UNIVERSITY OF WESTERN ONTARIO

Computer Science 3331a, 2011

Foundations of Computer Science I

ASSIGNMENT 2

Due: Wednesday, October 19, 2011

1. Give a full definition of a deterministic finite automaton (DFA) that accepts the set of all binary numbers (over the alphabet $\{0, 1\}$) each of which has a value divisible by 5. (Note that the set includes $\varepsilon, 101, 1010, 1111, \cdots$.)

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

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

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

   (3) The set of all words ending in *cbc*.

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

3. Prove that the language $L = \{a^i b^j \mid 0 \leq j < i\}$ 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 such that the fourth symbol from the right-end is 0.

   (2) The set of all words that have a subword 20201.

5. Convert the following ε-NFA into a DFA ($\Sigma = \{a, b\}$). Intermediate steps are required.