AS-201: ENGINEERING PHYSICS – II

Unit 2 - Dielectrics and magnetic properties (Assignment 2)

1. What are dielectrics?

2. Define dielectric constant.

3. Define Curie temperature for a ferroelectric material.

4. What is dielectric loss?

5. What is relaxation time?

6. What is meant by dielectric polarization?

7. What are polar and nonpolar molecules?

8. What is dielectric susceptibility?

9. Define Magnetic susceptibility 'χm'.

10. What is Curie temperature?

11. What do you understand by magnetic dipole?

12. What is hysteresis loss?

LONG Questions:

1) What are polar and non-polar molecules? What do you mean by polarization of a substance? Write different mechanisms of polarization in a dielectric.
2) Discuss Lorentz field equation for a non-polar isotropic dielectric. OR What is meant by local field or internal field? Derive expression for internal field in the case of a linear arrangement of electrical dipoles.
3) Deduce Claussius - Mossotti equation for non-polar solids.
4) Explain the behavior of dielectric in an alternating field. What is relaxation time? OR Discuss the frequency dependence of dielectric constant.
5) What is meant by dielectric losses? Give equations for loss angle and loss tangent and explain loss current.
6) What is meant by dielectric losses? Show that energy loss is due to the imaginary part of the dielectric function.
7) Consider an electron of charge −e moving in a circular orbit of radius **a** about a charge +e in a field directed at right angles to the plane of the orbit. Show that the polarizability α is approximately $4\pi\epsilon_0\mathbf{a}$
8) Explain the following terms: (a) magnetic susceptibility (b) relative permeability (c) magnetization. Also, derive the relation $\mu_r=1+\chi_m$
9) Explain diamagnetism, paramagnetism and ferromagnetism on the basis of magnetic dipoles of the atoms.
10) Show that the magnetic susceptibility of a diamagnetic material is negative and independent of temperature. OR Discuss Langevin's theory of diamagnetism. Show that diamagnetic susceptibility is independent of temperature and field strength.
11) What do you mean by hysteresis loss? Show that it is equal to the area of the hysteresis curve.
12) What is hysteresis curve? Explain residual magnetism, coercive force and hysteresis. Also write important applications of the curve.