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[5152]-544

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

MATERIAL SCIENCE

(2015 PATTERN)

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} coulomb.metre.

SECTION I

1. (a) Write short note on Polar and Non-Polar dielectric materials with examples. [6]
- (b) State the properties & applications of : [6]
- (i) Pressboard
 - (ii) Varnish.

P.T.O.

Or

2. (a) What are different mechanisms of polarization ? Explain any two with diagram. [6]
- (b) Explain various factors which affect breakdown in solid insulating materials. [6]
3. (a) What do you mean by spontaneous magnetization ? Hence derive Curie-Weiss law for ferromagnetic materials. [6]
- (b) Write materials used for Super-capacitors, Solders and Super Conductors. [6]

Or

4. (a) In a magnetic material, an application of a magnetic field of 3×10^5 A/m results into a flux density of 1.2 tesla. Calculate its permeability, susceptibility & magnetisation. [6]
- (b) Describe properties and applications of Kanthal and Bronze. [6]
5. (a) Describe with neat diagrams : [8]
- (i) Molecular Machines
- (ii) Single Electron transistor
- (b) What are different types of batteries used in electric hybrid vehicles ? Write their properties. [5]

Or

6. (a) Explain with neat diagram – BN Nanotubes. [7]
(b) Explain with neat diagram, chemical reaction and applications of : [6]
(i) Lithium-ion
(ii) Sodium-Sulphur.
7. (a) With neat circuit diagram & phasor diagram, explain measurement of dielectric loss angle ($\tan \delta$) by Schering Bridge as per IS 13585-1994. [7]
(b) With neat sketch, explain how flux density is measured with the help of Gauss meter. [6]

Or

8. (a) Explain the step by step method of finding dielectric strength of transformer oil with a neat diagram as per IS 6798. [6]
(b) Explain the method of finding dielectric strength of air using sphere gap voltmeter with a neat diagram as per IS 2584. [7]