

Homework Assignment #2

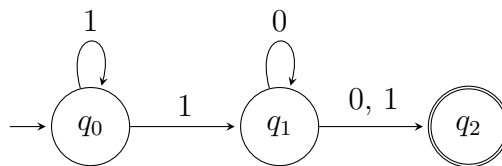
[Compiled on July 1, 2009]

Note

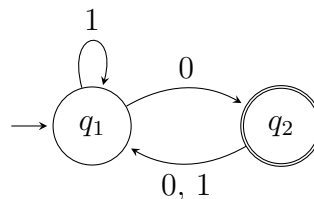
This assignment is due 9AM Thursday, July 2, 2009. Please write or type your answers on A4 (or similar size) paper. Put your completed homework by the due time on the lecturer's desk. **No late submission will be accepted. You may discuss the problems with others, but copying answers is strictly forbidden.**

Problems

- (20 Points) Convert the following NFA N with $\Sigma = \{0, 1\}$ into a DFA D such that $L(D) = L(N)$.



- (20 Points) Convert the following DFA D with $\Sigma = \{0, 1\}$ into a regular expression R such that $L(R) = L(D)$.



- (20 Points) Consider the regular expression $R = ((01)^*(1+2))^*$ with $\Sigma = \{0, 1, 2\}$.

- Convert R into an equivalent NFA N with ϵ -transitions.
- Remove the ϵ -transitions of N .

- (20 Points) For each alphabet Σ and set A of input sequences, draw an NFA with Büchi acceptance that exactly accepts A .

- $\Sigma = \{0, 1\}$ and $A = \{\alpha = a_1a_2 \dots a_n \dots : \text{for all even } i, a_i = 1\}$
- $\Sigma = \{req, ack\}$ and $A = \{\alpha = a_1a_2 \dots a_n \dots : \text{for all } i > 0, a_i = req \text{ implies that there exists } j > i \text{ such that } a_j = ack\}$

5. (20 Points) For each English sentence, write an equivalent monadic second logic formula.

- The set P and the set Q have no common element.
- There is a maximal element in the set P . (Given two singleton sets x and y , x is smaller than y if $x < y$).

6. (0 Points) Convert the following NFA with Muller acceptance $\mathcal{F} = \{\{q_1\}, \{q_1, q_2\}\}$ into an equivalent NFA with Büchi acceptance.

