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

Seat
No.

[4957]-1032

S.E. (Electrical) (First Semester) EXAMINATION, 2016

MATERIAL SCIENCE

(2012 PATTERN)

Time : Two Hours　　　　　　　　　　Maximum Marks : 50

Physical Constants :—

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

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

(3)　Charge of 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 (Mp) = 1.627×10^{-27} kg

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

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

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

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

1.　(*a*)　Derive Clausis-Mossotti relation as applied to dielectric materials in static field. State clearly the assumptions made.　　[6]

　　(*b*)　Describe various crystal defects.　　[6]

Or

2.　(*a*)　Write note on loss tangent (tan ∂) and negative loss tangent.　　[6]

P.T.O.

(b) State properties and applications of : [6]

(i) Press Board

(ii) Capacitors

3. (a) Derive Curie—Weiss law for magnetic materials. [6]

(b) Write note on Materials used for lamp filament and fuses. [7]

Or

4. (a) Differentiate between : [6]

(i) Ferromagnetism and Antiferromagnetism

(ii) Soft Magnetic Materials and Hard Magnetic Materials.

(b) A filament of a 220V, 100W lamp is to be manufactured. If filament temperature is 2500° at 100W dissipation and resistivity of the filament material at 20°C is 4.3×10^{-6} ohm-cm and $\alpha_{20} = 0.005/°C$. Calculate the length of the filament at 20°C if its diameter at 20°C is 0.022 mm. [7]

5. (a) What do you mean by Single Electron Transistor (SET) ? [6]

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

Or

6. (a) What are carbon nanostructures and carbon clusters ? [6]

(b) Discuss briefly, the energy bands in conductors and insulators. [6]

7. (*a*) Describe the method for measurement of dielectic strength of resins and polymers. [6]

(*b*) Describe measurement of dielectric strength of solid insulating material with reference to IS 2584. [7]

Or

8. (*a*) How will you test transformer oil ? Explain it, with a neat diagram of test setup. [7]

(*b*) With neat sketch, explain how flux density is measured with the help of Gauss meter. [6]