Fall ’10 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 code (including Swing).

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

You will not be asked questions about the Java API, such as questions requiring you to know which methods belong to a specific Java class.

Topics:

- Pseudocode (generic)
- Algorithms: sequential and binary search, selection and merge sort, recursion
- Complexity: Big-O notation, $O(1)$, $O(lg\ n)$, $O(n)$, $O(n\ lg\ n)$, $O(n^k)$, $O(k^n)$
- Number representation: binary numbers (unsigned, signed-magnitude), sampling
- Truth tables and logic gates (AND, OR, and NOT gates)
- Digital circuits: add, compare equal, multiplexers, decoders
- Von Neumann architecture: memory, I/O, control unit, ALU, machine instructions

Sample questions:

1. [10] Consider the following code:

   ```java
   for (int i = 0; i < n; ++i)
       m += n;
   ```

   What is the Big-O upper bound for this function with respect to n? Why?

2. [10] Draw a truth table and circuit (i.e., using AND, OR, and NOT gates) for the Boolean expression (a || !b):