KING SAUD UNIVERSITY COLLEGE OF COMPUTER AND INFORMATION SCIENCES Computer Science Department		
CSC 339 **Theory of Computation**	**Tutorial # 1** Deterministic Finite Automata (DFA)	**2^{nd} Semester 1443-2022**

Exercise 1

Find a possible alphabet $\boldsymbol{\Sigma}$ for the following languages:

1. The language **L = {oh, ouch, ugh}.**
2. The language **L = {apple, pear, 4711}.**
3. The language of all binary strings.

Note: a word ***foobar*** should be interpreted as a string of characters ***f, o, o, b, a, and r***.

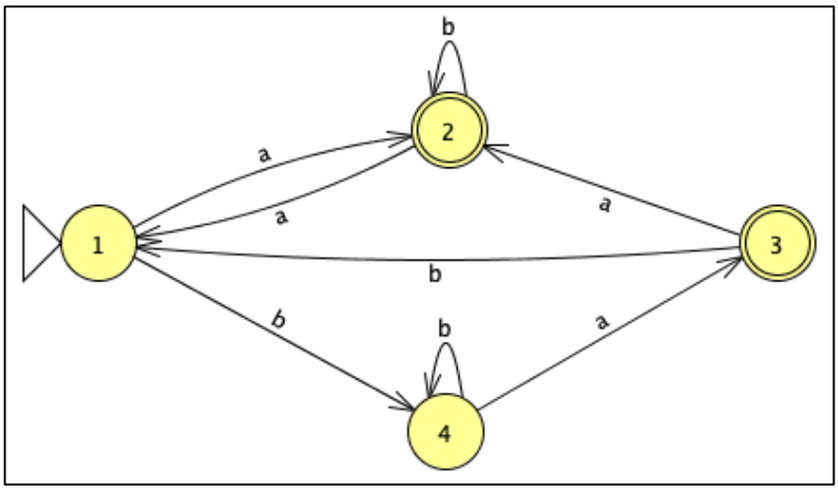
Exercise 2

Describe the result of applying the Kleene star operation $*$ over the following alphabets:

1. $\boldsymbol{\Sigma} = \{\mathbf{0}, \mathbf{1}\}$
2. $\boldsymbol{\Sigma} = \{\boldsymbol{a}\}$
3. $\boldsymbol{\Sigma} = \emptyset$ (the empty alphabet)

Exercise 3

Let $\boldsymbol{M}$ be the following DFA:



1. Write down four string accepted by $\boldsymbol{M}$ and the sequence of configurations that shows them.
2. Write down four strings not accepted by $\boldsymbol{M}$.

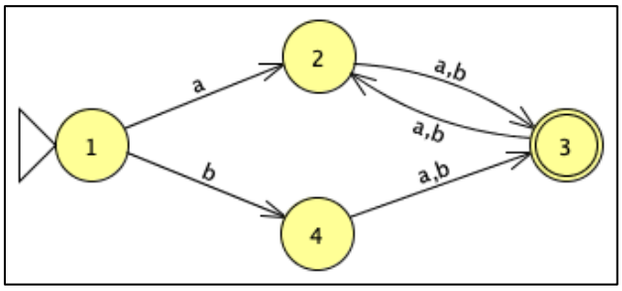
Exercise 4

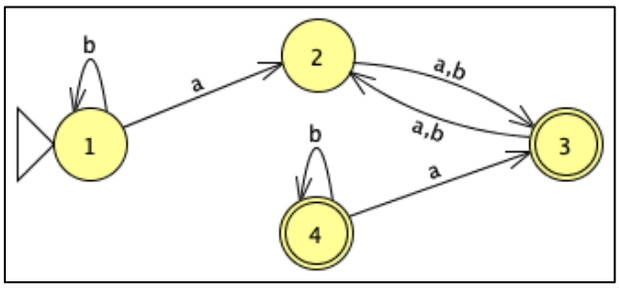
Let $\boldsymbol{\Sigma = \{0, 1\}}$; construct a DFA which accepts the following language:

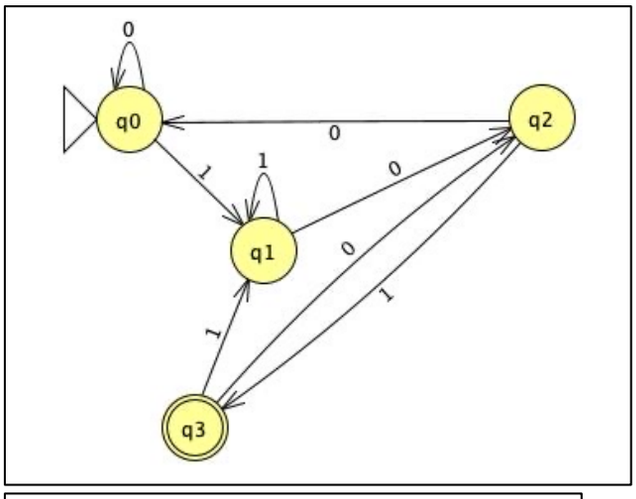
1. $\boldsymbol{L = \{w \mid w \in \Sigma^* \wedge w \text{ contains the substring } 0101\}}$. That is, $\boldsymbol{w = x0101y}$ for two arbitrary strings $\boldsymbol{x}$ and $\boldsymbol{y}$.

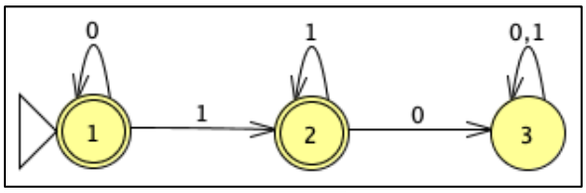
Exercise 5

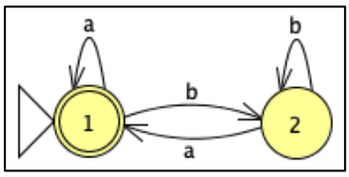
Which languages are accepted by the following automata?

1. 

2. 

3. 

4. 

5. 

Exercise 6

Consider the alphabet $\boldsymbol{\Sigma = \{a, b\}}$; give a DFA for each of the following languages:

1. All strings that end with $\boldsymbol{aa}$.
2. All strings that have **three** consecutives $\boldsymbol{a's}$ (i.e. contains the substring $\boldsymbol{aaa}$).
3. All strings without $\boldsymbol{aaa}$ as a substring.
4. All strings over the alphabet, where each string of length $\mathbf{5}$ contains **at least two** $\boldsymbol{a's}$.
5. The strings $\boldsymbol{\lambda}$, $\boldsymbol{aab}$ and $\boldsymbol{aaabab}$.