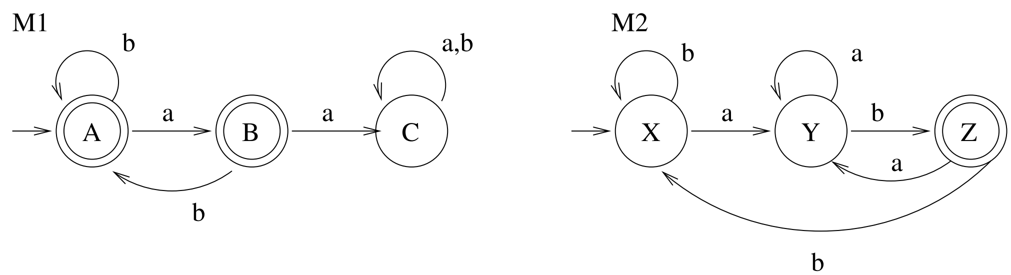
CS3311 Homework 5 Due date: Wednesday, February 25, 2015, in class

The answers 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. Any other source must be specified clearly.

1. *(20 points)* Use the procedure described in class to construct the machine $M3$ that corresponds to the "product" of machines $M1$ and $M2$. In other words, $L(M3) = L(M1) \cap L(M2)$.

$M1$ accepts the strings that do not contain 'aa'.
$M2$ accepts the strings that end with 'ab'.

Test all three machines with the four strings aa, ab, aba, aab and state whether they are accepted.



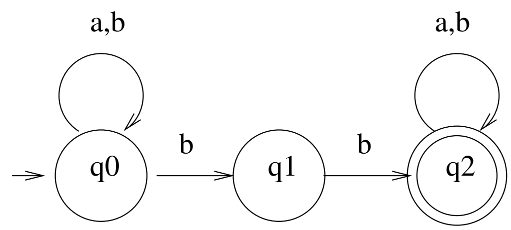
2. *(10 points)* Use $M1$ in the previous question to construct machine $M4$ where the language of $M4$ is all the strings that contain 'aa'. Construct a machine $M5$ which is the product of machines $M1$ and $M4$. Explain that $L(M5) = \emptyset$.

3. *(20 points)* Use Theorem 5.5.3 and Example 6.1.1 to convert the regular expression $(a \cup b)^* bb(a \cup b)^*$ into an NFA-λ.

Apply the full steps for converting a regular expression to an NFA-λ. Do not simplify the machine by removing λ transitions or making other changes. Do not construct the machine "directly". For your convenience, it is acceptable to label machines corresponding to segments of the regular expression and use them in subsequent drawings (see class examples for this).

Please turn the page over for additional questions.

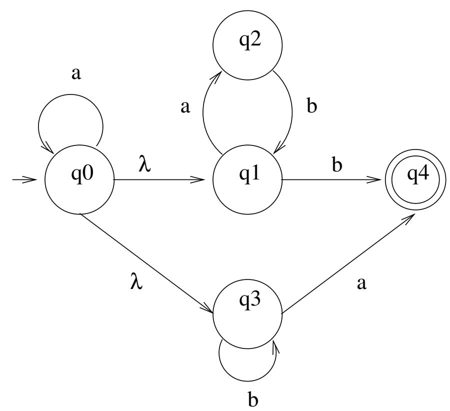
4. *(25 points)* Let M_1 be the following NFA:



(a) Give the transition function t for M_1 in tabular form.

(b) Use algorithm 5.6.3 to construct a state diagram of a DFA that is equivalent to M_1. Give the transition function and draw the state diagram of the equivalent DFA.

5. *(25 points)* Let M_2 be the following NFA-λ:



(a) Give the transition function t for M_2 in tabular form. Include a column for the λ-closure of each state.

(b) Use algorithm 5.6.3 to construct a state diagram of a DFA that is equivalent to M_2. Give the transition function and draw the state diagram of the equivalent DFA.