

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATIONS-2022

B.Tech-V Semester (ECE)

COURSE CODE (CREDITS): 18BIWPH531

MAX. MARKS: 15

COURSE NAME: SCIENCE AND TECHNOLOGY OF MATERIALS

COURSE INSTRUCTORS: P.B. BARMAN

MAX. TIME: 1 Hour

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*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

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Q1. For a dielectric material obtain an expression for static value of electronic polarizability.

[3 marks] [CO-1]

Q2. Discuss the temperature dependence of orientational polarizability for a dielectric material.

[3 marks] [CO-5]

Q3. Write short notes on the following

- (a) Refractory behaviour
- (b) Dielectric Strength
- (c) Hot-pressed solid state sintering

[1 mark each=3] [CO-2]

Q4. Two parallel plates of a capacitor having equal and opposite charges are separated by 6 mm thick dielectric material of dielectric constant 2.8. If the electric field strength inside be  $10^5$  V/m, determine polarization vector, displacement vector and energy density in the dielectric.

[2 marks] [CO-3]

Q5. In a drop of water of radius  $10^{-3}$  m the molecular dipoles are pointed in the same direction. If the dipole moment of the water molecule is  $6 \times 10^{-30}$  Cm, calculate the polarization.

[2 marks] [CO-3]

Q6. A material has static dielectric constant 5 and square of refractive index 2.5, calculate the ratio of ionic to electronic polarizability.

[2 marks] [Co-3]

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$\epsilon_0 = 8.85 \times 10^{-12}$  F/m,  $e = 1.6 \times 10^{-19}$  C,  $k_B = 1.38 \times 10^{-23}$  J/K,  $N_A = 6.023 \times 10^{23}$