UNIVERSITY OF WESTERN ONTARIO

Computer Science 331a, Fall 2006

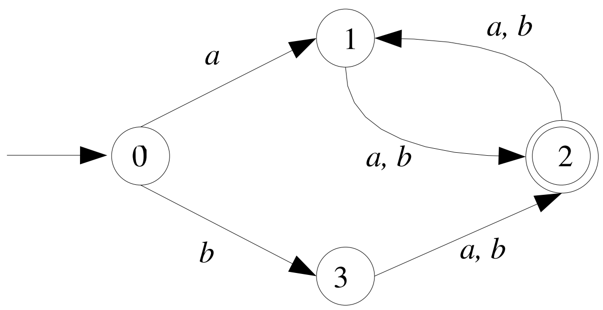
Foundations of Computer Science

ASSIGNMENT 2

Due date: Tuesday, October 17, 2006

1. Construct a state diagram for a simplified remote controller for TV that allows for 2 channels, on and off, and 3 volume levels.

2. Given the following DFA, M, what is $L(M)$?



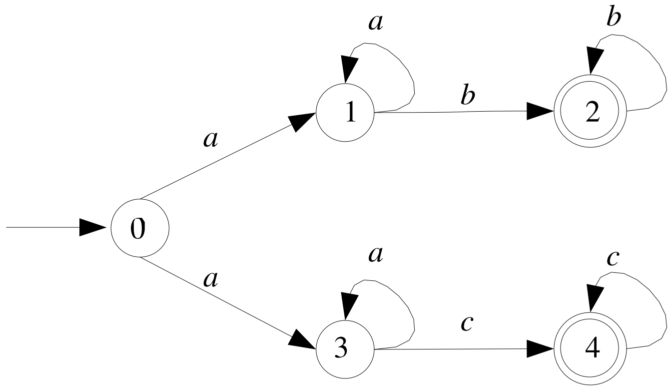
3. Give deterministic finite automata (DFA) accepting the following languages over the alphabet $\{a, b\}$:

(i) The set of all words whose length is divisible by three (transition diagram only);

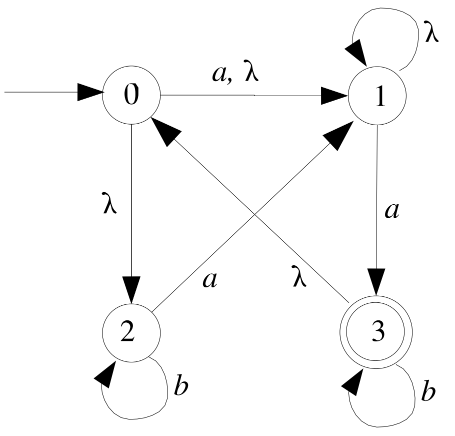
(ii) The infinite language $\{ba^{3i} : i \geq 0\}$ over the alphabet $\Sigma = \{a, b\}$ (full definition of the DFA).

4. Give a nondeterministic finite automaton accepting the set of strings in $\{0, 1\}^*$ such that some two 0's are separated by a string whose length is $4i$, for some $i \geq 0$. Use **JFLAP** (Java Formal Language and Automata Package) to check that your automaton is correct. Use **JFLAP** to give four examples of words that are in the language, and four examples of words that are not in the language. For the words belonging to the language, write an acceptance path. Print the automaton you have constructed and return it with your assignment.

5. Convert the following NFA into a DFA using the iterative subset construction. Show all your work.



6. Convert the following λ-NFA into an NFA without empty transitions, using the algorithm shown in class. Show all your work.



7. Use the Pumping Lemma for regular languages to prove that the language $\{a^{i+3}b^{2i+1} : i \geq o\}$ is not accepted by any deterministic finite automaton.