LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

 **B.Sc.** DEGREE EXAMINATION – **PHYSICS**

FIFTH SEMESTER – NOVEMBER 2010

# PH 5405 / 5402 - MATERIAL SCIENCE

 Date : 11-11-10 Dept. No. Max. : 100 Marks

 Time : 9:00 - 12:00

**Section – A**

**Answer all the questions: (10x2 = 20)**

1. Define primary and secondary bonds.
2. Give two methods for determining electronic structure.
3. Define space lattice and basis.
4. Distinguish between ionic and covalent bond.
5. What is meant by true stress and true strain? Give the power relation connecting them.
6. Give the expression for Young’s modulus of a composite material.
7. Define Curie temperature.
8. Distinguish between hard and soft magnetic materials.
9. Give the principle of X-ray and Gamma ray radiographic techniques.
10. Define magnification power of a microscope.

**Section – B**

**Answer any four questions: (4x7.5 = 30)**

1. Discuss stable, unstable and metastable states with the help of a tilting rectangular block.
2. Outline the theory of ferroelectrics using the structure of Barium Titanate as an example.
3. (a) Find the Miller Indices of a plane in an orthorhombic unit cell (a:b:c = 1:2:3) making intercepts of 3,2,1 A­­­0 on a,b,c axes respectively.

(b) The Bragg angle corresponding to the first order reflection from (1,1,1) planes in a crystal is 300 when X – rays of wavelength 1.75A0 are used. Calculate the interatomic distance, ‘a’.

1. Discuss “elastic modulus as a parameter in design”.
2. Describe the ultrasonic method of NDT with neat sketch and mention its advantages over other methods of NDT.

**Section – C**

**Answer any four questions: (4x12.5 = 50)**

1. Discuss in detail, the three important steps involved in the formation of ionic bond with specific reference to NaCl crystal.
2. Outline the atomic model of elastic behaviour. Obtain the relation between Young’s modulus (Y), Bulk modulus (K), Rigidity modulus (G), and Poisson’s ratio (µ).
3. Draw the sketch of a scanning electron microscope and discuss its working.
4. Discuss in detail, various point defects in crystals.
5. Explain different types of polarization and derive the expression for the total polarization of a material.

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