Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech.

End-Semester Examination April-May, 2019

Branch	**: EEE**	**Semester**	**:IV**
Title of the Course	**: Electrical Engineering Material**	**Course Code**	**:EEL 263**

Time: 3 Hours **Maximum Marks: 50**

Section A (Answer all questions)

1. **(10×1)=10**

i. A dielectric is always an insulator. But an insulator is not necessarily a dielectric. State True/False.
   a) True b) False

ii. What is the process of producing electric dipoles inside the dielectric by an external electric field?
   a) Polarization c) Susceptibility
   b) Dipole moment d) Magnetization

iii. Which of the following is the slowest polarization method?
   a) Ionic polarization c) Electronic polarization
   b) Orientation polarization d) Space charge polarization

iv. When does a dielectric become a conductor?
   a) At avalanche breakdown c) At dielectric breakdown
   b) At high temperature d) In the presence of magnetic field

v. Class of dielectric material which exhibit a hysteresis loop of polarization versus electric field is termed as
   a) Ferroelectrics c) Ferrites
   b) Electrets d) Dipole

vi. Which of the following breakdowns occur at a higher temperature?
   a) Avalanche breakdown c) Electrochemical breakdown
   b) Thermal breakdown d) Dielectric breakdown

vii. Which of the following materials exhibit Ferro-electricity?
   a) Iron c) Hydrogen
   b) Platinum d) Rochelle salt

viii. Dielectrics are basically
   a) Insulators c) superconductors
   b) Semiconductors d) conductors

ix. Energy band gap size for insulators is in the range _____ eV.
   a) 1-2 c) 3-4
   b) 2-3 d) > 4

x. Value of dielectric constant for a material _____.
   a) Equal to 1 c) Less than 1
   b) Greater than 1 d) Zero

Section B (Answer any FOUR questions)

(4×5)=20

2. Classify materials depending on the values of susceptibility and discuss about their characteristics. 2+3
3. What are the main two reasons of thermal conduction in solid? Compare the properties and characteristic of Si and Gi. 2+3
4. a) How are the elastic and electric fields related to each other in a piezoelectric material?
   b) A barium titanate (BaTiO3) wafer is of 0.15 mm thickness and modulus of elasticity = 70 GPa. If it is subjected to a compressive stress of 25 MPa, find the potential difference produced across it. Take piezoelectric constant for this wafer as 1.0×10^{-10} m/V. 3+2
5. High light the differences between insulators and dielectric materials. Explain some application of solid insulating materials. 2+3
6. What are the requirements of good insulating material? Explain pyroelectric effect on a crystal. 3+2

Section C (Answer any TWO questions)

(2×10)=20

7. Discuss about different polarization techniques and explain the effect of temperature on it. What do you understand by spontaneous polarization? 8+2
8. Explain magnetic hysteresis curve and discuss coercive force and retentivity with the help of it. Compare properties of hysteresis and eddy current losses. 6+4
9. Write a short note on following topics 5+5
   a) Dielectric loss
   b) Thermo electric effects