JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3EXAMINATION- 2025

B.Tech-I Semester (CSE/IT/ECE/CE/BT/BI)

COURSE CODE (CREDITS): 3 MAX. MARKS: 35

COURSE NAME: Science and Technology of Materials (18B1WPH531)

COURSE INSTRUCTORS: Haresh Raval 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. Explain superconductivity with its phase diagram. B. What is Meissner effect? Discuss and differentiate between Type I and Type II superconductors.	CO[3]	2 3
Q2	A. The transition temperature for lead is 7.26K. The maximum critical field for the material is 8×10^5A/m. Lead has to be used as a superconductor subjected to magnetic field of 4×10^4 A/m. What precaution will have to be taken? B. Determine the critical current and critical current density for a superconducting ring of diameter 10^{-3}m at temperature of 4.2K. Given the critical temperature for the sample is 7.18K and critical magnetic field is 6.5×10^4A/m.	CO[3]	2 3
Q3	Explain quantum theory of paramagnetism.	CO[5]	5
Q4	A. What is Polymer? What is Degree of Polymerization and how to calculate it? B. Differentiate between Number Average Molecular Weight and Weight Average Molecular Weight.	CO[4]	2.5 2.5
Q5	Calculate theNumber Average Molecular Weight and Weight Average Molecular Weight of a polymer sample containing 20% of polymer A and 80% of polymer B. The molecular weight of A and B are 3000 and 30000 respectively.	CO[4]	5
Q6	A. Why all materials are not magnetic materials? B. Using Atomic theory, derive the origin of magnetic moment and discuss subsequent angular momentum quantizations.	CO[3]	5
Q7	A solid contains 5×10^{28} atoms/m^4 each with a polarisability of 2×10^{-40} Fm^2. Assuming that the internal field is given by Lorentz formula. Calculate the ratio of internal field to the external field.	CO[3]	5

$$k_B = 1.38\times10^{-23}\frac{J}{K}, e = 1.6\times10^{-19}\,C, \quad m_e = 9.1\times10^{-31}\,kg,$$

$$\mu_0 = 4\pi\times10^{-7}H/m, \epsilon_0 = 8.85\times10^{-12}F/m, \quad \mu_B = 9.27\times10^{-24}Am^2$$