CPSC 313 — Tutorial Exercise #4
Nondeterministic Finite Automata

1 About This Exercise

The following exercise concerns material found in Section 1.2 of *Introduction to the Theory of Computation* and presented in the following lecture.

- Lecture #5: Introduction to Nondeterministic Finite Automata

This exercise will be discussed in the tutorial on Thursday, January 27. Please try to solve the problems in this exercise ***before*** attending this tutorial, so that participate in discussions about this exercise with other students and ask for the help from the teaching assistant that you need.

Problems To Be Solved

These questions concern the nondeterministic finite automaton M that is shown in Figure 1, on page 2, whose input alphabet is the set $\Sigma = \{\mathtt{a}, \mathtt{b}\}$.

1. List the set Q.
2. Which state in this nondeterministic finite automaton is the ***start state***?
3. List the set F of ***accept states*** in M.
4. Draw a table for the ***transition function*** δ of M.

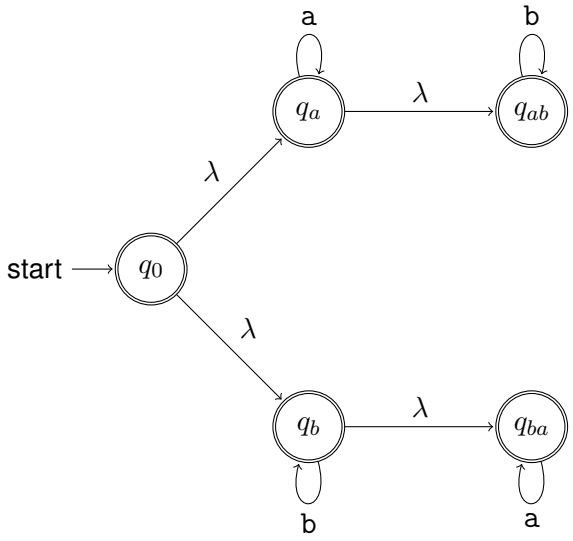

Figure 1: A Nondeterministic Finite Automaton

5. Draw the "tree of possibilities" corresponding to execution of M on each of the following strings.
   (a) λ
   (b) `a`
   (c) `b`
   (d) `ab`
   (e) `bba`
   (f) `abaa`
6. List the sets $Cl_\lambda(q)$ for each state q of M.
7. Describe, as precisely as you can, each of the following sets of strings.
   (a) The set of strings $\omega \in \Sigma^\star$ such that $q_0 \in \delta^\star(q_0, \omega)$.
   (b) The set of strings $\omega \in \Sigma^\star$ such that $q_a \in \delta^\star(q_0, \omega)$.
   (c) The set of strings $\omega \in \Sigma^\star$ such that $q_b \in \delta^\star(q_0, \omega)$.
   (d) The set of strings $\omega \in \Sigma^\star$ such that $q_{ab} \in \delta^\star(q_0, \omega)$.
   (e) The set of strings $\omega \in \Sigma^\star$ such that $q_0 ba \in \delta^\star(q_0, \omega)$.
8. Which strings are ***accepted*** by M? Why? Which strings are ***rejected*** by M? Why?
9. What is the language $L(M)$ of M?