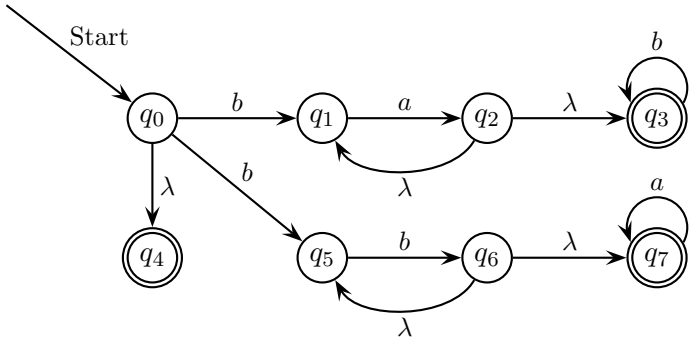
CS321
Theory of Computation
Quiz 2

Name:

1. Consider the following NFA N,



(a) [5pt] Circle the strings from the following list that are accepted by M.

$\underline{\lambda}$ abb $\underline{ba}$ $\underline{bb}$ $\underline{bbb}$ $\underline{baa}$ $baaba$

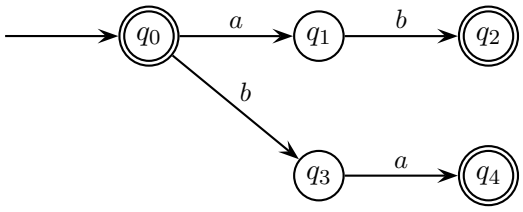
(b) [5pt] Let δ be the transition function for N. Indicate the value returned by δ for the following arguments:

$$\begin{aligned}
\delta(q_0, \lambda) &= \{q_4\} \\
\delta(q_0, a) &= \emptyset \\
\delta(q_0, b) &= \{q_1, q_5\} \\
\delta(q_1, \lambda) &= \emptyset \\
\delta(q_1, a) &= \{q_2\} \\
\delta(q_1, b) &= \emptyset
\end{aligned}$$

(c) [5pt] Let δ^* be the transition function for N. Indicate the value returned by δ^* for the following arguments:

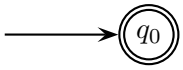
$$\begin{aligned}
\delta^*(q_0, \lambda) &= \{q_0, q_4\} \\
\delta^*(q_0, a) &= \emptyset \\
\delta^*(q_0, bb) &= \{q_5, q_6, q_7\} \\
\delta^*(q_1, \lambda) &= \{q_1\} \\
\delta^*(q_1, aa) &= \{q_1, q_2, q_3\} \\
\delta^*(q_1, bb) &= \emptyset
\end{aligned}$$

2. [10pt] Draw an NFA N with no more than 5 states and alphabet $\Sigma = \{a, b\}$ such that $L(M) = \{\lambda, ab, ba\}$.

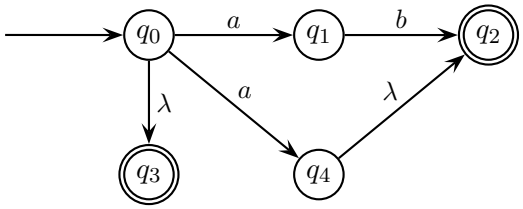


3. [10pt] Consider an NFA $N = (Q, \Sigma, \delta, q_0, F)$ with a non-empty set of states Q and suppose that $Q = F$. That is, all of its states are final states. It is necessarily the case that $L(N) = \Sigma^*$? That is, does N accept all strings? If your answer is yes, then give an example NFA with $Q = F$ along with a string $w \in \Sigma^*$ that N rejects.

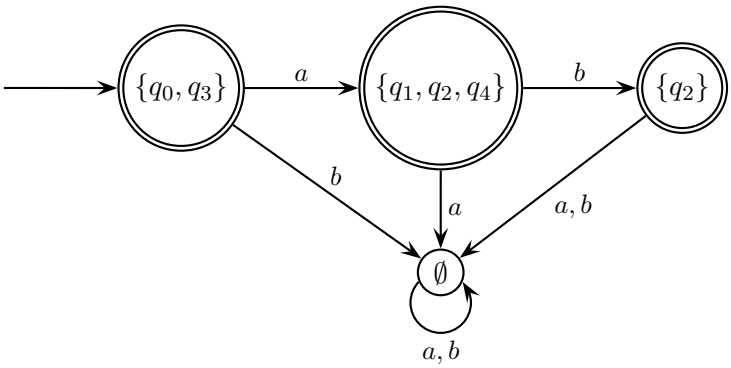
   This is not true. Consider the following single-state NFA N for which $Q = F$ but $L(N) = \{\lambda\}$ which is not equal to Σ^*.



4. [10pt] Consider the following NFA N,



   Use either the procedure taught in class or in the book to construct a DFA M such that $L(M) = L(N)$.


$\{q_0, q_3\}$
a
$\{q_1, q_2, q_4\}$
b
$\{q_2\}$
b
a
a, b
$\emptyset$
a, b