

B. Tech I Year (RR) Supplementary Examinations, November/December 2012

SOLID STATE PHYSICS

(Common to EEE, ECE, CSE, EIE, BME, IT, E.Con.E, ECC, CSS and ICE)

Time: 3 hours

Max. Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Plot and explain the variation of:
 - (i) Attractive potential energy
 - (ii) Repulsive potential energy
 - (iii) Resultant potential energy with interatomic distance when 2 atoms are brought nearer.(b) Deduce an expression for the interplanar spacing in the case of cubic structure.
- 2 (a) What is Burger vector? Explain how it is obtained.
(b) Explain the following structures:
 - (i) Zns
 - (ii) NaCl
- 3 (a) Derive Schrodinger time independent wave equation.
(b) Electrons are accelerated by 34400 Hz and are reflected from a crystal. The first reflection maximum occurs when the glancing angle is 60° . Determine the spacing of the crystal.
- 4 (a) Explain any four postulates of classical free electron theory.
(b) Using Kronig-Penney model, show that the energy spectrum of electron contains a number of allowed energy bands separated by forbidden bands.
- 5 (a) Obtain an expression for the internal field seen by an atom in an infinite array of atoms subjected to an external field.
(b) Explain and derive an expression for ionic polarization.
- 6 (a) Explain the classification of magnetic materials.
(b) Explain the Hysteresis curve in case of ferromagnetic materials.
- 7 (a) What is Meissner effect? Explain.
(b) Derive an expression for the carrier concentration of P-type semiconductors.
- 8 (a) Write any four applications of lasers.
(b) Define the acceptance angle and numerical aperture. Obtain an expression for the numerical aperture of an optical fiber.
(c) An optical fiber has a NA of 0.204 a cladding refractive index of 1.59. Find the acceptance angle for the fiber in water which has a refractive index of 1.33.
