EE 342: Electrical Engineering Material & Devices

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(3 – 1 – 0)
Theory Marks =100
Sessional Mark=50

1. **Structure of solids:**

   Crystalline state of solids, systems & classes, unit cell and space lattice, BCC, DC structure, Bragg's law, Miller indices, Crystal imperfections, grain boundaries.

2. **Dielectrics :**

   (I): Properties of static field. Static dielectric constant, polarization, dielectric constant of mono atomic gases & poly atomic molecules, internal fields in solids & liquids, ferroelectric materials, spontaneous polarization, piezo electricity.
   (II) Properties in alternating fields: Frequency dependence of electronic, ionic polarizability, complex dielectric constant, dielectric loss, dipolar relaxation, breakdown in dielectrics. General properties of common dielectrics (Electrical, mechanical chemical and thermal). Gaseous dielectrics, liquid insulating materials, solid insulating materials, films.

3. **Magnetic properties of materials:**

   Magnetization, origin of permanent magnetic dipole moment, classification of Magnetic of materials, dia, para, ferro, antiferro & ferromagnetism, magnetic anisotropy, magnetostriction, soft & hard magnetic materials for electrical applications.

4. **Conductors**:

   Electron gas model of a metal, Relaxation time, collision time, mean free path, electron scattering & resistivity, heating effect of current, thermal conductivity, superconductivity, electrical conducting materials (Cu, Al) & their application. Mechanical properties like corrosion, solid curability, contact resistance.

5. **Semiconductors and Devices**:

   Intrinsic carrier concentration, Effect of doping on carrier concentration. Holes and electrons, Majority and Minority carriers, Mobility and diffusion constants. Passage of current through semi-conducting material – drift and diffusion process. Recombination and carrier life time. Effect of temperature. Density of carriers in intrinsic semiconductor & in n-type & p-type semiconductor, conductivity, Hall effect, drift & diffusion current, Einstein relation.

Books:

1. Electrical Engineering Material---Dekker A.J. (PHI)
2. A course in Electrical Engineering Material—Seth & Gupta
3. Electrical Engineering Material---Rajput A.K.
4. Electrical Engineering Material---C.S. Indulkar & S. Thiruvengadam.