ITCS 4145/5145 Parallel Programming
Final exam
Thursday 3:30 pm - 6:30 pm Dec 15, 2005

Name:...

Part I is closed book. Do not refer to any materials for this part. Part II is open book. You may refer to any materials for this part (but not others in the class). Return Part I to get Part II.

Total /50
Part I /30
Part II /20

Part I

Do not refer to any materials for this part

Qu. 1   Answer each of the following <u>briefly</u>:

(a)   According to Amdahl's law, what is the maximum speed-up of a parallel computation given that 20% of the computation must be executed sequentially?   2

(b)   Suggest one reason that a MPI computation would execute slower on a system with two processor than on a system with one processor.   2

(c)   Under what circumstances would the command to execute the program prog1:

mpirun -np 1 prog1

not work (assuming the system is installed and functioning properly, and prog1 is a properly compiled executable)?   2

(d)   When the broadcast routine is used, it is executed by all processes involved in the broadcast. How is the source of the broadcast data identified?   2

(e)   What is the routine that combines a gather operation with an arithmetic or logical operation called?   2

(f)   Explain in 1-4 sentences numerical integration using the adaptive quadrature method.   3

(g)   Explain how the following code could be parallelized using pipelining:

```
for (i = 0; i < n; i++)
   sum = sum + a[i];
```
                                                                                                 2

(h)   Suggest one reason why synchronous parallel algorithms can have poor performance.   2

(i)   What is a detached thread in Pthreads?   2

(j)   What is OpenMP?   2

(k)   What is false sharing in shared memory programming?   2

(l)   What is meant by the term "stable sorting" in sorting algorithms. Is Bubble sort a stable sorting algorithm?
Explain.   3

(m)   Explain the red-black ordering method for solving a system of linear equations.   2

(n)   What does the Hough transform do?   2

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Part II

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Qu. 2   Write a complete 10-process MPI program to sort 1000 numbers using any suitable method.
Provide comments in your code to help the grader! If I do not understand the code, I will assume it is incorrect.

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