Code: EE4T5

II B.Tech - II Semester – Regular Examinations - JUNE 2014

MATERIAL SCIENCE
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours   Marks: 5x14=70

Answer any FIVE questions.   All questions carry equal marks

1. a) Explain briefly metals & alloys, Ceramic material and Organic materials with   examples.   6 M

   b) Write any eight differences between metals and non-metals based on their properties.   8 M

2. a) Explain p-type and n-type semiconducting materials.   4 M

   b) Show that, in terms of the Hall electric field E and the current density j, the number of charge carriers per unit volume is given by $n = (jB / eE)$.   6 M

   c) The resistivity of pure germanium at room temperature is 0.47 Ω-m. Find out the   carrier density of germanium at the room temperature for the electron mobility of 0.42 m^2/volt-sec and hole mobility = 0.20 m^2/volt-sec.   4 M

3. a) Explain the terms dielectric loss and dielectric constant. Enlist the factors affecting dielectric loss.   4 M

b) What do you understand by complex dielectric constant? Explain how the loss factor can be calculated.   6 M

c) Determine the percentage of ionic polarizability in the sodium chloride crystal, which has the optical index of refraction and the static dielectric constant 1.5 and 5.6, respectively.   4 M

4. a) Discuss in brief the Phenomenon of Piezoelectricity, Ferroelectricity and Spontaneous Polarization.   6 M

b) Differentiate between piezoelectricity and ferroelectricity.   4 M

c) Write the properties of ferroelectric materials.   4 M

5. a) Discuss the physical, electrical, mechanical, thermal and chemical properties of insulating materials?   10 M

b) Write the Engineering applications of insulating materials?   4M

6. Derive expression for Bohr magneton and magnetic dipole moment induced by the field.   14 M

7. a) Explain the properties of ferromagnetic materials.   7 M

b) Explain theory of antiferromagnetic materials.   7 M

8. a) Explain how dielectric constant will be measured?　　7 M

   b) Explain how semiconductor properties are measured?　7 M