

Tfy-3.475 Computer Simulation Methods in Physics

Final exam 7.11.2006

1. Explain briefly:
 - a) Wolff method
 - b) Lanczos diagonalization
 - c) Critical slowing down
 - d) Multigrid method
 - e) Variational quantum Monte Carlo
 - f) Hellman-Feynman theorem
2. How to solve wave equation $\partial^2 p / \partial t^2 = c^2 \nabla^2 p$ using computer?
3. a) Derive Hartree-Fock (HF) equations for two electrons.
c) Compare the two different spin states.
c) Compare HF to density-functional theory.
4. A point charge is inside a tetrahedron (triangular base pyramid).
 - a) How to calculate the average electric field on the tetrahedron surface by computer?
 - b) How to calculate the electric flux through the surface?
 - c) What are the computational difficulties in replacing tetrahedron by a general closed surface?
5. a) What is ballistic deposition (BD)?
b) What is random deposition (RD)?
c) What is surface roughness?
d) Compare surface roughness of BD and RD.