JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -1 EXAMINATION- 2024
BTech-V Semester (CSE/IT)

COURSE CODE (CREDITS): 18B1WPH532 (3)　　　　　MAX. MARKS: 15

COURSE NAME: Applied Materials Science

COURSE INSTRUCTORS:　PBB, VSA, SKT, HAZ, RRS　　　MAX. TIME: 1 Hour

Note: (a) All questions are compulsory.
(b) Marks are indicated against each question in square brackets.
(c) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems

Q1.　Obtain the expression of electronic polarizability when hydrogen gas is kept under the influence of an electric field of frequency ω.

[3 marks] [CO-2]

Q2. For a polar dielectric derive the expression to highlight the dipolar contribution to the total dielectric constant of the material. Also, indicate the same using a graphical representation.

[3 marks] [CO-2]

Q3. Derive the relation $D = \epsilon_o E + P$ for a dielectric placed between the plates of a parallel plate capacitor

[3 marks] [CO-1]

Q4. The atomic polarizability of neon (atomic number 10) is 4.3×10^{-41} Fm^2. If a neon atom is placed in an electric field of 5×10^4 V/m, calculate its dipole moment and the displacement of the centroids of positive and negative charges in it.

[3 marks] [CO-3]

Q5. The polarizability of ammonia molecule in the gaseous state is found to be 2.42×10^{-39} Fm^2 at 309 K and 1.74×10^{-39} Fm^2 at 448 K, respectively. Calculate for each temperature the polarizability due to permanent dipole moment and due to deformation of a molecule.

[3 marks] [CO-3]