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NEPWT—108—2024

FACULTY OF SCIENCE

M.Sc. (First Year) (Second Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

PHYSICS

Paper SPHYC-452

(Statistical Mechanics)

(Friday, 13-12-2024) **Time : 10.00 a.m. to 1.00 p.m.**

Time—3 *Hours* *Maximum Marks*—80

N.B. :— (1) Each question carries equal marks.

(2) Figures to the right indicate full marks.

(3) *First* question is compulsory.

(4) Solve any *three* of the remaining five questions (Q. No. **2** to Q. No. **6**).

1. Solve the following questions (each question **5** marks) : 20

(*i*) Calculate entropy of a perfect gas in microcanonical ensemble

(*ii*) Free electron model

(*iii*) Black body radiation

(*iv*) Brownian motion.

2. (*a*) Define ensemble and ensmble average. Distinguish between Microcanonical, Canonical and Grand canonical ensembles. 10

P.T.O.

(*b*) Derive an expression for M-B distribution law for velocity of particle. 10

3. (*a*) Derive F-D distribution law for the distribution of particle obeying F-D statistics. 10

(*b*) Obtain energy and pressure of a weakly degenerate Fermi gas. 10

4. (*a*) Explain Tisza's two fluid model. 10

(*b*) Explain the phenomenon of B-E condensation using B-E distribution law at $T < T_0$. 10

5. (*a*) Discuss Ising model in one dimension. 10

(*b*) Derive an expression for virial equation of state and obtain virial coefficients. 10

6. Write short notes on : 20

(*i*) Photon Statistics

(*ii*) White Dwarf star

(*iii*) Langevin's theory

(*iv*) Discuss about phase space, phase trajectory and phase volume.