



K24P 1110

Reg. No. : .....

Name : .....

**Second Semester M.Sc. Degree (C.B.C.S.S. – OBE-Regular)**  
**Examination, April 2024**  
**(2023 Admission)**  
**PHYSICS**  
**MSPHY02C09/MSPHN02C09 : Statistical Mechanics**

Time : 3 Hours

Max. Marks : 60

**SECTION – A**

Answer **any five** questions. **Each** carry **3** marks.

1. Derive the relation connecting entropy and number of microstates.
2. The relative root mean square fluctuation in energy of a grand canonical ensemble is negligible. Prove.
3. Derive the expression for mean occupation number using the grand partition function.
4. Show that the specific heat of an ideal Bose gas at  $T = T_c$  is  $1.925 Nk$ .
5. Write Sackur-Tetrode equation and show that entropy is an extensive quantity.
6. What is Critical exponent ? Give two examples. **(5×3=15)**

**SECTION – B**

Answer **any three** questions. **Each** carry **six** marks.

7. The Fermi system, even at absolute zero is quite alive. Prove.
8. What is order parameter ? Explain with three examples.
9. How Gibbs correction factor is applied in Ideal gas. Does it represent true quantum statistics ?

P.T.O.



10. Analyse a system in the canonical ensemble using the method of most probable values.

11. Derive the Liouville's theorem.

(3×6=18)

### SECTION – C

Answer **any three** questions. **Each** carry **9** marks.

12. Discuss the contact between two physical systems and establish the connection between Statistics and Thermodynamics.

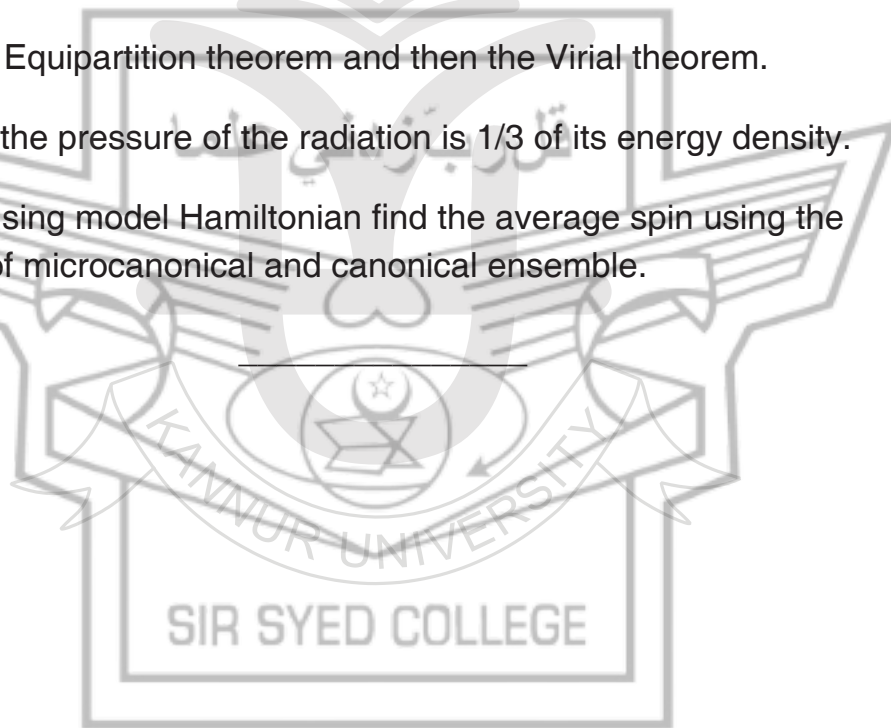
13. Find the canonical partition function of an ideal gas and find the values of Helmholtz free energy, chemical potential, pressure, entropy and internal energy.

14. Derive the Equipartition theorem and then the Virial theorem.

15. Show that the pressure of the radiation is 1/3 of its energy density.

16. Using the Ising model Hamiltonian find the average spin using the concepts of microcanonical and canonical ensemble.

(3×9=27)



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