7. What is Maxwell Boltzmann Statistics ? Derive an expression for Maxwell Boltzmann law of distribution of molecular speeds. **16**

Unit IV

8. (a) What is Fermi Dirac Statistics ? What are its assumptions ? **6**

   (b) What is Electron Gas ? Derive an expression for energy distribution of free electrons in metal. **6**

   (c) What are the properties of liquids helium ? **4**

9. (a) What is Fermi Energy ? Derive an expression for it. **7**

   (b) What are the differences between Maxwell Boltzman and Fermi Dirac Statistics ? **5**

   (c) What do you mean by specific heat of metals ? Explain. **4**

Subject Code—53403

B. Sc. EXAMINATION

(Batch 2018 Onwards)

(Main & Re-appear)

(Fourth Semester)

PHYSICS

CPL-402

Statistical Mechanics (Core Course–VII)

Time : 3 *Hours* *Maximum Marks :* 80

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) What do you mean by Grand Canonical Ensemble ? **2**

   (b) What do you mean by the principle of equal a priori probability ? **2**

(c) Define (i) Conduction, (ii) Diffusion. **2**

(d) State and explain law of equipartition of energy. **2**

(e) What do you mean by negative temperature ? Explain. **2**

(f) What do you mean by Momentum Space ? **2**

(g) What are fermions and bosons ? Give examples. **2**

(h) What are the differences between BE and FD statistics ? **2**

Unit I

2. (a) Explain the following : **6**

(i) Microstate

(ii) Macrostate

(iii) Thermodynamical probability

(iv) Constraints on a system.

(b) Define thermodynamical probability for distributing n distinguishable particles in two compartments. Find the probability of macrostate. **10**

3. Define Partition Function. Derive its relation with various thermodynamics quantities. **16**

Unit II

4. (a) Derive Maxwell's speed distribution law. Find the expressions for most probable speed, average speed and root mean squares speed. **12**

(b) Calculate root mean square speed and most probable speed of Hydrogen at 28°C. Given $k = 1.38 \times 10^{23}$ JK^{-1} and mass of hydrogen molecule $= 3.34 \times 10^{-27}$ Kg. **4**

5. (a) Explain mean free path and show that it is inversely proportional to pressure of the gas. **8**

(b) What are transport phenomena in gases ? Explain diffusion on the phenomenon of molecular collision. **8**

Unit III

6. (a) Explain the term phase space and its division into cells. **8**

(b) What are the basic assumptions of three statistics ? **8**