

ITCS 4145/5145 Parallel Programming
Final exam
Wednesday Dec 13, 2006, 3:30 pm - 4:45 pm
Name:

This test is closed book. Do not refer to any materials.

Total /40

Answer each of the following questions briefly:

1. According to Amdahl's law, what is the maximum speed-up of a parallel computation given that 85% of the computation must be executed sequentially? 2

2. What is meant by the term cost-optimal parallel algorithm? 2

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

4. How many send and receive routines are needed to implement the scatter operation without using the MPI scatter routine, given p processes? Clearly explain how you got your answer. No points for simply writing down a number even if correct. 2

10. Explain how the following code could be parallelized using pipelining:

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

2

11. What is the difference (if any) between a binary semaphore and a spin lock?

2

12. What is OpenMP?

2

13. Devise a data parallel algorithm to add together n numbers. (Not in notes; apply the general principles of data parallel algorithms.)

2

14. Suggest one reason why synchronous parallel algorithms can have poor performance. 2

15. What is meant by the phrase systolic array? 2

16. Is the following a bitonic sequence? 2

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Clearly explain how you got your answer. No points for simply writing down yes or no even if correct.

17. What feature of matrix multiplication is used to enable fewer processes to be used than elements in the row or column of the matrices? Illustrate your answer. 2

18. In a work-pool computation, why is it not sufficient to terminate the computation when the task queue is empty and all processes have no work to do? 2
19. Describe Rank sort and suggest how it might be parallelized. 2
20. What is meant by the term “stable sorting” in sorting algorithms. Is Bubble sort a stable sorting algorithm? Explain. 2