GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Basic Sciences

Master of Science in Physics
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

Sem II - C1PO203T - Solid State Physics

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Define the vortex state in superconductors.	K1(3)
2)	Debye temperature (θD) for sodium metal is 150K. Determine its molar specific heat at 10K.	K2(4)
3)	Explain the formation of Cooper pair in a superconductor.	K2(6)
4)	State the Curie law of para-magnetism and define the Curie temperature.	K3(6)
5)	Demonstrate the basic mechanism of band formation in solids.	K3(6)
6)	Apply the Einstein's theory of specific heat of solids to comment on experimental and observed values of specific heat at very high and very low temperature.	K3(9)
7)	What are the silent features of Drude - Lorentz theory of metals?	K3(9)
8)	What is an essential condition for the Braggs diffraction to occur. Determine the maximum wavelength for which Bragg diffraction can be observed from a crystal with an atomic separation of 0.2Å.	K4(8)
9)	Interpret the tight band approximation assumption and derive the energy equation for square lattice.	K4(12)
10)	What is reciprocal lattice? Establish the relationship between direct and reciprocal primitive translation vectors.	K5(10)
11)	Describe the Fermi surface. Explain the construction of Fermi surface in periodic zone scheme with 1st and 2nd Brillouin zone diagram.	K5(15)
	OR	
	Enumerate the properties of type -I and type -II supercoductors.	K5(15)

Derive the London equations and discuss how do they help in explaining the superconducting state.

12) What are ionic crystals and ionic bonding? State the properties of ionic crystals and explain ionic solids are poor conductors. K6(12)

OR

Define Frenkel defect. The average energy required to create a Frenkel defect in an ionic crystal, $A^{2+}B^{2-}$, is 1.4 eV. Calculate the ratio of Frenkel defects at 300K and 600K in 1g of crystal. K6(12)