

CSCI-UA.0480-003
Parallel Computing
Midterm Exam
Spring 2015 (60 minutes)

NAME:

ID:

- This exam contains **4 questions** with a total of 20 points in **4 pages**.
- The exam is open book/notes.
- If you have to make assumptions to continue solving a problem, state your assumptions clearly.

1. a) [2 points] State two advantages of multicore processors.

b) [2 points] State two advantages of single core processors.

c) [2 points] State two disadvantages of multicore processors.

d) [2 points] State two disadvantages of single core processors.

2. [2 points] We have seen that a multicore processor is MIMD in Flynn's classification. Can a single core processor be anything else but SISD? If yes, give examples. If not, why not?

3. [3 points] Describe 3 different scenarios where an MPI program can have a deadlock.

4. Suppose that MPI COMM WORLD consists of the three processes 0,1, and 2, and suppose the following code is executed (my_rank contains the rank of the executing process):

```

int x, y, z;

switch(my_rank) {

    case 0:
        x=0; y=1; z=2;
        MPI_Bcast(&x, 1, MPI_INT, 0, MPI_COMM_WORLD);
        MPI_Send(&y, 1, MPI_INT, 2, 43, MPI_COMM_WORLD);
        MPI_Bcast(&z, 1, MPI_INT, 1, MPI_COMM_WORLD);
        break;
    case 1:
        x=3; y=8; z=5;
        MPI_Bcast(&x, 1, MPI_INT, 0, MPI_COMM_WORLD);
        MPI_Bcast(&y, 1, MPI_INT, 1, MPI_COMM_WORLD);
        break;
    case 2:
        x=6; y=7; z=8;
        MPI_Bcast(&z, 1, MPI_INT, 0, MPI_COMM_WORLD);
        MPI_Recv(&x, 1, MPI_INT, 0, 43, MPI_COMM_WORLD, &status);
        MPI_Bcast(&y, 1, MPI_INT, 1, MPI_COMM_WORLD);
        break;
}

```

a. [4 points] What will be the values of x, y, and z for each of the 3 processes after executing the above code?

	P0	P1	P2
X			
Y			
Z			

b. [2 points] Is there a possibility that the communication among the 3 processes be executed out of order? If yes, explain the reason. If not, why not?

c. [1 point] What will happen if we execute the above code with: `mpiexec -n 4` (and `MPI_COMM_WORLD` will then contain 4 processes)?