

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

B.Tech-V Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WPH532 (03)

MAX. MARKS: 15

COURSE NAME: APPLIED MATERIALS SCIENCE

COURSE INSTRUCTORS: PBB, VSA, SKT, SBA, HAZ

MAX. TIME: 1 Hour

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.	Calculate the static value of electronic polarizability for atoms of Helium gas.	2	2
Q2.	(a) An isotropic material of relative permittivity ϵ_r is placed normal to a uniform external electric field with an electric displacement vector of magnitude $5 \times 10^{-4} \text{ C/m}^2$. If the volume of the slab is 0.5 m^3 and magnitude of polarisation is $4 \times 10^{-4} \text{ C/m}^2$, find the value of ϵ_r and total dipole moment of the slab.	3	2
	(b) Calculate the percentage of ionic polarizability in sodium chloride which has the refractive index and static dielectric constant 1.5 and 5.0, respectively.	3	2
Q3.	(a) Write the difference between high frequency dielectric constant and static dielectric constant	1	2
	(b) Suggest a suitable ceramic for surge protection application with suitable reason.	4	2
Q4.	Derive an expression for molar polarizability of a dielectric material.	2	2
Q5.	(a) What is strain hardening? Illustrate its advantages.	4	1
	(b) If the relaxation time is given as $18 \times 10^{-6} \text{ s}$ at 22°C , then calculate the frequency when the real and imaginary parts of the complex dielectric constant become equal. Find out the phase difference between the current and voltage at this frequency.	3	2
<p>Constants: $m_e = 9.11 \times 10^{-31} \text{ kg}$; $e = 1.6 \times 10^{-19} \text{ C}$; $N_A = 6.023 \times 10^{23}$; $k_B = 1.38 \times 10^{-23} \text{ J/K}$; $\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}$</p>			