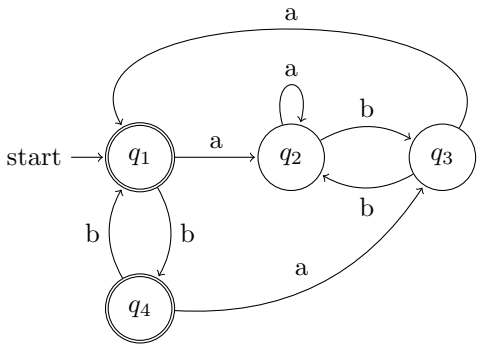
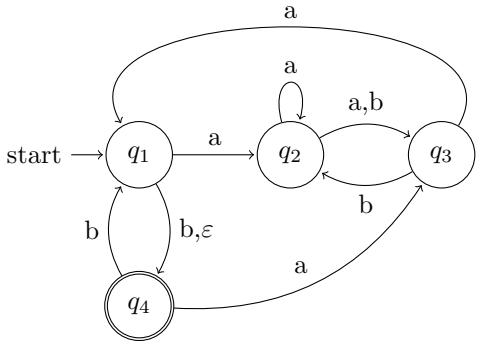
CS 3383 Theory of Automata
Exam 1 Review

1. Given the following finite automaton and strings, for each string indicate if the string is accepted by the automaton or not (Yes or No).



   (a) ε
   (b) *abaa*
   (c) *abbab*
   (d) *aaabbbabbsba*

2. Given the following nondeterministic finite automaton and strings, for each string indicate if the string is accepted by the automaton or not (Yes or No).



   (a) ε
   (b) *aaabb*
   (c) *abb*
   (d) *aaa*

3. For each of the following strings, answer Yes of no to the question of whether the string is a member of the language for the regular expression: $a^*(b \cup ba)^*a(b)^*$

   (a) ε

   (b) $abaa$

   (c) $baaba$

   (d) $bbbababb$

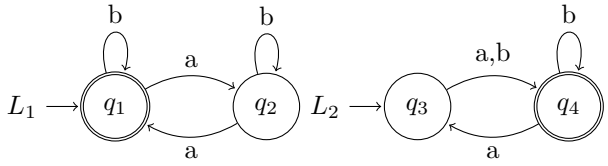
   (e) $baaabb$

4. Draw a DFA the accepts the language $\{\omega \mid \omega \in (a \cup b)^*,\ \omega$ starts with bb and ends with an $a.\}$.

5. Give a regular expression for the language $\{\omega \mid \omega \in (a \cup b)^*,\ \omega$ starts with 2 (or more) of the same character or ends with 2 or more b's (or both). $\}$.

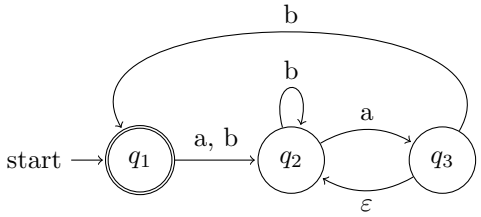
6. Let L_1 be the language accepted by the DFA in question 1. Give the DFA for $\overline{L_1}$ (i.e. the complement).

7. Given the following DFAs for languages L_1 and L_2, give the DFA for $L_1 \cap L_2$.



8. Using the construction from Kleene's Theorem, give the NFA for the regular expression $((a \cup b)^* \cup b^*a)$ (do EXACTLY as done in class - no simpltifications).

9. Convert the following NFA to a DFA.



10. Use the pumping lemma to prove $L = \{a^j b^2 j \mid j < 0\}$ is not regular.

11. Use the pumping lemma to prove $L = \{a^j b^i \mid i < 2j + 5\}$ is not regular.

12. Given the following GNFA, using the construction from Kleene's Theorem, find the regular expression for the GNFA by removing states q_1, q_2, and q_3 in that order.