In the name of God

Department of Physics
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ADVANCED STATISTICAL PHYSICS I

Exercise Set 4

(Date Due: 1395/08/25)

1. Solve exercise of chapter 3 (R. K. Pathria): Q5, Q7, Q4, Q15, Q18, Q23, Q27, Q30, Q35, Q36, Q40, Q42

2. Using micro canonical ensemble, prove equipartition theorem.

3. Suppose that we have a system with 3-level energy. Based on Boltzmann statistics and canonical ensemble, compute the $\langle E \rangle$. What happens for $\beta \to 0$ and $\beta \to \infty$.

4. Show that a method to solve inverse Laplace Transform can be given as follows:

$$g(E) = \mathcal{L}^{-1}\{Z(\beta)\} \equiv \frac{1}{2\pi i} \int_{\beta' - i\infty}^{\beta' + i\infty} d\beta e^{\beta E} Z(\beta)$$

here $\beta = \beta' + i\beta''$

5. For a static cylinder located on a flat surface in a gravitational field with g, determine number density and pressure as a function of height. Hamiltonian of this N-particles system includes free term plus a term corresponds to gravity.

Good luck, Movahed