Total No. of Questions—8]   [Total No. of Printed Pages—2

Seat No.	

[5559]-152

S.E. (Electrical) (I Sem.) EXAMINATION, 2019
MATERIAL SCIENCE
(2015 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 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 (ε_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

Q.1 a) What do you mean by polarization in dielectric materials. Hence differentiate types of polarization namely - ionic and orientation polarization. **(6)**

b) Explain various factors which affect breakdown in solid insulating materials.

OR

Q.2 a) Write short note on polar and non-polar dielectric materials with their examples. **(6)**

b) Define following terms with reference to dielectric materials- **(6)**
i) Breakdown Voltage
ii) Breakdown Strength
iii) Townsend's Primary ionisation coefficient
iv) Townsend's Secondary ionisation coefficient

Q.3 a) Write short note on Ferrites with their properties and applications. **(6)**

b) Enlist materials with high resistivity.Describe properties and applications of any two materials. **(6)**

P.T.O.

OR

Q.4 a) In a magnetic material, hysteresis loss is 400W when maximum flux density of 1.2 tesla and frequency is 50 Hz. What would be hysteresis loss if flux density is decreased to 0.8 tesla and frequency is increased to 60 Hz? Assume that hysteresis loss is proportional to $(B_m)^{1.6}$. **(6)**

b) What do you mean by an alloy? Hence write properties and applications of Kanthal and Nichrome. **(6)**

Q.5 a) Describe with neat diagrams -
 i) Carbon Clusters **(4)**
 ii) Nano wires. **(4)**

b) Discuss briefly, the energy bands in conductors and insulators. **(5)**

OR

Q.6 a) Explain with neat diagram - Single Electron Transistor. **(5)**

b) Explain with neat diagram, chemical reaction and applications of - **(8)**
 i) Sodium Sulphur Battery ii) Nickel Cadmium Battery

Q.7 a) Enlist the apparatus along with the specifications to find the dielectric strength of gaseous insulating material with a neat diagram. Which material have you tested in your High Voltage laboratory? **(6)**

b) With neat circuit diagram and phasor diagram, explain measurement of dielectric loss angle (tan δ) by Schering Bridge as per IS 13585-1994. **(7)**

OR

Q.8 a) Enlist the apparatus along with the specifications to find the dielectric strength of transformer oil with a neat diagram. As per IS, what should be the gap spacing between the two electrodes? What is the material used for the electrodes? **(7)**

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