Total No. of Questions : 4] **SEAT No. :**

P815 **[Total No. of Pages : 3**

[5315]-415
T.Y.B.Sc.
PHYSICS (Paper - III)
PH - 343 : Thermodynamics and Statistical Physics
(2013 Pattern) (Semester IV)

Time : 2 Hours] ***[Max. Marks : 40***

Instructions to the candidates:-

1) ***All the questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***
4) ***Use of logtables and calculator is allowed.***

Q1) Attempt All of the following (One mark each): **[10]**

a) What are transport phenomena in gases?

b) What is Binomial distribution?

c) Define temperature of Inversion.

d) What do you mean by microstate of a system.

e) Define the term canonical ensemble.

f) What are Fermions?

g) Define probability of an event.

h) What is partition function?

i) What are symmetric wave functions?

j) What is meant by thermodynamic probability of macrostate?

P.T.O.

Q2) Attempt any two of the following (Five marks each) **[10]**

a) Derive an expression for the coefficient of viscosity (η) of a gas in terms of mean free path of its molecules and discuss the effect of temperature on coefficient of viscosity.

b) What is Jonle Thomson effect? Prove that Jonle Thomson coefficient

$$\mu = \frac{1}{C_p}\left[T\left(\frac{\partial V}{\partial T}\right)_P - V\right]$$

c) Derive Ganssian probability distribution equation.

Q3) Attempt any two of the following (Five marks each): **[10]**

a) Consider the case of N = 100 steps, where p = q = $\frac{1}{2}$. Find mean value of n_1, mean displacement and Root mean square deviation.

b) In a system in thermal equilibrium at Temperature T, two states with energy difference 5.52×10^{-14} erg occur with relative probability 'e^2' erg deg^{-1}. Calculate the temperature. Given K = 1.38×10^{-16} erg/deg.

c) Three particles are to be distributed in four energy levels a, b, c and d. Calculate all possible whys of this distribution when particles are

i) Classical particles and

ii) Fermions.

Q4) a) Attempt any one [Eight marks]: **[8]**

i) Prove that for a homogeneous fluid, $C_P - C_V = T\left(\frac{\partial P}{\partial T}\right)_V \left(\frac{\partial V}{\partial T}\right)_T$ and hence prove that for a perfect gas $C_P - C_V = R$. Where symbols have their usual meanings.

ii) Compare M.B., B.E. and F.D. statistics.

b) Attempt any one [Two marks]: **[2]**

i) A bag contains 7 red balls, 9 white balls and 12 black balls. If a ball is drawn from the bag, what is the probability that it is either white or black?

ii) Establish the Gibbs - Helmholtzequation $U = F - T\left(\partial F / \partial T\right)_V$.