

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

FIFTH SEMESTER – NOVEMBER 2007

PH 5402 - MATERIALS SCIENCE

AC 11

Date : 01/11/2007
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

PART A

Answer **ALL** questions:

10 x 2 = 20 marks

1. Outline the characteristics of secondary bonding with an example.
2. Explain the classification of engineering materials with suitable examples.
3. Determine the Miller indices of a plane that makes intercepts of $4x$, y and $2z$.
4. Discuss the crystal structure level.
5. Write the expression for Young's modulus of composite material.
6. Explain the phenomenon of "work hardening".
7. What is the principle of the NDT method based on photoelastic phenomenon?
8. Explain thermoelectric effect method of NDT.
9. Give examples for hard and soft magnetic materials.
10. Mention two essential properties of ferroelectric materials.

PART B

Answer any **FOUR** questions:

4 x 7.5 = 30 marks

11. Discuss how the physical properties of materials are influenced by the variation in bonding character.
12. Explain the mechanism of formation of Schottky defect. Obtain the equation for the number of defects formed.
13. Briefly discuss the role of elastic modulus as an important parameter in design.
14. Explain the different types of electrical methods used for NDT.
15. Discuss different types of electric breakdown.

PART C

Answer any **FOUR** questions:

4 x 12.5 = 50 marks

16. Discuss in detail (i) production of ions of opposite sign (ii) the coulomb attraction and (iii) the short range repulsion – the steps involved in the formation of ionic bond between sodium and chlorine.
17. What is a Bravais lattice? With neat sketch discuss their properties.
18. Discuss the elastic properties on the basis of atomic model and obtain the relationships connecting the Young's modulus, shear modulus, Bulk modulus and Poisson's ratio.
19. Explain in detail the different categories of radiographic methods of Non destructive testing.
20. Draw the structure of Barium Titanate. Explain its ferroelectric properties.
