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

Seat No.	

[5152]-143

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

MATERIAL SCIENCE

(2012 Course)

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

Physical Constants :

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

(*ii*) Boltzmann's Constant (k) = 1.380×10^{-23} joule-degree^{-1}

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

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

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

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

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

(*viii*) Dielectric constant of free space (ε_0) = 8.854×10^{-12} F/m

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

(*x*) Debye Unit = 3.33×10^{-30} coulombmetre.

1. (*a*) Explain the terms Polarizability and Susceptibility with reference to dielectric material. [6]

(*b*) What are the required properties of a good insulating material. [6]

Or

2. (*a*) Write a note on mechanisms of polarization. [6]

(*b*) Write a note on insulating materials used in transformer. [6]

P.T.O.

3. (*a*) Compare soft magnetic material and hard magnetic materials. [6]

(*b*) The resistivity of pure copper is 1.7 μΩ-cm. An alloy of copper containing 1 atomic percent nickel has resistivity of 2.97 μΩ-cm. An alloy of copper containing 3 atomic percent gold has a resistivity of 1.9 μΩ-cm. What is the resistivity of alloy containing 2 atomic percent nickel and 2 atomic percent gold? [6]

Or

4. (*a*) In a magnetic material, an application of a magnetic field of 0.2×10^6 A/m results into a flux density of 1 tesla. Calculate its permeability, susceptibility and magnetisation. [6]

(*b*) Write a short note on thermocouple with its neat diagram and its principle of working. [6]

5. (*a*) Write a short note on Carbon Nano Tubes (CNTs). [7]

(*b*) Write a short note on C_{60}. [6]

Or

6. (*a*) Write a short note on BN Nano Tubes. [7]

(*b*) Write a short note on Single Electron Transistor (SET). [6]

7. (*a*) What is partial discharge of a dielectric ? Explain the method to determine partial discharge of solid dielectric. [7]

(*b*) With neat sketch, explain measurement of dielectric strength of transformer oil. [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*) Describe the method to determine the breakdown strength of air in the laboratory as per IS. [6]