ITCS 4145/5145 Parallel Computing
Test 2
5:00 pm - 6:15 pm, Thursday March 29, 2012

Name:..

This is a closed book test. Do not refer to any materials except those supplied for the test.

Supplied: “*Summary of OpenMP 3.0 C/C++ Syntax.*”

Answer questions in space provided below questions. Use additional paper if necessary but make sure your name is on additional sheets.

Total /40

Qu. 1 Answer each of the following briefly:

(a) What is wrong with the following OpenMP code (if anything):

```
#pragma omp parallel {
  printf("Hello World from thread = %d\n",omp_get_thread_num(),
   omp_get_num_threads());
}
```

2

(b) Use Bernstein’s conditions to determine whether the two code sequences:

```
forall (i = 0,j = 3;i < 3; i++,j--)
  a[i] += a[j+2];

for (i = 0,j = 3;i < 3; i++,j--)
  a[i] += a[j+2];
```

always produce the same results. Clearly show how you got your answer. (No marks for just yes or no!) 4

(c) Suppose an array A is declared in a C program as int A[10][10]. Under what circumstances could false sharing occur? Explain clearly.

2

(d) What is meant by the term "sequential consistency." 2

(e) Explain how matrix multiplication can be done in parallel to achieve a parallel time complexity of O(log *n*) where matrices have size *n* x *n*?

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(f) What is meant by the term cost-optimal?

2

(g) Why is Gauss-Seidel relaxation not suitable for parallel implement without modification?

2

(h) Suggest one potential numerical issue with duplicating a calculation in different processes rather than sending the result of a computation from one process to another process.

2

(i) In Assignment 3, how did you confirm that the OMP_NUM_THREADS environment variable is set as desired?

2

(j) Demonstrate sorting the sequence:

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using bitonic mergesort. Explain each step. Clearly show the operation and result of each step. 4

(k) Which OpenMP directive is used to create multiple threads?

2

(l) Write an OpenMP sequence to set all the elements of an array A[10000][10000] to zero using all the available threads.

2

Supplied: *“Summary of OpenMP 3.0 C/C++ Syntax.”*

Qu. 2 Write an OpenMP program that sorts *N* numbers using odd-even transposition using available threads. Provide comments in your code to help the grader! Briefly describe your method. ***If I do not understand the code, I will assume it is incorrect.***

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