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2. Derive the total number of particle in ideal Bose Einstein gas and hence discuss the Bose Einstein condensation.

Or

Discuss the ideal Fermi-Dirac gas for slight degeneracy.

3. Derive the exact solution for Ising model for one dimension.

Or

Discuss the Landan theory of phase transition.

4. Discuss the Langevin theory of Brownian motion.

Or

Derive the Fokker Planck equation.

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Roll No.....

III Semester Examination, April-2021

M.Sc.

PHYSICS

Paper II

(Statistical Mechanics)

Time : 3 Hours]

[Maximum Marks : 80

Note : All questions are compulsory. Question Paper comprises of 3 sections. **Section A** is objective type/Multiple Choice questions with no internal choice. **Section B** is short answer type with internal choice. **Section C** is long answer type with internal choice.

SECTION 'A'

(Objective Type Questions)

Choose the correct answer :

1 × 8 = 8

1. In the thermal equilibrium state :
 - (a) probability is maximum
 - (b) β parameters of the systems are equal
 - (c) both (a) and (b)
 - (d) number of particles is maximum
2. The particles obeying Maxwell-Boltzmann statistics are :
 - (a) identical and distinguishable
 - (b) identical and indistinguishable
 - (c) photons
 - (d) all the above
3. Pauli's exclusion principle applies to :
 - (a) M.B. statistics
 - (b) B.E. statistics
 - (c) F.D. statistics
 - (d) None of the above

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4. Deduction of Planck's law is possible on the basis of :

- (a) M.B. statistics (b) B.E. statistics
- (c) Classical statistics (d) F.D. statistics

5. Example of phase transition of second kind is :

- (a) ice change to water (b) water change to steam
- (c) transition of non-ferromagnetic state to a ferromagnetic state
- (d) none of the above

6. Landan theory of phase transition is related to :

- (a) Enthalpy of the system
- (b) Free energy of the system
- (c) Entropy of the system
- (d) None of the above

7. Brownian motion is an example of motion under :

- (a) fluctuating force (b) gravitational force
- (c) nuclear force (d) E.M. force

8. Fokker Planck's equation is a partial differential equation :

- (a) for a probability P concerning in the dependence
- (b) for a probability P concerting its mass dependence
- (c) for entropy at equilibrium
- (d) for probability at absolute zero

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SECTION 'B'

6 × 4 = 24

(Short Answer Type Questions)

Note : Answer the following questions in 250 words.

1. Discuss the phase space and phase cell.

Or

Discuss the density and energy fluctuation in grand canonical ensemble.

2. Discuss density matrix and derive Liouville's theorem using density matrix.

Or

Derive expression for Maxwell Boltzmann statistics.

3. Write virial equation of state and discuss second virial coefficient.

Or

Discuss the phase transition of second kind and hence write statement of Ising model.

4. Discuss the fluctuation in energy.

Or

Discuss the probability of one-dimensional random walk.

SECTION 'C'

12 × 4 = 48

(Long Answer Type Questions)

Note : Answer the following questions in 500 words.

1. State and prove the Liouville's theorem.

Or

What is Gibb's Paradox ? How this paradox is resolved ?

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P.T.O.