CLASS: IMSc   SEMESTER : III
BRANCH: MATHEMATICS AND COMPUTING   SESSION : MO/2024

SUBJECT: PH111 PHYSICS-II

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.

			CO	BL

Q.1(a)   The microscopic viewpoint interprets the increase of entropy for an isolated system as a   [5]   1   IV
         consequence of the natural tendency of the system to move from a less probable to a
         more probable state. Analyse these statements and develop a mathematical formulation
         regarding the same.

Q.1(b)   Answer to the following questions must be written in a couple of words: [5]   1   II
            A)   The work done in isothermal process is_____
            B)   The work done in the adiabatic process is_____
            C)   The entropy of a reversible process always_____
            D)   The entropy of an irreversible process always_____
            E)   As the temperature between the source and the surrounding increases, the
               corresponding theoretical COP value_____

Q.2(a)   Define the process of diffusion in simple term. Extend this simple diffusion process to the   [5]   2   IV
         process of quantum diffusion. Elaborate the processes mathematically.

Q.2(b)   Discuss the wave functions and energy levels of a particle in a finite potential well. The   [5]   2   III
         same particle without the energy to pass over a potential barrier may still tunnel through
         it. How?

Q.3(a)   Einstein introduced stimulated emission and used it to arrive at the form of Planck's   [5]   3   II
         radiation law. Derive Planck's radiation law according to Einstein's approach.

Q.3(b)   Answer to the following questions must be written with mathematical formula or   [5]   3   I
         numerical values wherever applicable:
            A)   In designing a laser system, the classical average energy density per standing wave
               is   expressed
               as_____
            B)   In designing a laser system, the quantum average energy density per standing
               wave   is   expressed
               as_____
            C)   The ratio between the probabilities for spontaneous and stimulated emission
               varies with_____
            D)   The ruby laser, is based on the_____energy levels that
               incorporates the Chromium ion with valency_____
            E)   How much excited Helium atom transfer collisional energy to the Neon atom in
               the working of the Helium-Neon Laser system_____

Q.4(a)   Define dielectric function with respect to dielectric property of material. Elaborate the   [5]   4   III
         principle of the excitation of lattice vibrations and obtain the expressions of real and
         imaginary part of the dielectric constant with their physical meaning.

Q.4(b) Answer to the following questions must be written in a couple of words or a mathematical [5] 4 II
formula wherever applicable:
A) The three types of polarization are_____
B) The different material have different dielectric constants due to_____
C) A microscopic dipole in the solid feel the local field given by expression____
D) Metals become transparent for light with a frequency above_____ having mathematical expression_____

Q.5(a) Describe macroscopic description of magnetism. [5] 5 II
Q.5(b) Describe quantum mechanical description of magnetism. [5] 5 II

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