2023

Time - 3 hours

Full Marks - 60

*Answer **all groups** as per instructions.*
Figures in the right hand margin indicate marks.
Candidates are required to answer
in their own words as far as practicable.

GROUP – A

1. Answer all questions and fill in blanks as required. [1 × 8

(a) Photons have _____ rest mass.

(b) Black body radiation is _____.

(c) Thermal radiation travels in _____ line.

(d) _____ law of thermodynamics fixes the zero level of entropy.

(e) The probability of any event cannot be _____.

(f) Define a Macrostate.

(g) Define an ensemble.

(h) What do you mean by fermi gas ?

GROUP – B

2. Answer any eight of the following questions within two to three sentences each. [1½ × 8

(a) State Bose-Einstein statistics.

(b) Define a Microstate.

(c) What is canonical ensemble ?

(d) What is negative temperature ?

(e) State Plank's law.

(f) Give thermodynamic function of two energy level.

(g) Give Saha ionization formula.

(h) What are Fermions ?

(i) What is thermal radiation ?

(j) What is phase space ?

GROUP – C

3. Answer any eight of the following questions within 75 words each. [2 × 8

(a) State Fermi-Dirac statistics.

(b) What is microcanonical ensemble ?

(c) Explain thermodynamic probability.

(d) Give two properties of Bosons.

(e) What is Maxwell-Boltzmann distribution law ?

(f) What is degenerate fermi gas ?

(g) What are thermodynamic potentials ?

(h) Give Sackur-Tetrode equation.

(i) State Wien's distribution law.

(j) Define law of equipartition energy.

GROUP – D

4. Answer any four of the following questions within 500 words each.

(a) Derive an expression for the thermodynamic probability of gaseous system. [6

(b) Derive an expression for partition function. [6

(c) Explain Gibb's paradox. [6

(d) Give an expression for the density state of Fermi-energy. [6

(e) Explain Bose-Einstein condensation. [6

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(f) Derive an expression for the radiation pressure. [6

(g) Explain Releigh-Jeans law. [6