(i) Printed Pages: 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 0247

Exam. Code : 0003

B.Sc. (General) 3rd Semester

(1129)

PHYSICS

Paper–A (Statistical Physics & Thermodynamics–I)

Time Allowed : Three Hours] [Maximum Marks : 22

Note :—(1) Attempt **FIVE** questions in all, selecting **TWO** questions each from Unit–I and Unit–II. Unit–III is compulsory.

(2) Use of log tables and non-programmable calculator is allowed.

UNIT—I

1. (a) Discuss the distribution of n distinguishable particles in k compartments of unequal size which are further sub-divided into cells of equal a priori probability. 3

   (b) A bag contains 6 green balls, 8 white balls and 10 black balls. If a ball is drawn from the bag, what is the probability of its being either white or black ? 1½

2. (a) Taking the case of n particles in two compartments with equal a priori probability. Discuss analytically the variation

of probability of macrostate on account of small deviation from the state of maximum probability and show that deviation reduces with increase in number of particles. 3½

(b) A pair of dice is thrown simultaneously. What is the probability that both of them have their faces 1 up ? 1

3. (a) Differentiate between meaningful and meaningless arrangements giving suitable examples and then prove that the probability of a macrostate is equal to the product of a thermodynamic probability of a macrostate and the probability of a microstate. 2½

(b) Evaluate the number of microstates, macrostates and thermodynamics probability for the distribution of four distinguishable particles in two compartments of equal size. 2

UNIT—II

4. (a) Discuss Maxwell-Boltzmann statistical distribution and derive MB distribution relation in terms of α and β. 3

(b) Describe the basic assumptions in the three types of statistics. 1½

5. (a) Derive Plank's Law for energy distribution of black body radiation in terms of wavelength of the radiation (using BE statistical distribution). 3

(b) Show that Wien's displacement law can be obtained from Planck's law. 1½

6. (a) Using Fermi Dirac statistics find out the expression for the distribution of energy among the free electrons in a metal. 3

(b) Using the velocity distribution formula in Fermi Dirac distribution, derive the expression for average speed of electrons at 0 K. 1½

UNIT—III

7. Attempt any **EIGHT** questions. Each question carries ½ mark :—

(a) Explain thermodynamic probability. What is its minimum value ?

(b) What do you mean by the most probable macrostate ?

(c) What is the meaning of the principle of equal a priori probability ?

(d) What is the difference between static and dynamic system ? Demonstrate with examples.

(e) Explain the term constraints on a system with suitable examples.

(f) Discuss phase space briefly.

(g) Define Fermi energy.

(h) What is the difference between Photon gas and ideal gas ?

(i) What do you mean by occupation index ?

(j) State the Stefan's law.