UNIVERSITY OF WESTERN ONTARIO

Computer Science 3331a, Fall 2010

Foundations of Computer Science I

ASSIGNMENT 2

Due: Wednesday, Oct. 20, 2010

1. Give deterministic finite automata (DFA) accepting the following languages over the alphabet $\{a, b, c\}$. Note that all the DFA are required to be **complete** DFA. (Transition diagrams only)

   (1) The set of all words that have bba as a prefix.

   (2) The set of all words that have bba as a subword.

   (3) The set of all words ending in bba.

   (4) The set of all words such that the second symbol from the right-end is a.

   (5) The set of all words that do not contain consecutive c's.

2. Give a full definition of a deterministic finite automaton (DFA) that accepts the set of all binary numbers (over the alphabet $\{0, 1\}$), each starting with a 1 and the value of which is congruent to 2 modulo 3. (Note that the set clearly includes $10, 101, 1000, 1011, \cdots$.)

3. Prove that the language $L = \{a^i b^j \mid 0 \leq i < j\}$ is not accepted by any DFA.

4. Design nondeterministic finite automata (NFA) for the following languages over the alphabet $\{0, 1, 2\}$. (Transition diagrams only.)

   (1) The set of all words that have a suffix 10210.

   (2) The set of all words such that the fourth symbol from the right-end is 0.