

Roll No.....

Total no. of Pages: [1]

Total No. of Questions: [11]

M.Sc. (Physics) (Semester-1st)

STATISTICAL PHYSICS

Subject Code: MSPHYS 1102

Paper ID: 18220702

Time: 03 Hours

Maximum Marks: 60

Instructions to Candidates:

1. Section A is compulsory. It carries 16 Marks. It consists of 4 questions of 4 marks each.
2. Section B consist of 4 questions of 08 marks each. The student has to attempt any 3 questions
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section –A

(4 marks each)

- Q1. Explain macroscopic and microscopic states.
- Q2. Compare microcanonical, canonical and grand canonical ensemble.
- Q3. Describe the thermodynamic behavior of an ideal Bose gas.
- Q4. Write a brief note on random walk in one dimension.

Section –B

(8 marks each)

- Q5. State and prove Liouville's theorem.
- Q6. Show that the entropy of a system in the grand canonical ensemble can be written as

$$S = - K \sum_{r,s} P_{r,s} \ln P_{r,s}$$

- Q7. Discuss the Bose-Einstein condensation and show that number of particle state equal to $n = g_s Z_i \cdot 2.612 \left(\frac{T_0}{T} \right)^{3/2}$
- Q8. What are the phase transitions of first and the second kind? Discuss Ising Model in the zeroth approximation.

Section –C

(10 marks each)

- Q9. (a) Show that for an ideal gas represented by a grand canonical ensemble, the probability of finding the subsystem within atom is given by Poisson distribution $\omega(n) = \frac{1}{n!} (\bar{n})^n \exp. (-\bar{n})$ where n is the mean number of atoms present.
(b) How the paradox of Gibbs is resolved in mixing of two gases, explain it?
- Q10. What do you mean by ideal Fermi system and explain its thermodynamic behavior.
- Q11. (a) Discuss Brownian motion as an example of fluctuating force using Fokker-Plank equation.
(b) Explain the contact between statistics and thermodynamics.