Total No. of Questions—**8**] [Total No. of Printed Pages—**3**

Seat No.	

[5252]-143

S.E. (Electrical) (I Semester)EXAMINATION, 2017

MATERIAL SCIENCE

(2012 COURSE)

Time : Two Hours **Maximum Marks : 50**

N.B. :— Physical Constants :

(1) Angstrom Unit (AU) = 1×10^{-10} metres

(2) Boltzmann's constant (k) = 1.380×10^{-23} joule degree-1

(3) Charge on Electron (e) = 1.601×10^{-19} coulomb

(4) Mass of Electron (m) = 9.107×10^{-31} kg

(5) Electron volt (eV) = 1.602×10^{-19} joules

(6) Mass of Proton (m_p) = 1.627×10^{-27} kg

(7) Velocity of light (c) = 2.998×10^{8} m/sec

(8) Dielectric Constant of free space ($\in_0$) = 8.854×10^{-12} F/m

(9) Permeability of free space (μ_0) = $4\pi \times 10^{-7}$ H/m

(10) Debye unit = 3.33×10^{-30} coulomb.metre

1. (*a*) Explain the terms :

(*i*) Electric Susceptibility

(*ii*) Polarizability [6]

(*b*) State the properties and applications of :

(*i*) Ceramics

(*ii*) SF_6 [6]

P.T.O.

Or

2. (*a*) The no. of atoms in a volume of one cubic metre of hydrogen gas is 8.4×10^{26}. Radius of hydrogen atom is 0.53 AU. Calculate the polarizability and relative permittivity of hydrogen gas.[6]

(*b*) Explain the insulating materials used for :

(*i*) Power Transformers

(*ii*) Switchgears [6]

3. (*a*) Write a note on classification of magnetic materials. [7]

(*b*) The resistivity of pure copper is 1.56 μΩcm and alloy of copper containing 1 atomic % Ni has resistivity 2.81 μΩcm. Alloy of copper containing 3 atomic % Ag has resistivity 1.98 μΩcm. What is the resistivity of Cu alloy for 2 atomic % Ni and 2 atomic % Ag ? [6]

Or

4. (*a*) If magnetic field of 1.25×10^5 A/m applied to a magnetic material, the resultant flux density is 250 mWb/m^2. Calculate its permeability, susceptibility and magnetization. [7]

(*b*) Write a short note on Superconductivity. [6]

5. Write short notes on the following : [12]

(*a*) Carbon Nano-wire

(*b*) C_{60}

Or

6. Write short notes on following : [12]

(*a*) Carbon nano-tubes (CNT)

(*b*) Single Electron Transistor (SET)

7. (*a*) With neat sketch, explain the method to determine breakdown voltage of transformer oil. [7]

(*b*) Describe the method to determine the breakdown strength of solid dielectric in the laboratory as per IS. [6]

Or

8. (*a*) Describe the method of measurement of tan δ of a dielectric by Schering Bridge as per IS code of practice. [7]

(*b*) With neat sketch, explain detail procedure for measurement of dielectric strength of air as per IS code of practice. [6]