Computer Science 220S1T (2008)

Assignment 3: Automata and Pattern Matching

Due date: June 3, 2008; 8:30pm (ADB time)

Questions

1. A) Design an NFA N accepting the language $L = \{a^n b a^m : n, m > 0\}$.

[10 marks]

B) Design a DFA M such that $L(M) = L(N)$.

[10 marks]

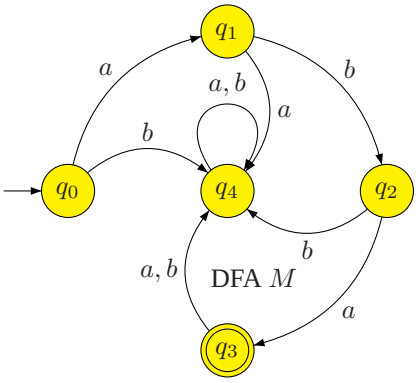
2. A) Describe an algorithm which tests whether an arbitrary DFA M accepts only finitely many strings.

[10 marks]

B) What is the runtime of your algorithm?

[5 marks]

C) Use the algorithm in A) to test whether the following DFA



accepts infinitely many strings.

[10 marks]

C) Determine $L(M)$. Justify your answer.

[5 marks]

3. Show that there is an algorithm which receives as input a DFA M over the alphabet $\{a, b\}$ and decides whether $L(M) = \{a\}$ or $L(M) \neq \{a\}$. Clearly state all results you use.

[20 marks]

4. A) Construct an NFA N recognising the language $\{uababv : u, v \in \{a, b\}^*\}$.

[15 marks]

B) Construct a infinite sequence of strings $s_1, s_2, \ldots$ each of which is accepted by the NFA N at A); justify your answer.

[5 marks]

5. Show that there exist infinitely many DFA's each of which recognises exactly the language $\{\varepsilon, a, b\}$.

[10 marks]