TIME: 2 HOURS 30 MINUTES

ANSWER THREE OUT OF FOUR QUESTIONS.

HOD'S SIGNATURE

Question one.

(i) Explain the term dielectric polarization.
(ii) Derive the value of Polarisability, $\alpha = \varepsilon_o X_e / N$
(iii) Explain the following: Ferroelectric domain, Piezoelectricity and their applications.

Question two

(i) What is a plasma? Derive an expression that represents Debye length.

(ii) With good diagram, explain plasma oscillation?

Question three

(i) What is an imperfection?
(ii) List and explain three categories of imperfection
(iii) Given that energy of vacancy formation for silver is 1.1ev . Calculate the number of vacancies per cubic centimeter at 300^0C . Find out the fraction of lattice sites that are vacant at the melting temperature of silver (960^0). Atomic weight of silver A = 107.9, density $\rho= 10,500kg/m^3$.

Question four

(i) Explain Langevin"s classical theory of diamagnetism.
(ii) In Langevin"s classical theory of paramagnetism,
Prove that $M = P_{in} N \int_{-1}^{+1} X e^{ax}dx / N \int_{-1}^{+1} e^{ax}dx$
Hence, sketch the plot of function L(a) used in the description of dipole orientation for paramagnetic behaviour.