UNIVERSITY OF WESTERN ONTARIO

Computer Science 3331a, Fall 2010

Foundations of Computer Science I

ASSIGNMENT 3

Due: Monday, November 22, 2010

1. Prove by Pumping Lemma that $\{x \in \{a,b\}^* \mid |x|_a = 2|x|_b\}$ is not a DFA language.

2. Write regular expressions for the following languages over $\{a,b\}$:

   (1) the set of all words that have no consecutive a's.

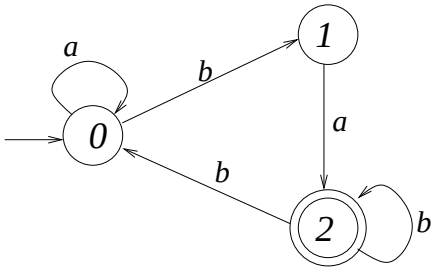
   (2) the set of all words containing at least three consecutive b's.

3. Given the following regular expression E

$$(0+10)^*1+00$$

   construct an ε-NFA A such that $L(A) = L(E)$. (All the intermediate steps are required.)

4. Given the following NFA A, obtain an equivalent regular expression. (All the intermediate steps are required.)



5. Give a CFG for each of the following languages:

   (1) $L_1 = \{0^i 1^{i+3} \mid i \geq 0\}$.

   (2) $L_2 = \{a^i b^j \mid 0 \leq i+1 < j\}$

   (3) L_3 is the set of all strings over the set of symbols '(' and ')' such that '(' and ')' are well paired and nested. For example, '((()))', '(()(()))', and '(())((()))()()' are all words in L_3.

   (4) $L_4 = \{0^m 1^n 0^{m+n} \mid m,n \geq 0\}$