

M.SC. INSTRUMENTATION SCIENCE 1<sup>st</sup> YEAR 2<sup>nd</sup> SEMESTER EXAM- 2023

SUBJECT: MATERIAL SCIENCE-I

Time: 2 Hours

Full Marks: 40

Answer any four questions

1. Describe various dielectric polarisation mechanism. Explain and derive electronic and orientational polarization in dielectric medium. 2+4+4
2. Explain 'internal field' in a solid dielectric. Deduce an expression for the local field for structure possessing cubic symmetry. 2+8
3. Show that  $P = E \epsilon_0 (\epsilon_r - 1)$  where P is the electric polarisation. Discuss the relation between dielectric constant and electronic polarisability. 4+6
4. Discuss Weiss theory of ferroelectricity. Give some applications of ferroelectric materials. 10
5. Explain the physical basis of diamagnetism and paramagnetism of materials. What is meant by hysteresis in magnetic material? How the hysteresis curve can be explained on the basis of domain theory? 2+2+6
6. What is Curie temperature? Discuss the Curie-Weiss law with proper mathematical expression? Deduce the Curie Law from the Langevin's theory of paramagnetism. 1+2+7