Roll No.....

Total No. of Units : 04

Total No. of Printed Pages : 03

Code No. : 02/201

Second Semester Examination, May 2019

M.Sc. PHYSICS

Paper - II

STATISTICAL MECHANICS

Time : 3 Hrs. **Max. Marks : 80**

- Part A and B of each question in each unit consist of very short answer type questions which are to be answered in one or two sentences.

  Part C (Short answer type) of each question should be answered in 200-250 words.

  Part D (Long answer type) of each question should be answered within the word limit 400-450.

Unit - I

Q.1 A. What is meant by Grand canonical ensemble? **(2)**

Q.1 B. Define enthalpy and Gibb's free energy. **(2)**

Q.1 C. Derive an expression for entropy and internal energy of perfect gas in microcanonical ensemble. **(4)**

OR

Obtain the relation between different statistical and thermodynamical quantities.

Q.1 D. Obtain an expression for chemical potential and entropy of perfect gas in grand canonical ensemble. **(12)**

OR

Define microcanonical ensemble. Use it to calculate the entropy of a perfect gas? Show how the internal energy and equation of state for a perfect gas can be obtained from it.

P.T.O.

Unit - II

Q.2 A. Define phase space. What do you mean by space and space? **(2)**

Q.2 B. What do you mean by light and strong degeneracy? **(2)**

Q.2 C. Explain how the Gibb's paradox has been resolved. **(4)**

OR

Write the basic assumptions of Classical Statistics.

Q.2 D. Derive Bose-Einstein's distribution law. **(12)**

OR

What is Fermi gas? Deduce an expression for the energy of a Fermi gas at absolute temperature. Write its significance.

Unit - III

Q.3 A. Write the Virial equation of state for a classical gas. **(2)**

Q.3 B. Draw the diagram of the cluster expansion for N=3. **(2)**

Q.3 C. What is phase transition? Explain the phase transition of first and second kind. **(4)**

OR

Explain the Ising model in one dimension.

Q.3 D. What is Landau's phenomenological theory of phase transition? **(12)**

OR

What do you mean by cluster? Obtain expression for cluster

expansion for a classical gas.

Unit - IV

Q.4 A. What are fluctuations? Explain thermodynamic fluctuation. **(2)**

Q.4 B. Write the Nernst relation. **(2)**

Q.4 C. Derive Fokker-Planck equation. **(4)**

OR

Obtain an expression for fluctuation dissipation theorem.

Q.4 D. Write the Langevin's theory of the Brownian motion. **(12)**

OR

Obtain the Einstein's relation and expression for mobility.

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