PRN:		Course Code:	**P60PC203**

First Year **M. Sc.** End Semester Examination Summer 2024

Statistical Mechanics

Day and Date: 25 MAY 2024, Sat — Max Marks: **50**

Time : 02:00PM To 04:00PM — Duration: **02** hrs

Instructions:

- All questions are ***compulsory***
- *Draw **neat labeled** diagram where necessary*
- Figures to the ***right*** indicates ***full marks***
- ***Digital gadgets*** are ***not allowed.***

Q.1	**Attempt the following**	Marks	Bloom's Level	CO
a)	Differentiate between macroscopic and microscopic states in statistical mechanics.	***02***	L2	CO1
b)	Define the concept of the partition function Z in the context of the canonical ensemble and explain its significance.	***02***	L3	CO2
c)	Explain grand canonical ensemble.	***02***	L2	CO2
d)	Define radiation pressure and radiation density.	***02***	L2	CO3
e)	What characterizes a first-order phase transition.	***02***	L2	CO4

Q.2	**Attempt any two from the following**			
a)	obtain the different thermodynamic potentials using laws of thermodynamics.	***05***	L1	CO1
b)	Discuss principle of conservation of density in phase space.	***05***	L4	CO1
c)	Explain the term priori probability? Explain its postulates.	***05***	L3	CO1

Q.3	**Attempt any two from the following**			
a)	Derive an expression for free energy of an ideal gas.	***05***	L3	CO2
b)	Explain the Micro-Canonical distribution function.	***05***	L4	CO2
c)	Derive Linear Harmonic Oscillator of canonical ensemble.	***05***	L4	CO2

Q.4 **Attempt any two from the following**

ESE

SGU Library Copy

a)	Derive the thermodynamic functions for Grand Canonical Ensemble.	*05*	L3	CO2
b)	Briefly describe the relationship between the grand potential and the number of particles, volume, and temperature in the grand canonical ensemble.	*05*	L4	CO2
c)	Discuss Weiss molecular field theory of ferromagnetism.	*05*	L3	CO4

Q.5 **Attempt any two from the following**

a)	Explain the radiation density property of the black body radiation.	*05*	L3	CO3
b)	Obtain the expression for Einstein's derivation of Plank's Law of radiation.	*05*	L4	CO3
c)	Derive Vander Wall's equation for liquid vapour phase transition.	*05*	L3	CO4

*****

ESE