CS 181: Homework 1

Jonathan Woong

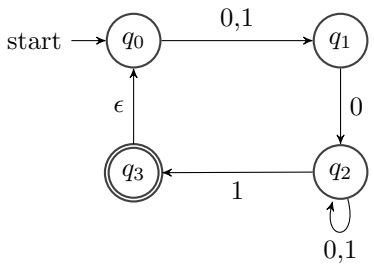
804205763

Summer 2017

Discussion 1A

Thursday 20$^{\text{th}}$ July, 2017

Problem 1. Given NFA N



find the language L(N) and build DFA DN equivalent to N.

state	ϵ-closure
$\{\emptyset\}$	$\{\emptyset\}$
$\{q_0\}$	$\{q_0\}$
$\{q_1\}$	$\{q_1\}$
$\{q_2\}$	$\{q_2\}$
$\{q_3\}$	$\{q_0, q_3\}$
$\{q_0, q_1\}$	$\{q_0, q_1\}$
$\{q_0, q_2\}$	$\{q_0, q_2\}$
$\{q_0, q_3\}$	$\{q_0, q_3\}$
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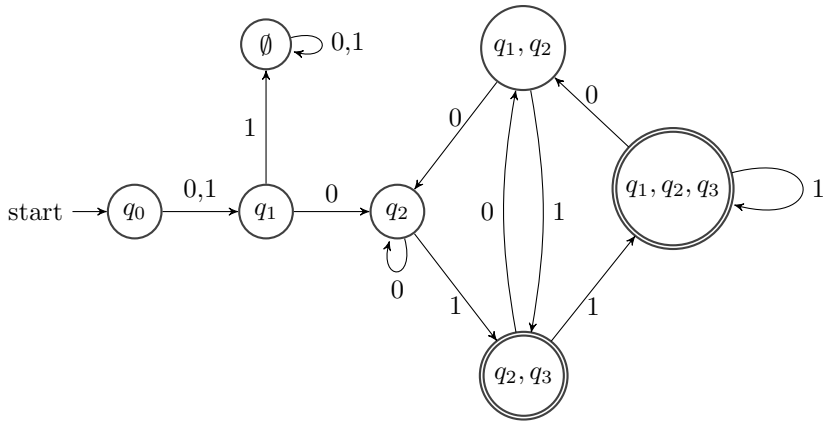


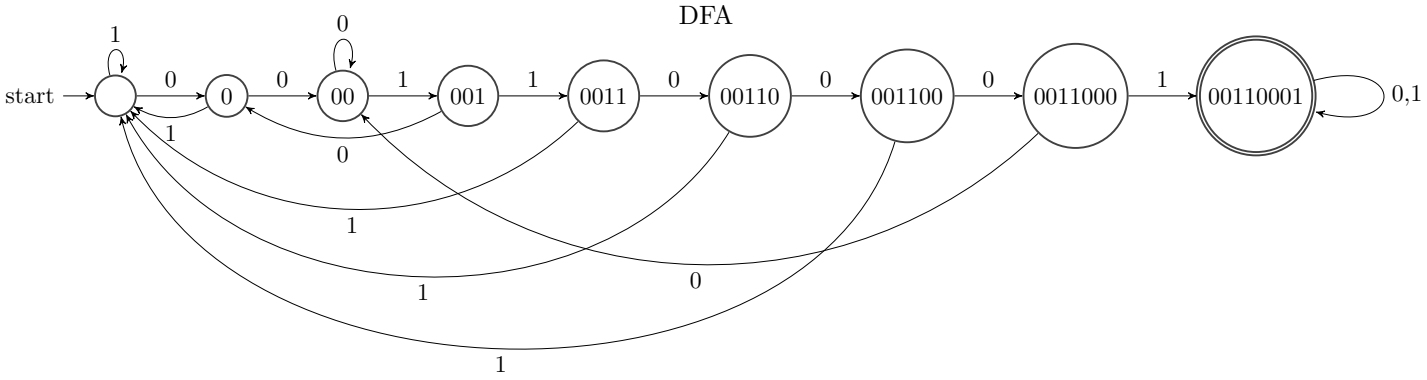
$$\boxed{\mathrm{L}(N) = \Big[(0 \cup 1)0(0 \cup 1)^*1\Big] \cup \Big[(0 \cup 1)0(0 \cup 1)^*1\Big]^*}$$

Problem 2. Build DFA D and NFA N such that L(D)=L(N), which consists of all binary strings that have substring 00110001.

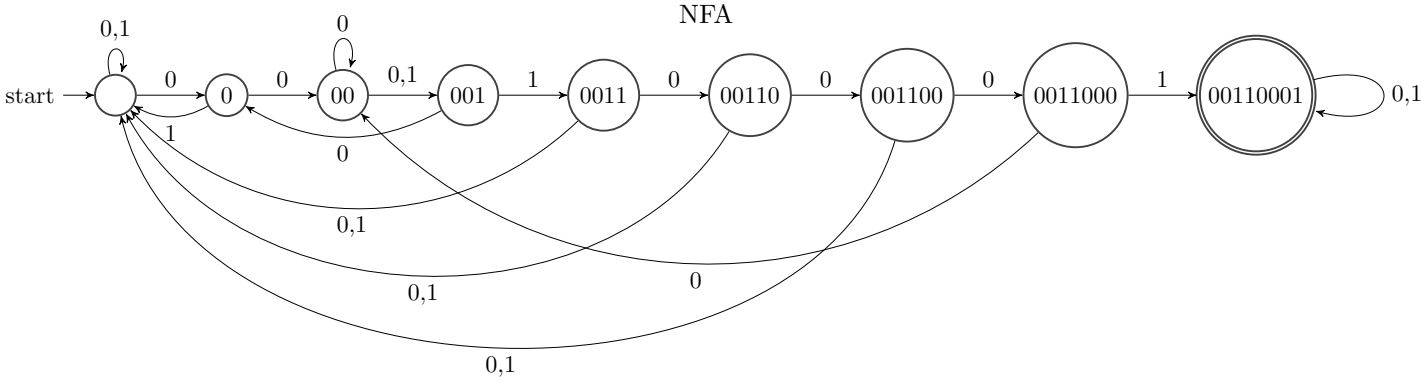
$$\Sigma = \{0, 1\}$$

$$\mathrm{L}(D) = \{x00110001y \mid x, y \in \Sigma^*\}$$

DFA

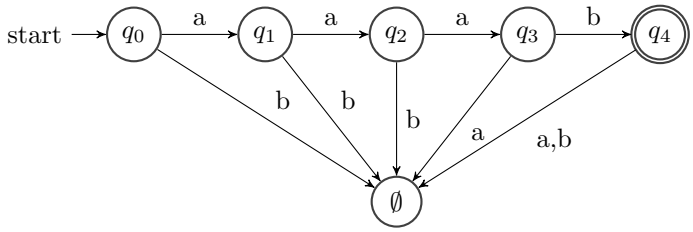


NFA



Problem 3. Find if the language $L = \{a^3b \ ; \ a, b \in \Sigma\}$ is regular and prove that your answer is correct.

The language L is regular because we can construct the following finite automata:



Here, the word $aaab$ is accepted by language L, and by definition, any language that is accepted by a finite automata (DFA or NFA) is also a regular language (Kleene-Myhill Theorem).