Seat No.	

[5459]-152

S.E. (Electrical) (I Semester) EXAMINATION, 2018

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

1.　(*a*)　Write short note on fibre optics along with materials used and its applications. [6]

(*b*) What is the difference between dielectric material and insulating material ? Hence write the properties and applications of – Air and Pressboard. [6]

Or

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

(*b*) Classify the solid insulating materials as per their ability to withstand temperatures. Explain properties and applications of any *two* solid insulating materials. [6]

3. (*a*) Differentiate between : [6]

(*i*) Ferromagnetism and Antiferromagnetism

(*ii*) Soft Magnetic Materials and Hard Magnetic Materials.

(*b*) Describe properties and applications of any *two* materials of the following : [6]

(*i*) Copper

(*ii*) Constantan

(*iii*) Brass

Or

4. (*a*) Write short note on laser and magnetic strip technology. [6]

(*b*) The resistivity of copper at $300°K$ is 1.56×10^{-8} Ωm. With 2 atomic percent nickel, the resistivity of alloy of copper - nickel becomes 4.06×10^{-8} Ωm. With 3 atomic percent

silver, the resistivity of alloy of copper-silver becomes 1.98×10^{-8} Ωm. What will be the resistivity of alloy of copper for 4 atomic percent of nickel and 3 atomic percent of silver at 300ºK ? [6]

5. (*a*) Explain State Of Charge (SOC), Depth Of Discharge (DOD), energy density, power density in case of batteries. [8]

(*b*) Explain with neat diagram Single Electron Transistor. [5]

Or

6. (*a*) Explain with neat diagram, chemical reaction and applications of : [6]

(*i*) ZEBRA Battery

(*ii*) Nickel Cadmium Battery.

(*b*) Describe with neat diagrams : [7]

(*i*) Molecular Machines

(*ii*) Nano wires.

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

(*b*) 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 ? [7]

Or

8. (*a*) With neat circuit diagram and phasor diagram, explain measurement of dielectric loss angle (tan δ) by Schering Bridge as per IS 13585-1994. [6]

(*b*) Enlist the apparatus along with the specifications to find the dielectric strength of solid insulating material with a neat diagram. Which materials have you tested in your High Voltage laboratory ? What was the material used for the electrodes ? [7]