

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATIONS- 2026

B.Tech-VI Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WPH532

COURSE NAME: Applied Materials Science

COURSE INSTRUCTOR:VSA

MAX MARKS: 35

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

(c) Use of calculator is allowed

Q.No	Question	CO	Marks
1	Justify that the superconductors witness perfect diamagnetism and obey the Meissner effect.	2	4
2	A given superconductor has critical fields 1.4×10^5 and 4.2×10^5 at 14 K and 13 K respectively. Calculate its transition temperature and the critical field for 4.2 K.	3	3
3	The penetration depths for lead are 396 Å and 1730 Å at 3 K and 7.1 K respectively. Calculate the critical temperature for lead.	3	2
4	Differentiate between additional and step growth polymerization.	1	4
5	(a) Elaborate how can we induce conductivity in polymers. (b) Calculate the number average molecular weight for a random nitrile rubber copolymer consisting of acrylonitrile (C_3NH_3) and butadiene (C_4H_6) having fractions 0.7 and 0.3 respectively and the number average degree of polymerization 2000.	4 3	4
6	What is intermodal dispersion and derive the expression for intermodal dispersion.	1	3
7	The refractive index of core and cladding of a fibre are 1.465 and 1.460 respectively and the wavelength of light used is 1.25 μm. What should be the diameter of core for a single mode propagation? Later, if the core diameter is changed to 50 μm, how many modes can propagate through this fibre?	3	2
8	The refractive indices for core and cladding for a step index fibre are 1.52 and 1.41 respectively. Calculate (i) critical angle; (ii) numerical aperture; (iii) the maximum incidence angle.	3	3
9	(a) What is dot pitch and when does it correspond to pixel? (b) Give the mechanism to induce ferroelectric behavior in Ceramics.	4 5	4
10	A metal has bcc structure with two atoms per unit cell. The radius of sodium atom is 1.85 Å. Estimate the order of the diamagnetic susceptibility in sodium if it contributes one electron per atom to diamagnetism.	3	3
11	There are 1.6×10^{20} molecules/m ³ in NaCl vapour. Determine the orientational polarization at 300 K if the vapour is subjected to a field of 5×10^6 V/m. Assume that NaCl molecule consists of Na ⁺ and Cl ⁻ ions separated by a distance of 2.5 Å.	3	3

Constants: $\mu_0 = 4\pi \times 10^{-7} \text{ H-m}^{-1}$; electron charge = $1.6 \times 10^{-19} \text{ C}$; $k_B = 1.38 \times 10^{-23} \text{ JK}^{-1}$; electron mass = $9.1 \times 10^{-31} \text{ kg}$