Roll No. .....

22021

M. Sc. (Physics) 2nd Semester Examination – May, 2019

STATISTICAL MECHANICS

Paper : PHY(H)-201

Time : Three hours] ***[Maximum Marks : 80***

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. **1** is ***compulsory***.

1. Write short notes on : **4 × 4**

(a) Postulate of equal a priori probability

(b) Entropy of mixing of two samples of the same gas

(c) Thermionic emission

(d) One dimensional random walk

https://www.haryanapapers.com

UNIT – I

2. Define statistical equilibrium and deduce the contact between statistics and thermodynamics by deriving various relations. Derive the expressions for various distributions using a micro-canonical ensemble. **16**

3. Define entropy and derive expressions for internal energy and entropy of a monoatomic gas enclosed in a fixed volume. Derive the Sackur Tetrode equation for a monoatomic ideal gas and give relevant justifications. **16**

UNIT – II

4. How one may extend the treatment for a canonical ensemble to a Grand Canonical ensemble ? Deduce the grand partition function and related thermodynamic parameters for an assembly of different kinds or molecules. **16**

5. Describe the canonical ensemble and calculate the entropy of a perfect gas. Explain how the internal energy and equation of state can be derived. Discuss the effect of shifting of zero level of energy. 16

UNIT – III

6. Describe gas degeneracy and derive the expressions for energy and pressure of an ideal Fermi-Dirac gas. Discuss the concept of Fermi energy and its relation with chemical potential. 16

7. In what sense degeneracies of Bosons and fermions differ ? Discuss the phenomenon of B-E condensation and explain its difference from ordinary vapour condensation. Calculate the temperature at which the condensation in momentum space starts. 16

UNIT – IV

8. Discuss Bragg William approximation and its application to the using model. Explain spontaneous magnetization in ferromagnetic substances on the basis of this approximation. 16

9. What are the phase transitions of first and second kind ? How cooperative phenomenon accounts for phase transitions of second kind ? Present the analysis of Ising Model in two dimensions. 16