MANIPAL ACADEMY of HIGHER EDUCATION
(Institution of Eminence Deemed to be University)

Reg. No. | | | | | | | | | |

DEPARTMENT OF SCIENCES, IV SEMESTER M.Sc. (Physics)
MAKE-UP EXAMINATIONS, MAY/JUNE 2023

CONDENSED MATTER PHYSICS – II [PHY 6011]

(CHOICE BASED CREDIT SYSTEM - 2020)

Duration: 3 Hours | Date: 02-06-2023 | Max. Marks: 50

Note: Answer ALL questions.

		Marks	CO	BL
1A	What is electric polarization? Derive the Classius-Mossotti relation.	5	1	2
1B	A material has 10 turns/cm of wire wound uniformly upon it which carries a current of 2A. The flux density in the material is 1.0 T. Calculate the magnetic field and magnetization of the material. Also calculate the relative permeability of the core.	3	2	2
1C	What is *dielectric loss* and how is it related to the *loss tangent*?	2	1	2
2A	What are garnets and magnetic bubbles ? Explain.	4	2	2
2B	Derive first and second London equations in superconductors.	4	3	3
2C	There are 1.6×10^{20} molecules/m^3 in NaCl vapour. Determine the orientational polarization at room temperature (300 K) if the vapour is subjected to an electric field of 5×10^6 V/m. Assume that the NaCl molecule consists of Na^+ and Cl^- ions separated by a distance 2.5Å.	2	1	3
3A	What is Meissner effect in Superconductors? The penetration depths for superconducting Pb at 3K and 7.1K are 39.6nm and 173nm respectively. Calculate its critical temperature as well as penetration depth at 0K.	4	3	2
3B	Explain the kinetic theories that govern the formation of glass.	6	4	2

4A	Describe the structure and properties of ceramics and composites in a comprehensive manner.	5	4	2
4B	Describe the molecular weight of polymers in terms of "number average" and "weight average". Compute the number-average degree of polymerization for polypropylene $(C_3H_6)_n$, given that the number average molecular weight is 1,000,000 g/mol. Molecular weight of C is 12.01 g/mol and H is 1.008 g/mol.	5	4	3
5A	Give an account of thermotropic liquid crystals.	5	4	2
5B	Describe the approach to identifying the structure of the given cubic crystal and determining its cell parameter via the powder XRD method.	5	5	2

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