

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: I M Sc/M Sc/Pre Ph.D
BRANCH: Physics

SEMESTER : IX/III/I
SESSION : MO/2023

SUBJECT: PH505 THEORY OF SOLIDS

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a) Prove the Bloch theorem and explain the reduced zone scheme.	[5]	1	V
Q.1(b) Using E -k curve Distinguish conductor, insulator and semiconductor materials.	[5]	1	
Q.2(a) What is electronic density of states (DOS) of a material. Build up the mathematical relation and show that the DOS of a two dimensional material does not depend on the energy.	[5]	2	I, III
Q.2(b) Sodium has a density 971 kg/m ³ and an atomic weight of 22.99. What is its Fermi Energy?	[5]	2	I
Q.3(a) Starting with Maxwell's equation develop the expression for the refractive index and permittivity of nonmagnetic material.	[5]	3	VI
Q.3(b) Summarize different types of phase transitions in ferroelectrics.	[5]	3	II
Q.4(a) Develop the mathematical expression for phase transition using Ising Model.	[5]	4	III
Q.4(b) Explain Landau theory of ferromagnetism.	[5]	4	II
Q.5(a) Explain the mechanism of propagation of light wave in a dense optical medium.	[5]	5	II
Q.5(b) Show that the absorption coefficient of Lorentz oscillator at the line centre does not depend on the value of natural frequency (ω_0).	[5]	5	II

:::24/11/2023 E:::