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NEPRT—132—2024

FACULTY OF SCIENCE

M.Sc. (NEP) (Second Semester) EXAMINATION

APRIL/MAY, 2024

PHYSICS

Paper SPHYC-452

(Statistical Mechanics)

(Saturday, 20-04-2024) **Time : 10.00 a.m. to 1.00 p.m.**

Time—Three Hours *Maximum Marks*—80

Note :— (*i*) Question No. **1** is compulsory.

(*ii*) Each question carries equal marks.

(*iii*) Figures to the right indicate full marks

(*iv*) 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*) Photoelectric emission.

(*iii*) Phonon statistics

(*iv*) Virial equation of state.

P.T.O.

2. (*a*) Define ensemble and ensemble average. Distinguish between microcanonical, canonical and grand canonical ensembles. 10

(*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*) State and explain in detail about Landau's theory of liquid He. 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 and two dimensions. 10

(*b*) Derive the Fokker-Plank equation. 10

6. Write short notes on : 20

(*i*) Free electron model

(*ii*) λ-transition in liquid Helium

(*iii*) Brownian motion

(*iv*) Gibbs' Paradox.