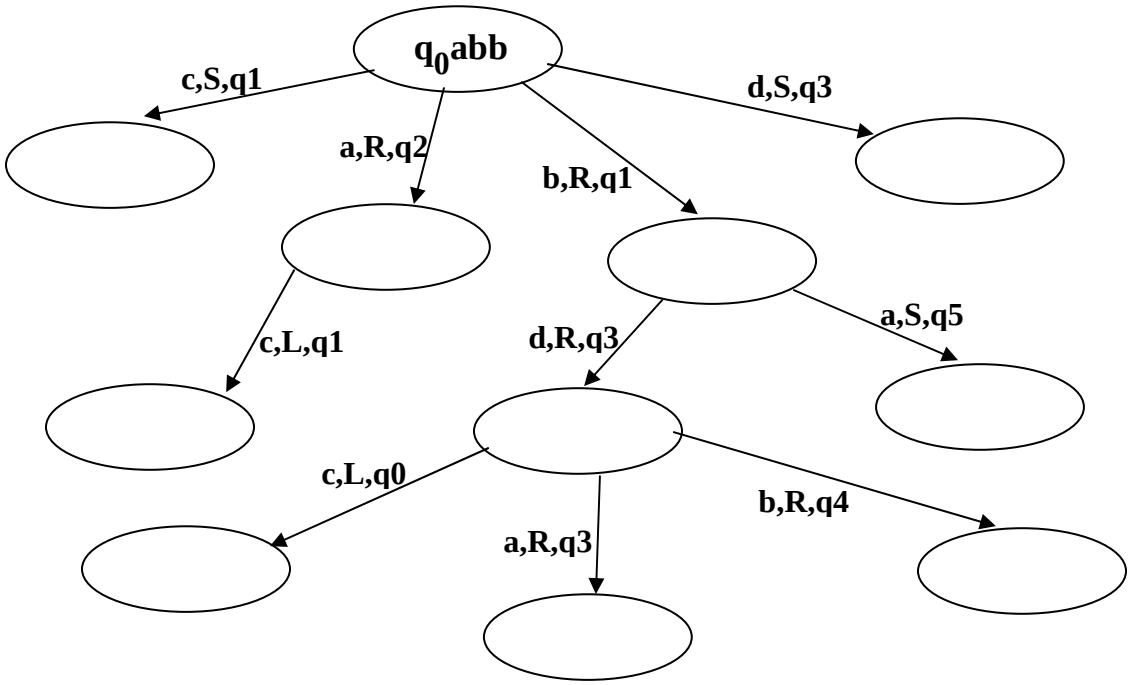
CSE 237, Homework 9
due 4/17/06 in class

Please start each problem on a new sheet.

Problem 1. **Computation trees for Nondeterministic TMs.**

The following is a diagram of a part of some NTM computation tree; for the transitions (labels on edges), we only show the new character, head move, and state.



a) In each node, write the configuration that corresponds to it, in textbook's notation (as we've done for the root).

b) Next to each node (except the root), write its *address* (defined as in the proof of theorem 3.16)

c) List the addresses for all the nodes from the diagram in breadth-first order.

d) We are traversing the computation tree, and we have reached node 312; what are the transitions that need to be made to reach this node from the root of the tree? What is the computation that corresponds this node, as a sequence of configurations?

Problem 2. Enumerators for decidable languages

In class, we proved that the set of enumerable languages is the same as the set of recognizable languages (Theorem 3.21). Let us now define a language L as "enumerable-in-order" if (a) L is enumerable, and (b) the strings are enumerated in order (that is, for any w,w' in L, w is printed before w' iff w comes before w' in the enumeration of Sigma*).

Prove that the set of enumerable-in-order languages is the same as the set of decidable languages.
Note: this should proceed in the same way as the proof of Theorem 3.21.

Problem 3. Closure properties of TM-decidable languages

(a) textbook problem 3.15-a (solution is in textbook)

(b) textbook problem 3.15-d

(c) textbook problem 3.16-a (solution is in textbook)

(b) textbook problem 3.16-d