Reg. No ..... (Pages: 2) K3855

Name .....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION
MAY / JUNE– 2006

Branch II: PHYSICS

PH 222 QUANTUM AND STATISTICAL PHYSICS

Time: 3 Hours Max. Marks: 75

Part – A

Answer any five questions. Each question carries 3 marks.

I. a) What is Ehrentest's theorem? What limits the equivalence of quantum and classical mechanics.

b) Show that in stationary states the probability current density in constant in time.

c) Prove that Eigen function corresponding to different eigen values of Hermitian operator are orthogonal.

d) Describe relationship between entropy and probability.

e) Explain the concept of grand canonical ensemble. Give an example.

f) Explain how to distinguish between first order and second order phase transitions.

g) Explain Bose – Einstein condensation.

h) Describe the concept of partition function.

(5 x 3 = 15 Marks)

Part – B

Answer all question. Each question carries 15 marks.

II. A. a) Explain the terms 'entropy' and 'charge in entropy'. Is entropy a state function? Discuss.

b) Establish connection between entropy and second law of thermo dynamics.

OR

II. B. a) Explain the terms (i) thermo dynamic potential (ii) enthalpy.

b) Obtain clausins – clapeyron latent heat equation for first order phase transition.

III. A. a) Show that eigen value of operator is expectation value of corresponding dynamic variable.

b) Explain the acceptability conditions of wave function.

OR

III. B. a) Obtain the expression for energy eigen value of harmonic oscillator using matrix approach.

b) Obtain the expression for number operator.

IV. A. a) Solve schrodinger equation for potential barrier.

b) What is the conditionthat probability of tunneling vanishes?

OR

IV. B. a) Solve the angular part of schrodinger equation for hydrogen atom.

b) What are atomic orbitals?

(3 x 15 = 45 Marks)

Part – C

Answer any three questions. Each question carries 5 marks.

V. a) Obtain the conditions that two hermitain operators will have common eigen function.

b) Prove that $Y_{lm}(\theta, Q)$ is eigen function of L^2. Find the eigen value also.

c) Show that momentum of free particle is constant of motion. The system is described in Heisenberg's representation.

d) Obtain the expression of chemical potential for ideal gas.

e) Obtain the partition function for vibrating diatomic molecules.

f) Set up the creation operates, annihilation operator and number operator for harmonic oscillator as matrices.

(3 x 5 = 15 Marks)