Assume that iron atoms when in the metallic form, have moments of two Bohr magneton per atom. Iron is body centered cubic (BCC) with lattice parameter a = 0.280 nm. Calculate (a) the saturation magnetization (b) the Curie constant (c) the Weiss field constant (d) the magnitude of the internal field.	3	4
Q4	**(a)** Considering the curve of ferromagnetic magnetization and temperature, derive the thermo-magnetic equation.	2	3
	(b) Draw and discuss the rotation of the domains when a ferromagnetic material is subjected to an external applied magnetic field.	1	2
Q5	Polyethylene $[-(C_2H_4)_n-]$ sample containing 4000 chains with molecular weights between 1000 and 4000 g/mol, 8000 chains with molecular weights between 6000 and 9000 g/mol, 7000 chains with molecular weights between 10,000 and 15,000 g/mol, and 2000 chains with molecular weights between 15,000 and 20,000 g/mol. Determine number average molecular weight, weight average molecular weight, degree of polymerization and polydispersity index .	3	4

Constants: $m_e=9.11x10^{-31}$ kg; $e = 1.6x10^{-19}$ C; $N_A = 6.023x10^{23}$; $k_B=1.38x10^{-23}$ J/K;

$\varepsilon_o=8.85x10^{-12}$ F/m; $\mu_B=9.27x10^{-24}$ Am^2;