ITCS 4145/5145 Parallel Computing
Test 2
3:30 pm - 4:50 pm, Tuesday November 15th, 2005

Name:...

Part I is closed book. Do not refer to any materials for this part. Return Part I to get Part II.

Part I /25
Part II /25
Total /50

Part I

Do not refer to any materials for this part

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

(a) What is the time complexity of a Butterfly barrier in terms of number of steps to effect a barrier for p processes? (Clue: Butterfly barrier is a variation of a tree barrier.)   2

(b)   What is the prefix sum problem?   2

(c)   What is a Jacobi iteration (that is, its basic charactertistic compared to other types of iterations)?   2

(d)   What is the difference between static load balancing and dynamic load balancing?   2

(e)   What does a `forall` statement specify?   2

(f)   State Bernstein's conditions for two processes/statements to execute simultaneously and obtain the correct result.   3

(g)   Sequential consistency refers to operations of processors occurring in program order. Suggest one reason why instructions are not executed by a processor in the order indicated in a high level program.   3
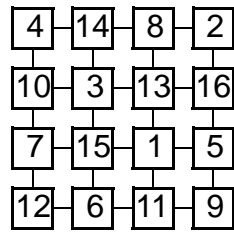
(h)   What is a Bitonic sequence?   4

(h)   Show the steps to sort the following numbers using Shearsort:

4	14	8	2
10	3	13	16
7	15	1	5
12	6	11	9

Part II

Name: ....

You may refer to any materials for this part (but not others in the class).

Qu. 2   Write a complete MPI program that solves following system of linear equations by iteration:

$$a_{2,0}x_0 + a_{2,1}x_1 + a_{2,2}x_2 = b_2$$
$$a_{1,0}x_0 + a_{1,1}x_1 + a_{1,2}x_2 = b_1$$
$$a_{0,0}x_0 + a_{0,1}x_1 + a_{0,2}x_2 = b_0$$

where the unknowns are x_0, x_1, and x_2, and the a's and b's are given. Use three processes, one for each unknown, and iterate until none of the x values change by more than 1%. Provide comments in your code to help the grader! If I do not understand the code, I will assume it is incorrect.   20

Briefly describe your method.   5