King Saud University
College of Computer and Information Sciences
Department of Computer Science

Theory of Computation (CSC 339) – Fall 2023
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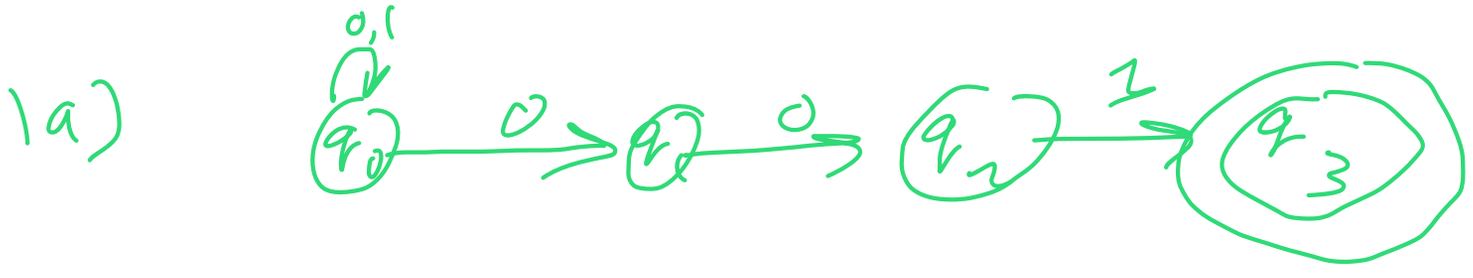
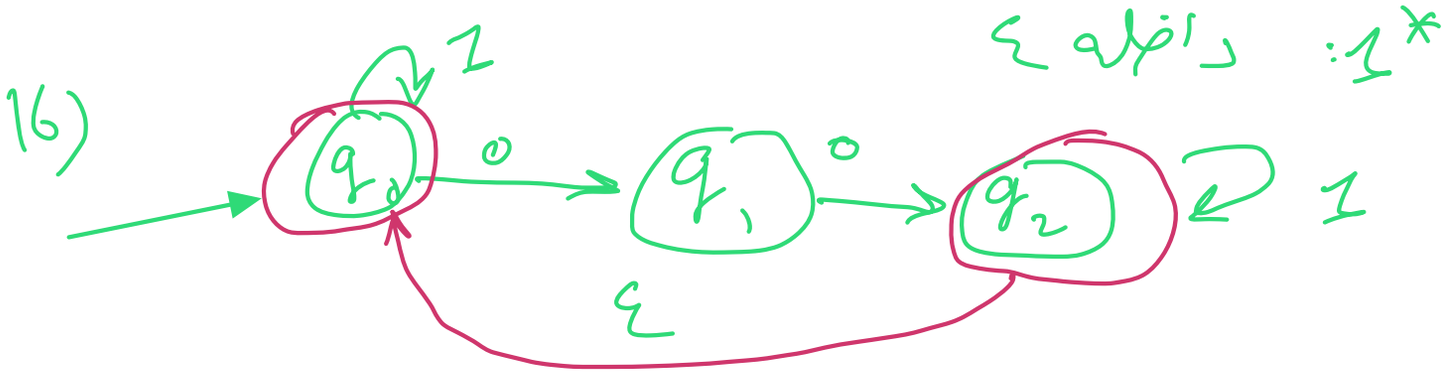
Tutorial 3: Nondeterministic Finite Automata

1. Give state diagrams of NFAs with the specified number of states recognizing each of the following languages. In all parts, the alphabet is $\Sigma = \{0, 1\}$.
   (a) The language $\{w | w$ ends with $001\}$ with four states.
   (b) The language $1^*(001^*)^*$ with three states.
   (c) The language ϵ with one state.
   (d) The language 0^* with one state.
   (e) The language $\{w | w$ is any string except 11 and 111$\}$.
2. Convert the NFAs obtained in the previous question to DFAs.
3. (3 points) Give the state diagrams of NFAs recognizing the concatenation and the star of the following languages. The alphabet is $\Sigma = \{0, 1\}$.
   (a) The language $\{w | w$ ends with $001\}$; The language $1^*(001^*)^*$.
   (b) The language ϵ with one state; The language 0^*.
4. Convert the following regular expressions to NFAs. The alphabet is $\Sigma = \{0, 1\}$.
   (a) $(0 + 1)^*000(0 + 1)^*$.
   (b) $(((00)^*(11)) + 01)^*$.
   (c) $\emptyset^*$





$(001^*)^* = \{\varepsilon, 00, 001, 001001, \dots\}$

$L = \{ 1^* (001^*)^* \}$

$1^* \rightarrow \varepsilon$ $\quad$ $(001^*)^* \rightarrow \varepsilon$

ملاحظة مهمة جدًا:

$(1)^*$: ممكن يكون ε

$(001^*)^*$: ممكن أي جزء داخل القوس يكون ε

في الـ Finite State : ε يعني لازم q_0 تكون accept state

1c)

$L = \{\varepsilon\}$

it is an NFA

1d)

$L = \{0^*\}$


q_0
Σ^*