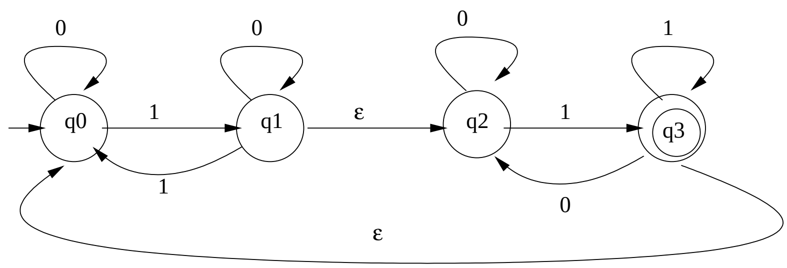
CSE 322
Autumn Quarter 2003
Assignment 3
Due Friday, October 17, 2003

All solutions should be neatly written or type set. All major steps in proofs must be justified.

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) State without proof a behavioral lemma for your construction that describes how your new machine behaves relative to the original machines.

(c) Use the behavioral lemma to prove that M accepts $L_1 \mid L_2$.

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) State without proof a behavioral lemma for your construction that describes how your new machine behaves relative to the original machines.