CLASS: MSC/IMSC/PRE PHD   SEMESTER : III/IX/NA
BRANCH: PHYSICS   SESSION : MO/2022

SUBJECT: PH505 THEORY OF SOLIDS

TIME: 3:00 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.

Q.1(a)	What are the drawbacks of free electron theory. [BT I]	[2]	CO1
Q.1(b)	Explain the Kronig Penney Model. [BT V]	[3]	CO1
Q.1(c)	Explain the significance of the effective mass of the electron. [BT V]	[5]	CO1
Q.2(a)	Explain electronic density of states (DOS) of a material. [BT II]	[2]	CO2
Q.2(b)	Develop the mathematical relation and show that the DOS of a two-dimensional material does not depend on the energy. [BT III]	[3]	CO2
Q.2(c)	If electrons are treated as distinguishable particle, at what temp would they have an avg energy of 5.5 eV. [BT I]	[5]	CO2
Q.3(a)	What is the physical significance of real and imaginary part of dielectric constant of a material? [BT I]	[2]	CO3
Q.3(b)	Starting with Maxwell's equation develop the expression for the refractive index and permittivity of nonmagnetic material. [BTVI]	[3]	CO3
Q.3(c)	If a dielectric is represented with an equivalent parallel RC circuit. Develop the relation between real and Imaginary part of the Impedance. Using the relation plot a graph between real and imaginary part of the impedance (No graph paper required). [BTVI] [BTIII]	[5]	CO3
Q.4(a)	What is ferromagnetism in solids? [BT I]	[2]	CO4
Q.4(b)	Develop the mathematical expression for phase transition using Ising Model. [BT III]	[3]	CO4
Q.4(c)	Explain Bloch $T^{3/2}$ law. [BT II]	[5]	CO4
Q.5(a)	Construct the relation between the refractive index and complex dielectric constant of a medium [BT III]	[2]	CO5
Q.5(b)	Explain the mechanism of propagation of light wave in a dense optical medium. [BT II]	[3]	CO5
Q.5(c)	Develop the relation between the optical density and absorption coefficient of a medium [BT VI]	[5]	CO5

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