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Reg. No. : ....

Name : ....

Second Semester M.Sc. Degree Examination, September 2022

Physics

PH 222 : THERMODYNAMICS, STATISTICAL PHYSICS AND BASIC QUANTUM MECHANICS

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer any **five** questions. **Each** question carries **3** marks.

1. What do you meant by partition function?

2. Explain is Nernst's Theorem and explain its importance.

3. What do you meant by statistical equilibrium?

4. What is Gibbs function and prove that Gibbs function decrease during isothermal isobaric process and is equal to the net work obtained.

5. Write the most probable distributions in Maxwell Boltzman statistics, Bose Einstein Statitics and Fermi dirac Statistics.

6. Explain quantum mechanical tunneling.

7. Write a short note on Dirac notation.

8. Briefly explain Schrödinger representation or Schrödinger picture.

(5 × 3 = 15 Marks)

P.T.O.

SECTION – B

Answer **any three** questions. **Each** question carries **15** marks.

9. Derive Maxwell's thermodynamic relations and hence derive Clausius Clapeyron equation.

OR

10. Derive an expression for the distribution of speeds of particles in a classical gas.

11. Explain Fermi dirac statistics and distribution law.

OR

12. Discuss Bose Einstein Condensation.

13. Solve linear harmonic oscillator problem using Schrödinger method.

OR

14. Discuss particle moving in a spherically symmetrical potential.

(3 × 15 = 45 Marks)

SECTION – C

Answer **any three** of the following questions. **Each** question carries **5** marks.

15. With the help of Maxwell's relations, show that $\mathrm{TdS} = \mathrm{C_v}dT + T\left(\frac{\partial p}{\partial T}\right)_V dV$ And $TdS = C_p dT - T\left(\frac{\partial V}{\partial T}\right)_P dP$

16. Derive the co-relation of partition function Z with entropy S for ideal gas obeying classical statistics.

17. Prove that for Maxwell Boltzman statistics, the total energy E = (3/2) RT.

18. Derive Richardson Dushman equation of thermionic emission.

19. Show that the zero point energy of ½ $\hbar\omega$ of a linear harmonic oscillator is a manifestation of the uncertainty principle.

20. Show that operator can be expressed in matrix form.

(3 × 5 = 15 Marks)