Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4657]-533

S.E. (Electrical) (First Semester) EXAMINATION, 2014

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 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*) Explain the following terms with their units :

(1) electric dipole

(2) electric polarisation

(3) polarizability. [6]

P.T.O.

www.manaresults.co.in

(*b*) State the electrical applications of the following materials. Explain why are these materials suitable for the given applications :

(1) mica

(2) ceramics. [6]

Or

2. (*a*) Write a note on piezoelectric materials stating their applications. [6]

(*b*) Explain the factors that cause the breakdown of solid insulating materials under normal industrial conditions. [6]

3. (*a*) Explain the behaviour of ferromagnetic material below and above the ferromagnetic Curie temperature. State Curie temperature for iron material. [6]

(*b*) The filament of a 230 volt incandescent lamp is to be drawn from a wire of 0.026 mm diameter and resistivity at 20°C of 4.3×10^{-6} ohm-cm. If temperature coefficient of resistance at 20°C is 0.005 per degree celsius, calculate the length of filament. [6]

Or

4. (*a*) In a material an application of magnetic field of 1.75×10^5 ampere per meter causes a magnetic flux density of 218.2 mili weber/meter^2. Calculate its permeability and susceptibility. Also find magnetization. [6]

www.manaresults.co.in

(*b*) Give with reasons the material used for making the :

(1) filament of a lamp

(2) precision resistors.

State the pair of materials used making the thermocouple. [6]

5. (*a*) Write a note on molecular machines. [7]

(*b*) What is meant by nano tube ? Compare carbon and BN nano tubes. [6]

Or

6. (*a*) Explain carbon clusters and nano wires. [8]

(*b*) Write a note on energy band gaps for conducting, insulating and semiconductor materials. [5]

7. (*a*) Explain the IR testing and power frequency voltage withstand tests conducted on power cables. Explain what is meant by withstand voltage. [7]

(*b*) Explain the method of finding the dielectric strength of solid insulating materials according to relevant standard. Draw the neat sketch of electrodes used. State the precautions to be taken for safety and accuracy. [6]

www.manaresults.co.in

Or

8. (*a*) With a neat diagram explain the method of finding the tan δ value of insulating materials. State its significance. [7]

(*b*) With neat sketch explain the method of finding the dielectric strength of transformer oil according to relevant standard. [6]

www.manaresults.co.in