No. of Printed Pages : **2**

21PHY3C9L

Sl. No.

M.Sc. III Semester Degree Examination, April/May - 2024

PHYSICS

Thermal and Statistical Physics

(NEP)

Time : 3 Hours Maximum Marks : 70

Note : *Answer* ***any five*** *of the following questions with question No.* ***1 (Q.1) Compulsory****.*
Each question carries ***equal*** *marks.*

1. (a) What are macroscopic and microscopic states ? Explain. **5**

(b) What is probability distribution ? Obtain the probability distribution formula for Gaussian distribution. **9**

2. (a) Obtain Maxwell-Boltzmann distribution function for energy. **7**

(b) Obtain the expression for the entropy of a monoatomic gas of structureless particles. **7**

3. (a) Obtain the expression for Bose-Einstein distribution function for a gas of system of particles. **7**

(b) What is Bose-Einstein condensation ? Obtain the expression for Bose-Einstein condensation temperature. **7**

4. (a) Arrive at the expression for fluctuations in case of canonical ensemble. **7**

(b) Obtain an expression of mean square displacement in the theory of random walk problem. **7**

5. (a) Derive the conditions under which different phases can exist in equilibrium, so that no transfer of matter takes place from one phase to another. **7**

(b) Explain the process of a transition from liquid helium to a superfluid state. Also explain the Andronikashvili experiment to know the properties of helium. **7**

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6. (a) Derive the partition function for atoms of a monoatomic gas having translational motion. **8**

(b) What are bosons and fermions ? List out the differences between them. **6**

7. (a) Derive the Einstein relation for mobility of a particle. **7**

(b) Explain the phase transition in ferromagnetic materials. **7**

8. (a) Obtain an expression of average speed by Maxwell-Boltzmann distribution. **5**

(b) Explain the concept of Pauli paramagnetism. **4**

(c) State and explain the phase diagram. **5**

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