CSE 322: Formal Models in Computer Science **Homework #7**
May 27, 2009 Due: **Friday**, June 5, 2009

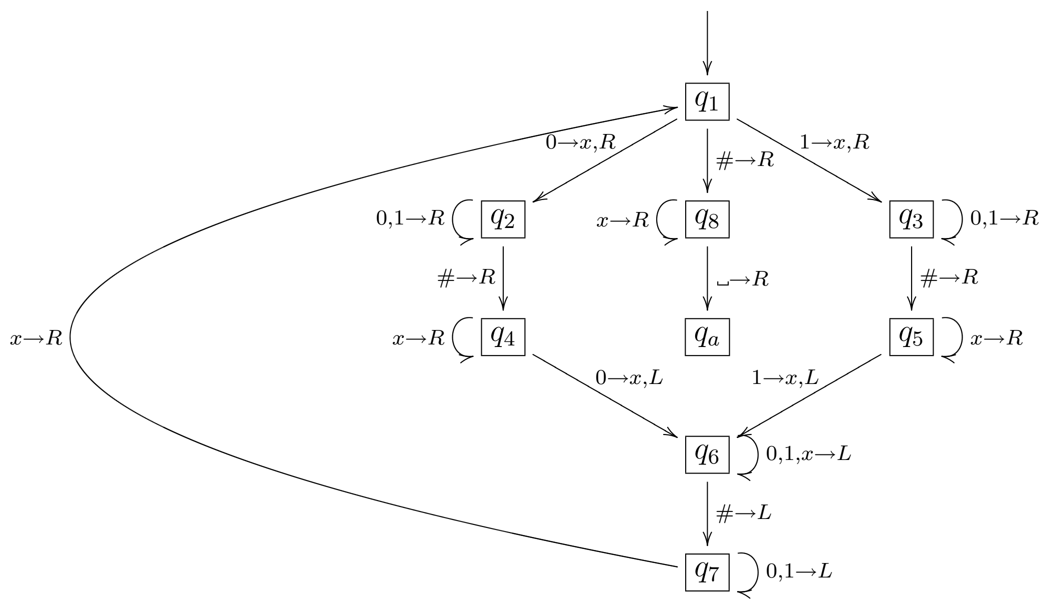
Reading Assignment: Sipser 3.1,3.2, 4.1,4.2

1. Let L be the language of all palindromes (strings w such that $w = w^R$) over $\{0, 1\}$ containing an equal number of 0s and 1s. Prove that L is not context-free.

2. Apply the Cocke-Kasami-Younger algorithm to the following Chomsky Normal Form grammar to show that the string *babbaa* is accepted (please show the tableau):

$$\begin{aligned} S &\rightarrow AB|BA|AT|BU|SS \\ T &\rightarrow SB|SU \\ U &\rightarrow SA \\ A &\rightarrow a \\ B &\rightarrow b \end{aligned}$$

3. Consider the following Turing machine with accept state q_a:



We have not drawn the reject state, q_r, or transitions going to the reject state. Those transitions occur implicitly whenever a state lacks an outgoing transition for a particular symbol. In each of the parts below, give the sequence of configurations that this machine enters when started on the indicated input string (a configuration is both a state and the contents of the tape).

(a) 1#1

(b) 10#11

4. **Extra Credit:** To be done for the glory, not the points. Show that the problem of determining whether a CFG generates all strings in $L(1^*)$ is decidable. In other words, show that $\{\langle G\rangle | G$ is a CFG over $\{0,1\}$ and $L(1^*) \subset L(G)\}$ is a decidable language.