21PHY2C7L

M.Sc. II Semester Degree Examination, Sept./Oct. - 2024
PHYSICS
Condensed Matter Physics
(NEP)

Time : 3 Hours Maximum Marks : 70

Note : *Answer* **any five** *of the following questions with* **Questions No.1 (Q1)** *is* **Compulsory,** *each question carries* **equal** *marks.*

1.	(a)	Describe the classification of crystal systems based on lattice parameters with suitable diagrams.	**9**
	(b)	Explain the crystal structure of NaCl.	**5**
2.	(a)	Explain the Von Laue treatment of X-ray diffraction and obtain the Laue's equations.	**9**
	(b)	Outline the key difference between the Laue method and the powder method in X-ray diffraction.	**5**
3.	(a)	Derive the expression for dispersion relation for vibrations of one dimensional monoatomic lattice and discuss the relation at low frequencies.	**9**
	(b)	Write a note on colour centers in the crystals.	**5**
4.		Discuss the formation of energy bands in one-dimensional periodic solids following Kronig-Penny model.	**14**
5.	(a)	Derive the expression for carrier concentration in intrinsic semiconductors.	**9**
	(b)	Outline the Meissner effect in superconductors.	**5**
6.	(a)	Define atomic scattering factor. Deduce the general expression of atomic scattering factor.	**9**
	(b)	Give an account on binding energy of crystals of inert gases.	**5**
7.	(a)	Explain BCS theory and its significance in understanding superconductivity.	**9**
	(b)	Define the Fermi surface and describe its significance in metal conductivity.	**5**
8.	(a)	What is Ionic bonding ? Explain with an example.	**5**
	(b)	Write the differences between Type I and Type II superconductors.	**5**
	(c)	What are planar imperfections ? Explain.	**4**

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