

M.SC. INSTRUMENTATION SCIENCE FIRST YEAR SECOND SEMESTER EXAM- 2019

SUBJECT: MATERIAL SCIENCE-I

Time: 2 Hours

Full Marks: 50

Answer any five questions

1. Describe various dielectric polarisation mechanism. What is meant by complex dielectric constant? Discuss the relation between dielectric constant and refractive index. Explain dielectric relaxation and loss angle. 10
2. Explain 'internal field' in a solid dielectric. Obtain Clausius-Mosotti formula of dielectric constant with microscopic polarisabilities. 10
3. Derive the Langevin's theory of polarisation in polar dielectrics. Draw the Langevin curve. 10
4. Discuss Weiss theory of ferroelectricity. Give some applications of ferroelectric materials. 10
5. What is the value of magnetic dipole moment associated with a loop carrying current? What is Bohr magnetron? What is meant by hysteresis in magnetic material? What are hard and soft magnetic materials? Mention their uses. 10
6. How does paramagnetic susceptibility of a substance vary with temperature? Explain the physical basis of diamagnetism and paramagnetism of materials. Discuss the domain structure in ferromagnetic materials. 10
7. Explain free electron theory of electrical conductivity in metals. What are the main drawbacks of classical free electron theory? Explain Wiedemann-Franz law. 10