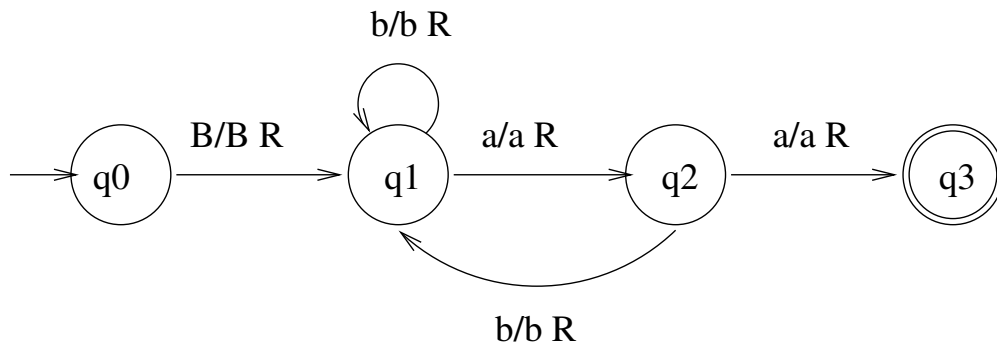


The answers, comments, and programs (if any) must be the original work of the author. While discussion with others is permitted and encouraged, the final work should be done individually. You are not allowed to work in groups. You are allowed to build on the material supplied in the class. If you use any other source than the class notes and the textbook, specify it clearly.

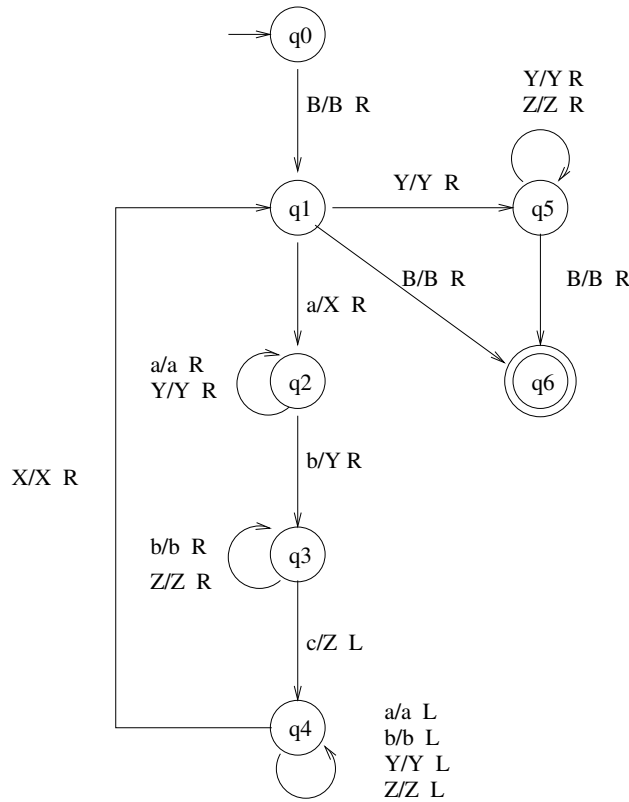
1. (20 points) Let M be the TM in Example 8.2.1 on page 260 (the machine for $(a \cup b)^*aa(a \cup b)^*$). Show the computation sequence for the strings $aaab$ and $abba$.

Note that the syntax for a computation shows the entire tape contents as a string and inserts the current state into the string right before the current symbol. For example, $q_0BaabbB$ means that the machine is in state q_0 and is about to read the first blank; Bq_1aabbB means that the machine is in state q_1 and is about to read symbol a .



Please turn the page over for the remaining questions.

2. (20 points) Let M be the TM in Example 8.2.2 on page 261 (the machine for $a^i b^j c^i$). Show the computation sequence for the strings abc and $aabc$.



3. (60 points) Construct TMs that accept the following languages:

- The set of strings over $\{a, b, c\}$ that begin with a , contain exactly two b s, and end with cc .
- $\{a^i b^j c^k \mid i + j = k\}$
- $\{ww \mid w \in \{a, b\}^*\}$