Week 4 Assignment: Ising model-1. Comp-Physics (13 Sept 2021)

Implement a Ising model in **3-d,** such that you have a **L*L*L** cubic lattice with periodic boundary conditions. Write the code such that the length of the lattice L is a input parameter of simulation. Moreover, the number of iterations (niter) at a particular temperature T are also input parameters. Thermal energy k_BT is measured in units of J_ising, where J_ising=1.0. N=L*L*L.

Run the simulation for the parameters given below for each question and answer the following questions.

(+/-) : signiifies that the value could be either positive or negative depending on the sequence of random numbers generated,

Q1. Suppose all the spins in the lattice were pointing in the same direction (i.e. -1) in the initial configuration. L=20. The total magnetic moment (in simulation units) of the entire lattice in this initial configuration will be

Ans:

Q2. Suppose all the spins in the lattice were pointing in the same direction (i.e. +1) in the initial configuration. L=10. The total energy (in simulation units where J_ising=1) of the entire lattice will be

Ans:

Q3. For Parameters k_BT=4.7, L =10, niter =50000. The instantaneous magnetization per spin (value of magnetic moment per spin in a microstate: **M**) fluctuates around the value:

Ans:

Q4. Parameters k_BT=4.0, L =10, niter =50000. The instantaneous energy per spin (value of the energy per spin in a microstate: **E**) fluctuates around the value:

Ans:

Q5. Parameters k_BT=4.1, L =10, niter =50000. The instantaneous magnetization M per spin and instantaneous energy E per spin fluctuates around the value:

Ans: