

Total No. of Questions—8]

[Total No. of Printed Pages—3

Seat No.	
-------------	--

[5668]-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

1. (a) Define with units : [6]
 - (i) Electric dipole moment
 - (ii) Polarizability
 - (iii) Electric susceptibility.
- (b) State the properties and applications of : [6]
 - (i) Asbestos
 - (ii) Sulphur Hexa Fluoride (SF₆).

P.T.O.

Or

2. (a) Write short note on fibre optics with its principle of working. State clearly materials used for fibre optics. [6]
(b) Explain properties of insulating materials which are used in Transformers and Capacitors. [6]
3. (a) Differentiate soft and hard magnetic materials with their examples and applications. [6]
(b) The resistivity of pure copper is $1.7 \mu\Omega\text{-cm}$. An alloy of copper containing 1 atomic percent of nickel has resistivity of $2.97 \mu\Omega\text{-cm}$. An alloy of copper containing 3 atomic percent of gold has a resistivity of $1.9 \mu\Omega\text{-cm}$. What is the resistivity of an alloy containing 3 atomic percent of nickel and 3 atomic percent of gold ? [6]

Or

4. (a) Write short note on compact discs and LASER. [6]
(b) Describe properties and applications of Tungsten and Bronze. [6]
5. (a) Explain with neat diagram - Single Electron Transistor (SET). [7]
(b) Explain with neat diagram, chemical reaction and applications of :
(i) Lithium Ion battery
(ii) Sodium Sulphur Battery. [6]

Or

6. (a) With neat diagram, explain energy bands in conductors, semiconductors and insulators. [5]
(b) Describe with neat diagrams :
(i) Boron Nano Tubes
(ii) Carbon clusters. [8]

7. (a) How will you find out dielectric strength of liquid insulating material? Draw neat diagrams of the test set up and test cell (along with its standard dimensions) as per IS. Name few liquid insulating materials, you know. [8]
- (b) With neat sketch, explain how flux density is measured with the help of Gauss meter. [5]

Or

8. (a) Explain the method of finding dielectric strength of air using sphere gap arrangement with a neat diagram as per IS 2584. What is the ideal value of dielectric strength of air ? [7]
- (b) Explain the step by step method of finding dielectric strength of solid insulating materials with a neat diagram as per IS. How could you measure the thickness of solid insulating materials ? [6]