Fall ’11 CIS 212 Midterm Review

You may bring one page of notes, front and back.

You may bring a calculator but shouldn’t need one.

Questions will be in short-answer format with partial credit for partial answers.

Questions will require you to read Java and assembly (Chapter 6) code.

You will not be asked to write Java or assembly code, but may be asked to write pseudocode (i.e., code that unambiguously describes your solution but is not required to compile).

Topics:
- Algorithms: pseudocode, sequential and binary search, selection and merge sort
- Complexity: Big-Theta notation, $\Theta(1)$, $\Theta(lg n)$, $\Theta(n)$, $\Theta(n lg n)$, $\Theta(n^2)$, $\Theta(n^3)$, $\Theta(2^n)$
- Binary numbers: converting to/from integers, sampling
- Logic gates: AND, OR, NOT gates, Boolean expressions, truth tables, sum of products
- Digital circuits: full add, compare equal, multiplexers, decoders
- Von Neumann architecture: memory, I/O, control unit, ALU, machine instructions
- Assembly language: translating to/from machine language, the Chapter 6 instruction set

Sample questions:

1. [10] Consider the following code:
   
   ```java
   for (int i = 0; i < n; ++i)
       for (int j = 0; j < n; ++j)
           print(i + j)
   ```
   
   a. (5) How many is the print statement executed if $n = 5$? Why?
   
   b. (5) What is the Big-Theta complexity of this function with respect to $n$? Why

2. [10] Draw a truth table and circuit (using AND, OR, NOT gates) for the Boolean expression $(A \mid \mid \neg B)$:

3. [10] Consider the following assembly code:
   ```
   LOAD X
   SUBTRACT Y
   STORE X
   OUT X
   ```
   
   X: .DATA 21
   Y: .DATA 2

   What value is printed when the code is executed?