

B.Sc. S. Y. (CBCS Pattern) Semester-V
USDSEPHT10 - Physics Paper-II - Solid State Physics

P. Pages : 3

Time : Three Hours



GUG/S/25/13094

Max. Marks : 50

Either:

1. A) i) State and prove Bragg's law of X-ray diffraction. 3
- ii) Describe the construction and working of Bragg's spectrometer. 4
- iii) Why a crystal diffract x-rays? 1
- iv) The spacing between successive planes in NaCl is 2.82\AA . X-rays incident on the surface of the crystals is found to give rise to first order Bragg reflection at glancing angle 8.8° . Calculate the wavelength of X-rays. 2

OR

- B) a) What are Bravais lattices? Discuss Bravais lattices in two dimensions. 2½
- b) Show that in a crystal of cubic structure the distance between plane with miller indices h, k and l is $d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$ 2½
- c) What is crystal structure? State the relation between crystal structure, lattice and basis. 2½
- d) Explain the concept of Miller indices. Also find the Miller indices for planes in each of the following sets with intercepts \bar{a} , \bar{b} and \bar{c} at $3a$, $3b$, $2c$. 2½

Either:

2. A) i) Explain Diamagnetism. 2
- ii) Discuss Langevin's theory of diamagnetism and Paramagnetism. 4
- iii) Define magnetic susceptibility. 1
- iv) Derive the expression for diamagnetic susceptibility. 3

OR

- B) a) Explain Weiss's theory of ferromagnetism. 2½
- b) Explain Paramagnetism and give properties of Paramagnetic materials. 2½
- c) Distinguish between diamagnetic, paramagnetic and ferromagnetic materials. 2½
- d) What are ferrites? How it differs from ferromagnetic substances? 2½

Either:

3. A) i) Define and explain the three electric vectors \vec{E} , \vec{D} and \vec{P} . 2
- ii) Derive the expression representing the relation between three electric vectors \vec{E} , \vec{D} and \vec{P} . 3
- iii) Derive expression for local electric field at an atom inside the dielectric. 5

OR

- B) a) Explain Classical Theory of Electric Polarizability. 2½
- b) Explain second phenomena of Normal and Anamolous dispersion. 2½
- c) Derive Clausius Mossotti equation from local field. 2½
- d) Derive Langevin-Debye equation. 2½

Either:

4. A) i) Discuss the Kronig Penny model. 2
- ii) What are the basic assumptions of Kronig Penney model? 3
- iii) Explain the Kronig Penny Model for energy band structure of solid. 5

OR

- B) a) Explain Type I and Type II superconductors. 2½
- b) Give brief idea of BCS theory of Superconductivity. 2½
- c) State applications of superconductors. 2½
- d) State and explain Meissner effect. 2½

5. Solve **any 10** of the following.

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| a) Define unit cell. | 1 |
| b) For simple cubic structure $a = 2.14\text{\AA}$, Find radius r . | 1 |
| c) Define magnetization vector. | 1 |
| d) What is Hall effect? | 1 |
| e) What is fermi level? | 1 |
| f) Define crystal lattice. | 1 |
| g) What is Curie temperature. | 1 |
| h) What is B-H Curve. | 1 |
| i) What is dielectric substance. | 1 |
| j) Define critical magnetic field. | 1 |
| k) What is Hysteresis loss? | 1 |
| l) Draw BCC structure. | 1 |
