Roll No. .....

DD-452

M. Sc. (Second Semester)

EXAMINATION, May/June, 2020

PHYSICS

Paper Second

(Statistical Mechanics)

Time : Three Hours

Maximum Marks : 80

Note : Attempt all the *five* questions. *One* question from each Unit is compulsory. All questions carry equal marks.

Unit—I

1. Explain the entropy of mixing and Gibbs' paradox. How Gibbs' paradox is resolved ?

Or

Establish relations between statistical and thermodynamical quantities for enthalpy and Helmholtz free energy.

Unit—II

2. Define canonical ensemble and find the expression for perfect gas in canonical ensemble.

Or

Define partition function in micro-canonical ensemble and obtain its correlation with thermodynamic quantity Helmholtz free energy and entropy in terms of Partition Function.

Unit—III

3. Give an account of Maxwell-Boltzmann statistics. Deduce an expression for Maxwell-Boltzmann distribution function.

Or

Compare the basic postulates and result of the all three statistics (B-E, F-D and M-B statistics). Discuss the case where Bose-Einstein and Fermi-Dirac distribution approaches the Maxwell-Boltzmann distribution.

Unit—IV

4. What is Fermi Gas ? Obtain an expression for the energy of a Fermi gas at absolute zero and write its physical significance.

Or

Explain the behavior of an ideal Fermi gas. Discuss the non-relativistic and relativistic degenerate electron gas.

Unit—V

5. Discuss the method of cluster expansion for a classical gas. Draw the cluster diagram for N = 3.

Or

Explain the thermodynamical fluctuations. Obtain its spatial correlation in a fluid.