Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET UNIVERSITY)

M.Sc. (Second Semester - Regular) Examinations, July – 2025
24MPHPC12003– Basic Solid State Physics
(Physics)

Time: 3 hrs   Maximum: 60 Marks

Answer ALL questions
(The figures in the right hand margin indicate marks)

PART – A		(2 x 5 = 10 Marks)	
Q.1. Answer *ALL* questions		CO #	Blooms Level
a.	What are the characteristics of the metallic bond?	CO1	K1
b.	Given an account of the reduced and periodic zone schemes.	CO1	K2
c.	List out some major drawbacks of the classical theory of free electron theory.	CO2	K1
d.	Discuss the structure of diamond.	CO3	K2
e.	Calculate the density of state per unit volume with energies lies between 0 and 1 ev.	CO4	K1

PART – B			(10 x 5 = 50 Marks)		
Answer *ALL* the questions			Marks	CO #	Blooms Level
2. a.	What are ionic crystals? Explain the formation of an ionic crystals and obtain an expression for its cohesive energy.		10	CO1	K2
	(OR)				
b.	Discuss about different types of bonding present in crystals? Define Madelung constant.		10	CO1	K2
3.a.	Discuss non-degenerate and degenerate semiconductors with suitable examples.		10	CO2	K2
	(OR)				
b.	Discuss Lorenz field in solid dielectric and hence derive the Clausius-Mossotti relation.		10	CO2	K1
4.a.	What is density of states in metals? Derive an expression for density of states and hence obtain Fermi energy of a metal.		10	CO3	K2
	(OR)				
b.	Explain the classification of solids into conductor, semiconductor and insulator on the basis of band theory.		8	CO3	K1
c.	Calculate the temperature at which there is a 10^{-6} probability that an energy state of 0.55 ev above the fermi energy is occupied by an electron.		2	CO3	K2
5.a.	Define piezoelectric, pyroelectric and ferroelectric materials with examples.		6	CO4	K1
b.	Define Wiedemann Franz law? Find the correct value of the Lorentz number.		4	CO4	K1
	(OR)				
c.	What are Brillouin zones? Illustrate your answer by constructing two Brillouin zone for a square lattice.		10	CO4	K2
6.a.	Discuss dipolar, ionic, and electronic polarizabilities. Plot a graph in total polarizability and frequency of all the three polarizabilities.		10	CO5	K2
	(OR)				
b.	Explain the difference between Schottky and Frenkel defects.		4	CO5	K1
c.	Derive a mathematical expression for Einstein's theory of specific heat.		6	CO5	K2

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