

Homework One Theory of Computation 2022

Important Note:

Please remember that you should return your answer at 10/12 (Wednesday) 15:10 and your HW should be handwritten. We will take your HW during the class. After 10/12 15:10, you must upload your HW to moodle. But remember penalty for late submission: 20% per day.

Q1: For $\Sigma = \{a, b\}$, construct dfa's that accept the sets consisting of

- all strings with exactly one a,
- all strings with at least one a,
- all strings with at least one a and exactly two b's,
- all the strings with exactly two a's and more than two b's.

Q2: Find dfa's for the following languages on $\Sigma = \{a, b\}$.

- $L = \{w : |w| \bmod 5 \neq 0\}$.
- $L = \{w : |w| \bmod 3 \leq 0, |w| \neq 6\}$.

Q3: Let L be the language accepted by automaton in Figure 1. Find a dfa that accepts L^2 .

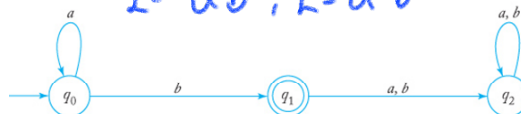


Figure 1: Automaton diagram.

Q4: Find a dfa that accepts the language defined by the nfa in Figure 2.

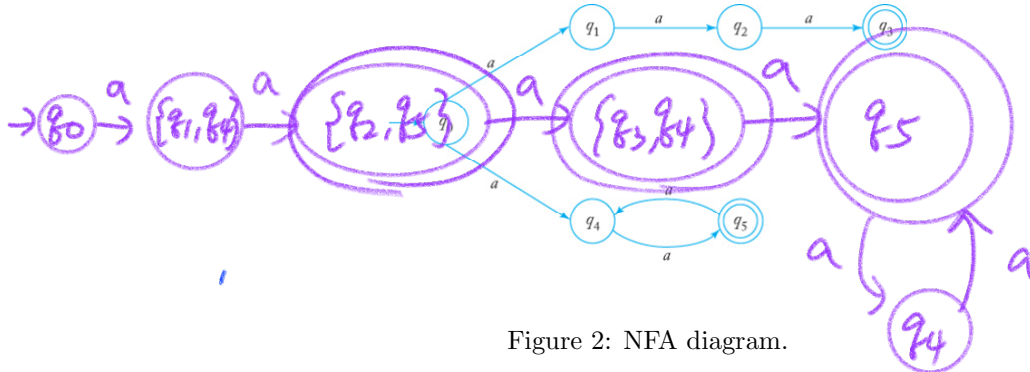


Figure 2: NFA diagram.

Q5: Design an nfa with no more than five states for the set $\{abab^n : n \geq 0\} \cup \{aba^n : n \geq 0\}$

Q6: Find an nfa with four states for $L = \{a^n : n \geq 0\} \cup \{b^n a : n \geq 1\}$.

Q7: Convert the following nfa into an equivalent dfa.

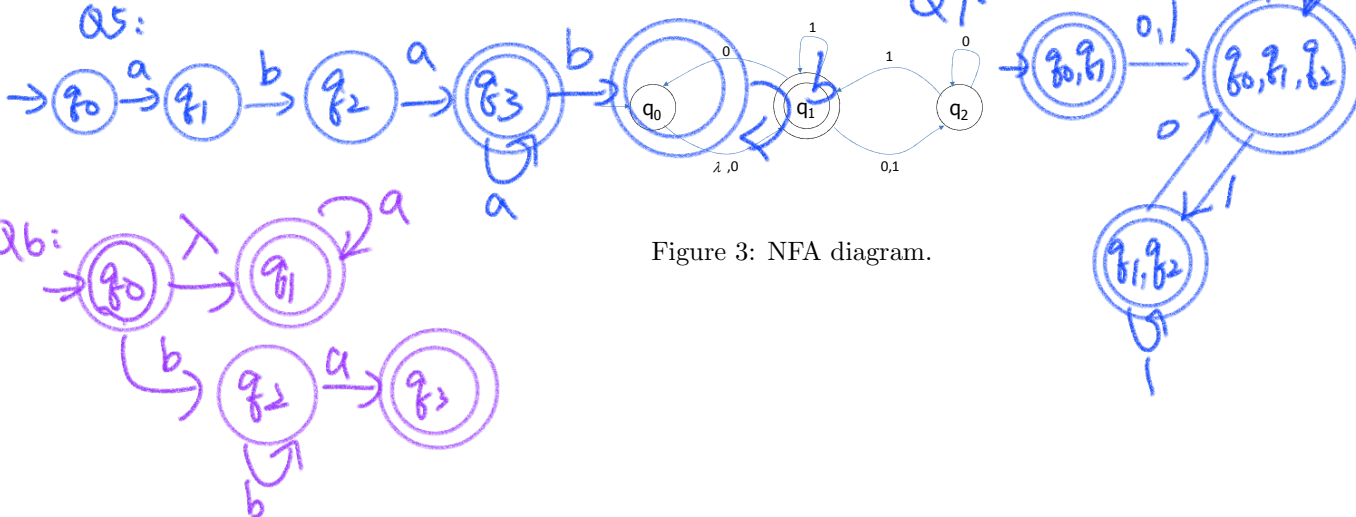


Figure 3: NFA diagram.