| CS 5740 | **Parallel and Distributed Computing** | Test 1 |
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| Name: | Spring 2008 | Max Pts: 38 |

**Important**: This is an open book test. You can use any books, notes, or paper, but not exchange anything with other students. You are not allowed to use any electronic/communication devices, including a calculator. *Do not log into the computer during the test. Switch off your cell phones.* Any calculations and rough work can be done on the back side of the test pages. You will lose five points for not writing your name.

1. [10 pt] Given a task that can be divided into $m$ subtasks, each requiring one unit of time, how much time is needed for an $m$-stage pipeline to process $n$ tasks.

2. [10 pt] The distance between nodes $u$ and $v$ in a graph is the length of the shortest path from $u$ to $v$. Given a $d$-dimensional hypercube and a designated source node $s$, how many nodes are distance $i$ from $s$, where $0 \leq i \leq d$?

3. [10 pt] Prove that performing an $n$-element reduction on the task/channel model has time complexity $\Omega(\log n)$.

4. [8 pt] Given a set of five unsigned, eight-bit integers with decimal values 13, 22, 43, 64, and 99, determine the decimal result of the following reductions:

   (a) add
   (b) multiply
   (c) maximum
   (d) minimum
   (e) bitwise or
   (f) bitwise and
   (g) logical or
   (h) logical and

   Assume the meaning of the *and* and *or* operators is the same as in C programming language.