

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2023

B.Tech-V Semester (ECE)

COURSE CODE(CREDITS):18B1WPH531(03)

MAX. MARKS: 15

COURSE NAME: Science and Technology of Materials

COURSE INSTRUCTORS: Dr. Ragini Raj Singh

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

Q.1.(a) Establish the relation between electric susceptibility and relative permittivity.

[CO:1 ; Marks:1.5]

(b) What is the difference between polar and non polar molecules?

[CO:1 ; Marks:1.5]

Q.2. What are the main polarizations Mechanisms in dielectric materials? Discuss frequency and temperature dependency of each mechanism.

[CO:1 ; Marks:2]

Q.3. (a) Derive and discuss Clausius Mossoti relation.

[CO:2 ; Marks:2]

(b) Explain piezoelectric and pyroelectric materials with examples and applications.

[CO: 2 ; Marks:2]

Q.4. If an ionic crystal is subjected to an electric field of 1000 Vm^{-1} and the resulting polarization $4.3 \times 10^{-8} \text{ cm}^2$. Calculate the relative permittivity of NaCl.

[CO:1 ; Marks:2]

Q.5. Calculate the electronic Polarization of argon atom. Given at $r = 1.0024$ at NTP and $N = 2.7 \times 10^{25} \text{ atom m}^{-3}$.

[CO:2 ; Marks:2]

Q.6. A solid contains $5 \times 10^{28} \text{ atoms/m}^3$ each with a polarisability of $2 \times 10^{-40} \text{ F m}^2$. Assuming that the internal field is given by Lorentz formula. Calculate the ratio of internal field to the external field. $E_0 = 8.854 \times 10^{-12} \text{ Fm}^{-1}$.

[CO:3 ; Marks:2]