Total No of Questions: [8] ***SEAT NO. :***

[Total No. of Pages : *2*]

S.E. 2012 (Electrical) Material Science
(Semester – I)

Time: 2 Hours ***Max. Marks : 50***

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***Answer any three questions from each section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of Calculator is allowed.***
6) ***Assume Suitable data if necessary***

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

Q1) **a)** i) Explain the term 'polarization'. With neat diagram, explain Orientation Polarization. [6]
ii) Explain piezoelectric materials along with their applications.

b) Explain various factors which affect breakdown in gaseous insulating materials [6]

OR

Q2) **a)** What do you mean by dielectric loss and dielectric loss tangent [6]

b) **i)** Give classification of insulating materials. [4]

ii) Define Primary Ionization Coefficient and Secondary Ionization Coefficient. [2]

Q3) **a)** Write short note on – i) Compact Disc ii) LASER [7]

b) The resistivity of copper at 300^oK 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 the resistivity of alloy of copper for 3 atomic percent of nickel and 3 atomic percent of silver at 300^oK? [6]

OR

Q4) **a)** Define with units - i) Magnetic Dipole Moment ii) Magnetic susceptibility iii) Magnetization [6]

b) State the properties & applications of i) Canthal ii) Aluminium [7]

Q5) **a)** Write a short note on Carbon Nano-tubes and BN nano-tubes. [8]

	b)	Write a short note on molecular machines.	[4]
		OR	
Q6)	**a)**	Describe with neat diagrams - i) Carbon Clusters ii) Nano wires.	[6]
	b)	What do you mean by Single Electron Transistor (SET)?	[6]
Q7)	**a)**	With neat sketch, explain how HV bushings are tested?	[7]
	b)	Describe the method for measurement of dielectric strength of resins and polymers.	[6]
		OR	
Q8)	**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 solid insulating material with a neat diagram as per IS 2584.	[7]