3 (Sem–6) PHY M 4

2020

PHYSICS

(Major)

Paper : 6·4

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

Write the answers to the ***two Groups*** *in separate books.*

Group–A

(Statistical Mechanics)

Marks : 30

1. Answer the following questions : 1×4=4

   (a) State the postulate of "Equal a priori probability" of statistical physics.

   (b) Define the term microstate and macrostate.

   (c) Which statistics is obeyed by electron gas ?

(d) Write the postulates of Fermi-Dirac statistics.

2. Answer the following questions : 2×3=6

(a) What do you mean by an Ensemble ? What type of ensemble would be used to describe the behaviour of a photon gas ?

(b) How do the degeneracies of Bose-Einstein and Fermi-Dirac gas differ ?

(c) Write the distinguishing features of M-B and B-E statistics.

3. Answer the following :

(a) How is entropy related to probability ? Derive a relation between them. 1+4=5

(b) What is Fermi-energy ? Calculate the value of Fermi-energy of a metal. Does the Fermi-energy depend upon size or volume of the conductor ? 1+3+1=5

4. Answer ***any one*** of the following :

(a) Write basic assumptions of Bose-Einstein quantum statistics.

Derive the expression $n_i = \frac{g_i}{e^{\alpha} e^{u_i/kT} - 1}$ for the most probable distribution of a system of particles obeying Bose-Einstein statistics. 2+8=10

Or

(b) What is the difference between photon gas and ideal gas ? Starting from Bose-Einstein energy distribution law, derive Plank's law of Blackbody radiation. 2+8=10

Or

(c) Discuss Maxwell-Boltzmann's law of distributions of velocity for gas molecules. How can it be represented graphically ? 8+2=10

Group – B

(*Computer Applications*)

Marks : 30

1. State true ***or*** false : 1×3=3

(a) Precedence of assignment operator is higher than arithmetic operators.

(b) An array is used to store a collection of data of the same type.

(c) A function can return multiple quantities.

2. Write statements to perform the following tasks : 2+2=4

(a) To display natural numbers between 50 and 80.

(b) To interchange value of two variables.

3. Answer ***any three*** of the following questions : 5×3=15

(a) Write a program to find solution of a quadratic equation.

(b) Write a program to sort a list of numbers in ascending order.

(c) Write a program to generate n terms of the series :

1, 4, 9, 16, 25,.....

(d) Give a brief description of operaters available in the programming language of your choice.

(e) Write a program to implement Runge-Kutta 4th order method of solving differential equation.

4. Write a program to find the roots of a system of linear equations. 8

Or

Write a program to find cube root of a number using iterative method. (Do not use library function to find cube root of the given number).
