6. In what sense degeneracies of Bosons and fermions differ ? Discuss the phenomenon of B-E condensation and explain its difference from ordinary vapour condensation. Deduce the temperature at which the condensation in momentum space starts. **20**

Unit IV

7. Explain phase transitions of first and second kind with suitable examples. Discuss Ising model for phase transitions of second kind and describe Bragg William approximation. **20**

8. (a) Describe cooperative phenomenon and explain one dimensional Ising model. Why a one dimensional chain is not ferromagnetic ? **14**

(b) Describe one dimensional random walk and hence explain Brownian motion. **6**

No. of Printed Pages : 04 **Roll No. .....**

DD-281

M. Sc. EXAMINATION, Dec. 2018

(Fourth Semester)

(Re-appear Only)

PHYSICS

PHY602B

Statistical Mechanics

Time : 3 *Hours*] [*Maximum Marks :* 100

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

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. Define statistical equilibrium and deduce the contact between statistics and thermodynamics. by deriving various relations. Show that the particles tend to move from regions of higher chemical potential to lower chemical potential as the system approaches equilibrium. **20**

2. What is density of phase points ? Describe cellular nature of phase space and prove conservation of density in phase space. Show that the phase trajectory of the representative point for a one dimensional harmonic oscillator is an ellipse. **20**

Unit II

3. How a canonical ensemble may be extended to a Grand Canonical ensemble ? Discuss importance of a Grand Canonical ensemble and deduce the grand partition function and related thermodynamic parameters for an assembly of different kinds of molecules. **20**

4. (a) Explain the concept of a canonical ensemble and derive the value of partition function. Using partition function, establish the relationship between various thermodynamic parameters. How a canonical ensemble may be optimized in terms of a microcanonical ensemble ? **14**

(b) Explain fluctuations and derived the expression for density fluctuations. **6**

Unit III

5. Derive the expression for Fermi energy of a degenerated Fermi gas. How is it related to pressure exerted by the gas ? Establish the relationship between specific heat of the gas at constant volume with absolute temperature. **20**