Tfy-3.4423 Computational Physics P (5 cr)

Final exam 7.5.2009

Answers in Finnish or English

1. Explain **briefly** (a few lines maximum):

a) Central limit theorem in computational physics

b) Detailed balance in Metropolis algorithm

c) Mean-field analysis of Ising model

d) Multigrid for poisson

e) Simulating wave equation

f) Finite difference method for kinetic energy

g) Richardson extrapolation

h) Hamiltonian matrix of a quantum system

i) Storing and processing information coded on single bits

j) Lanczos diagonalization

k) Boson exact diagonalization for two particles

1) Importance sampling in diffusion quantum Monte Carlo

Use around one page for each of the questions 2.-4:

2. Ising model and phase transition.

3. Random walk and diffusion equation modeling nature.

4. Analytic basis vs. finite difference for solving quantum problems.