K-5/2110 7409/N

Semester-III

Statistical thermodynamics-332

Time: 3 hrs. **Maximum Marks: 55**

Attempt any four questions. All questions carry equal marks.

1. A) Write the classical treatment of specific heat capacity.
   B) Discuss Lennard-Jones potential energy equation and Lennard-Jones parameters for compressed gases. **5,8.75**
2. A) Derive the law of equipartition of energy from first principle.
   B) Write down the relation between thermodynamic probability and entropy. **7, 6.75**
3. A) Derive Sackur-tetrode equation for entropy of an ideal monoatomic gas and show its contribution to molar heat capacity.
   B) Briefly describe the statistics of photon and electron gases. **7, 6.75**
4. A) Discuss the statistical treatment of thermionic emission in metals.
   B) Write the comparison between Maxwell-Boltzmann and Fermi-Dirac statistics. **7, 6.75**
5. A) Discuss the salient features of Einstein theory of specific heat capacity of solid.
   B) Define mean deviation and root mean square deviation. **7, 6.75**
6. A) Show that $\mu_a + \mu_b = \mu_{ab}$ for chemically reactive hypothetical system, $A + B \rightleftarrows AB$, where μ represents chemical potential.
   B) Discuss about equilibrium constant and its computations in chemical system. **6.75, 7**
7. A) Derive an expression for the equilibrium constant in terms of partition function for dissociation process.
   B) Write the difference between Debye model and Einstein model for heat capacity of solid. **7, 6.75**
8. A) What do you mean by thermoelectric effect? Write a short note on Thomson effect.
   B) Describe briefly theory of Brownian motion and Brownian motion of galvanometer. **7,6.75**
9. A) What is meant by order and disorder in solids?
   B) Define microstate and macrostate of a system.
   C) What is meant by entropy production in heat flow? Derive the expression for entropy production in heat flow. **4, 4, 5.75**