CPGR 5145 Final Exam

Thursday May 7th, 1998, 7:00 pm - 10:00 pm

5 pages.
Attempt all questions in the spaces provided. Name: ...

You may refer to the appendices from the notes.
Do not refer to any other materials.

Mark/50

Qu. 1 Answer each of the following briefly:

(a) Explain the difference between SIMD and MIMD computers. 2

(b) What is the diameter of a mesh network? 2

(c) Define speedup factor 2

(d) Describe an optimal hypercube message routing algorithm which uses only the destination address and the address of the node currently holding the message. 4

(e) Describe what a scatter routine does. 4

(f) What is meant by the term *embarrassingly parallel*? 2

(g) How many steps are needed in the tree implementation of a barrier, given *n* processes? 2

(h) Name two situations that a pipeline structure can lead to increased execution speed. 2

(i) What are the general conditions for termination in a work-pool computation? 2

(j) What is meant by the term *data parallel*? 2

(k) What is a *condition variable* in threads? 2

(l) What is the purpose of Gaussian Elimination? 2

(m) What is the purpose of the Hough Transform? 2

Qu. 2 Show the steps to sort the list of number 4, 2, 7, 8, 5, 1, 3, 6 using odd-even (transposition) sort. 6

Qu. 3 Write a parallel program in PVM or MPI to solve the one-dimensional heat distribution problem based upon finite difference equation:

$$x_i = \frac{x_{i-1} + 2x_i + x_{i+1}}{2}$$

for $0 \leq i < 100$.

Qu. 4 Write a parallel program in Pthreads to sum *n* numbers held in an array `a[]`, using two threads, each computing half of the sum. The final result is to be held in a single location.