

Dr. Rakesh Kumar

22/11/2022 (90)
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National Institute of Technology Hamirpur

Department of Physics and Photonics Sciences

End Term Examination (November 2023)

B.Tech. 3rd Year (5th Semester)

Statistical Mechanics(PH-313)

M.M.: 50

T.T.:3hrs

Note: All questions are compulsory.

1. Write a comparison between microstate and macrostate. (3)
2. Discuss ensemble average and its significance in statistical mechanics? (3)
3. Discuss how statistics and thermodynamics are linked to each other. Establish the corresponding link. 5()
4. Derive Liouville's theorem for a region in phase space by showing that the local density of representative points viewed by an observer moving with the a representative point, stays constant. (7)
5. What is a canonical ensemble? At equilibrium, find probability of having a state with given energy. (6)
6. What do you mean by statistical fluctuations? Find expression for energy fluctuations in canonical ensemble. (6)
7. Write the partition function for a system of dipoles with $J=1/2$. Find the entropy of the system and discuss the meaning negative temperature. (7)
8. Discuss a system in grand canonical ensemble. Find the probability of finding a state with given energy and number of particles at any time. (6)
9. How does classical statistics differs from quantum statistics? Differentiate between different types of statistics by considering a distribution of few particles in a few energy states. (5)
10. Write the expression for density matrix and expectation value of a physical quantity for a quantum ensemble? (2)