M-33/2110 10476/N

Semester-III

Statistical thermodynamics-332

(SYLL-DEC-2019)

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

Attempt any four questions. All questions carry equal marks.

1. A) Write the comparison between Maxwell-Boltzmann and Fermi-Dirac statistics.
   B) Define thermodynamic probability in quantum statistics.
   C) Calculate entropy of one mole of gaseous argon at 298K and 1 atm pressure.
   6, 3.75, 4
2. A) Discuss the vibrational, rotational and electronic contributions to the specific heats of ideal diatomic gases.
   B) What is meant by (i) entropy of mixing (ii) thermionic emission. **9.75, 4**
3. A) Discuss Lennard-Jones potential energy equation and Lennard-Jones parameters for compressed gases
   B) Write down the energy expression for rotational energy level and derive an expression for rotational partition function. **7, 6.75**
4. A) Derive the equation of state of non-ideal gases from statistical considerations.
   B) Discuss the effect of internal rotation on specific heat of polyatomic gases.
   9, 4.75
5. A) Define heat capacity and derive Debye theory of specific heat capacity.
   B) Describe in detail the density fluctuation in an ideal gas. **8, 5.75**
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) Derive equation of state of a melting solid. **7, 6.75**
7. A)What do you mean by Seebeck effect in irreversible process
   B) Derive an expression for the equilibrium constant in terms of partition function for dissociation process. **5, 8.75**
8. A) What is meant by entropy production in heat flow? Derive the expression for entropy production in heat flow.
   B) Write a note on Brownian motion. **9, 4.75**
9. A) What is meant by order and disorder in solids?
   B) Define microstate and macrostate of a system.
   C) Write the main assumptions of Einstein theory of specific heat capacity of diatomic gas. **5,4,4.75**