| Roll No. | | | | | | | |
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**24-PH-22**

# M.Sc. II SEMESTER [MAIN/ATKT] EXAMINATION
## JUNE - JULY 2024

# PHYSICS
Paper - II
## [Statistical Mechanics]

*[Max. Marks : 75]* *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

**Note :** Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt five questions. Each question carries an internal choice.
Each question carries **15 marks.**

**Q. 1** Describe states of a system connection between thermodynamics and statistics. (15 Marks)

**OR**

What is partition function, explain its. Express Helmholtz free energy and entropy in terms of partition function. (15 Marks)

**Q. 2** Explain the differences between Maxwell - Boltzmann, Bose - Einstein and Fermi - Dirac distribution. Derive the expression for the most probable distribution according to Bose - Einstein statistics. (15 Marks)

**OR**

Deduce Boltzmann Transport equation and discuss in terms of collision. (15 Marks)

**Q. 3** Describe cluster expansion for a classical gas and give its applications. (15 Marks)

**OR**

Derive virial equation of state and explain virial coefficient. (15 Marks)

**Q. 4** State and prove Onsager reciprocity relations. (15 Marks)

**OR**

Explain mean field theory of Ising model in one dimensions. (15 Marks)

**Q. 5** Write short notes on **any two** - (7½ + 7½ Marks)

i) Gibbs Paradox.
ii) Electron gas in metals.
iii) Fokker - Planck equation
iv) Phase transition.