

CPS Qualifying Exam Review

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Answered by CPS students, Spring 2010

CPS 5401

Sample Questions
Fall 2009 and Fall 2010

(AZ)1) Basic Unix commands.

(GC)2) Create a simple Makefile.

3) Basic compiler options of g++ and gcc compiler (-l,-L,-I,-c,-o).

(GC) 4) Basic MPI commands

5) What is the difference between MPI and Open MP?

6) What is the difference between Distributed Memory Systems (Clusters), Shared Memory Systems, and General Distributed Computing?

7) What do you know about job scheduling (Torque, Sun Grid Engine, Windows HPC etc.).

8) What is distributed computing?

9) Development tools for C, C++, and FORTRAN

(CS) 10) Write a program for matrix multiplication in C++ or FORTRAN.

11) Debugging.

(CT)12) Parallel method for calculating an integral

(CT)13) Parallel Monte Carlo Method for calculating an integral.

(JP)14) Newton's method *(PDF file)*

(JP)15) Newton method with different starting points (parallel programming) *(PDF file)*

16) Row-major order versus column-major order in matrices.

17) Visualization (Matlab, Excel, GNU PLOT etc.)

(CF)18) Gauss elimination, LU decomposition *(PDF file)* *Gauss elimination, LU decomposition**(Word file)*

(CF)19) General information about iterative solvers (Jacobi, Gauss-Seidel)*(PDF file)* General information about iterative solvers (Jacobi, Gauss-Seidel)*(Word file)*

20) What do you know about numerical libraries for linear algebra(BLAS, LAPACK etc.) libraries?

(OL)22) Basics of FDM method (finite differences, numerical differentiation). *(PDF file)*

(OL)23) Explicit FDM method . *(PDF file)*

(OL)24) Implicit FDM method

25) Euler method and numerical integration of systems of ODE.(????)

27) Calculate mean value and variance by using parallel computing.

28) Find the following stochastic integral.

29) Solve the following stochastic differential equation by using Euler-Maruyama method.

(PA) 30) Least Squares problem, Linear regression. *(PDF file)*

31) *Inverse Problems*

32) Describe the basic types of attractors (e.g. fixed point, limit cycle, limit tori, strange attractor).

33) Give short list of typical BVP (e.g. heat transfer equation, wave equation).General Information About Iterative Solvers.pdf