

**Roll No.**

**Total No. of Pages : 02**

**Total No. of Questions : 11**

**M.Sc. (Physics) (2018 Batch) (Sem.-2)**

# STATISTICAL MECHANICS

**Subject Code : MSPH-422-18**

**M.Code : 75990**

**Time : 3 Hrs.**

**Max. Marks : 70**

### INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **SEVEN** questions carrying **FIVE** marks each and students have to attempt any **SIX** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

## SECTION-A

**1. Answer briefly :**

- What do you understand by Bose-Einstein condensation?
- What is the importance of diffusion equation?
- What is partition function?
- What are the problems encountered in the calculation of  $\Delta\Gamma$  in explaining Gibb's paradox?
- What do you mean by an ensemble? Which type of ensemble would be used to describe the behavior of a photon gas?
- Find the probability of a drunkard at a point 'm' steps away after N steps.
- What is Pauli paramagnetism?
- Write down the distribution function and the partition function of a canonical ensemble.
- What are the properties of an ideal gas and photon gas?
- What are thermodynamic fluctuations?

## SECTION-B

2. State and explain Gibbs paradox.
3. Obtain an expression for internal energy of a non-degenerate Bose gas.
4. Explain the correlation function for a randomly varying quantity.
5. For a classical ideal gas, show that  $PV = \frac{2}{3} E$ .
6. Differentiate between Bose-Einstein and Fermi Dirac Statistics
7. Write a note on Ising model.
8. Obtain the distribution function for a grand canonical ensemble.

## SECTION-C

9. What is random walk and Brownian motion? Obtain an expression for Brownian motion.
10. Define phase space. State and prove Liouville's theorem.
11. What is Maxwell Boltzmann Statistics? Find an expression for Maxwell Boltzmann Statistics.

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**