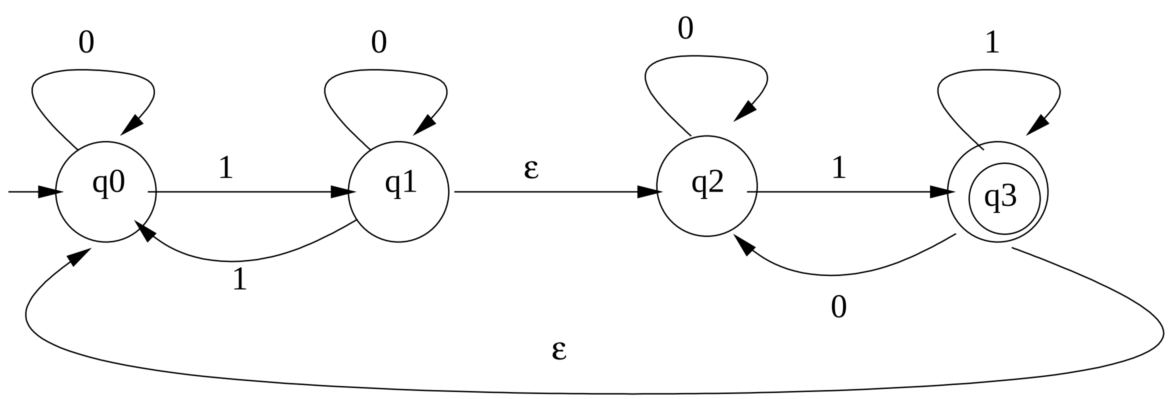
CSE 322
Winter Quarter 2009
Assignment 3
Due Friday, January 23, 2009

All solutions should be neatly written or type set. All major steps in proofs must be justified. Please start each problem solution on a new page and put your name on every page.

1. (10 points) For this problem you will practice converting a NFA to a DFA. Convert the following NFA to a DFA. Show only the reachable states of the DFA. The transition function should be given in a table.



2. (10 points) For this problem you will have practice in showing that regular languages are closed under more operations using finite automata constructions. We define the *simple interleaving* of two languages A and B over Σ by

$$A \mid B = \{x_1y_1 \cdots x_ny_n : x_i, y_i \in \Sigma, x_1x_2 \cdots x_n \in A, \text{ and } y_1y_2 \cdots y_n \in B\}.$$

For example if $A = \{a, ab, aa\}$ and $B = \{01, 11\}$ then $A \mid B = \{a0b1, a1b1, a0a1, a1a1\}$.

(a) Start with DFA's M_1 and M_2 that accept L_1 and L_2, respectively. Then construct an DFA that accepts $L_1 \mid L_2$. A cross product type construction will be useful.

(b) Explain why your machine accepts only those strings in $L_1 \mid L_2$.

3. (10 points) For this problem you will have more practice in showing that regular languages are closed under more operations using finite automata constructions. We define the reversal of a language as follows:

$$L^R = \{x^R : x \in L\}.$$

That is the reversal of a language is the set of reversals of all strings in the language.

(a) Given a DFA M that accepts L construct an NFA M' such that M' accepts L^R.

(b) Explain why your machine only accepts strings in L^R.