

Computer Science 220S2C (2009)

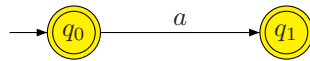
Assignment 1: Automata and Pattern Matching

This assignment is worth 40 marks representing 8% of your total course grade.

Due date: 21 August 2009; 8:30pm (ADB time)

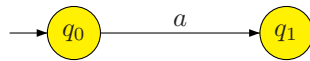
Questions

1. a) Construct a DFA M that recognises the complement of the language recognised by the NFA N working on the alphabet $\{a, b\}$ with the diagram:



NFA N

- b) Compare the languages $L(M)$ and $L(R)$, where R is the NFA given by the diagram:



NFA R

Are they equal? What is the relation between N and R ? Justify your answer.

[10 marks]

2. Consider the language $L = \{ab^n c \mid n \geq 0\}$.

a) Show that L is regular.

b) Determine the following languages:

$$L_1 = \{x \in L \mid x \text{ doesn't contain } a\},$$

$$L_2 = \{x \in L \mid x \text{ doesn't contain } b\},$$

$$L_3 = \{x \in L \mid x \text{ doesn't contain } c\}.$$

c) Prove that each language L_1, L_2, L_3 is regular.

[10 marks]

3. a) Construct a DFA and a regular expression for the following two languages:

$$L_1 = \{w \in \{a, b\}^* \mid |w| \text{ is even } \},$$

$$L_2 = \{w \in \{a, b\}^* \mid |w| \text{ is odd } \}.$$

b) What is the relation between L_1 and L_2 ?

[10 marks]

4. Describe an algorithm which given an NFA N and a DFA M decides whether $L(N) = L(M)$. Justify each step of the algorithm. **[10 marks]**