

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034****B.Sc. DEGREE EXAMINATION – PHYSICS****FIFTH SEMESTER – APRIL 2023****PH 5408 – MATERIALS SCIENCE**

Date: 13-05-2023

Dept. No. 

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

**PART – A****(10 x 2 = 20 Marks)**

<b>Q. No.</b>	<b>Answer ALL questions</b>
1	Give two examples each for organic polymers and ceramic materials.
2	Distinguish between primary bond and secondary bond.
3	Define Poisson's ratio.
4	Differentiate between true strain and engineering strain.
5	What is magnetic susceptibility? Give its SI unit.
6	Draw the structure of barium titanate ( $\text{BaTiO}_3$ ).
7	Mention few medical applications of shape memory alloys (SMA).
8	What are smart materials? Give example.
9	Outline the photoelastic method of NDT.
10	List out the different electrical methods of NDT.

**PART – B****(4 x 7.5 = 30 Marks)****Answer any FOUR questions**

11	Explain the different levels of structure of materials.
12	With neat diagram explain the procedure to detect flaws in solids using ultrasonic method.
13	Discuss the classification of magnetic materials.
14	Explain the role of elastic modulus as a parameter while designing instruments or structures.
15	With neat diagram explain the piezoelectric effect and mention its uses.
16	Explain the different kinds of equilibriums employing a tilting rectangular block.

**PART – C****(4 x 12.5 = 50 Marks)****Answer any FOUR questions**

17	Discuss the formation of ionic bond in sodium chloride crystal and hence obtain the expression for the potential energy of the system.
18	Outline the atomic model of elastic behaviour. Obtain the relation between Young's modulus $Y$ , Rigidity modulus $K$ , bulk modulus $G$ and Poisson's ratio $\sigma$ .
19	Outline various contributions to polarization and hence obtain an expression for the total polarization of a substance.
20	Write notes on a) Ferro fluids (6) b) Dielectric elastomers (6.5)
21	Draw the block diagram of a scanning electron microscope and explain its principle, construction and working.
22	Highlight the essential features of rubber-like elasticity and derive the equation of state of rubbery

material.