# DatZ 1037 – Practical Assignment 3
# Autumn 2019
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- *Due date is* ***Monday, December 09, 2019***
- *Please send your program including the source code by e-mail to 'abuzer@lu.lv'*
- ***Demo session*** *is during the class on Tuesday, December 10, 2019.*
- *Your submission is considered as* ***incomplete*** *if you do not make a demo of your program.*
- *You can work as a group of two people.*

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**Task:** Write a computer program that takes

- *the description of a binary nondeterministic finite automaton* and
- *a list of binary strings*,

and then

- <u>outputs the decision of the automaton on each input.</u>

**Details:**

1) You can use *C++* or *Javascript with HTML*.

If you use *C++*, then the input of your program are received from a text file or console (copy-paste from the text file).

If you use *Javascript with HTML*, then the input of your program are received from the text boxes on the HTML file (copy-paste from the text file).

The output of your program can be written on a text file or written on the screen (console or visual environment).

2) The input alphabet is fixed as $\Sigma = \{a, b\}$.

3) The description of an automaton will be in the following format:

$$m\#A\#T0\#T1\#T2,$$

where

- $m$ is the number of states and it is always assumed that the states are labelled as s1,s2,...,sm and s1 is the starting state;
- $A$ is the list of the accepting state(s), e.g., s3 or s5,s7,s13;
- $T0$ is the list of transitions rules without reading any symbol ($\varepsilon$-transitions), $T1$ is the list of transitions rules when reading symbol $a$, and $T2$ is the list of transitions rules when reading symbol $b$:
  - There might be no transition rule, one transition rule, or several transition rules separated by comma.
  - Each transition rule can be either of the form

    s3->s5

    when there is a single transition or

    s3->s5;s7;s8

    when there are more than one transition.

4.a) Example 1: The description of an automaton recognizing the language

$$\mathtt{L_1} = \{w \mid \text{ the length of } w \text{ is a multiple of 3 or 4}\}$$

is given below:

8#s2,s5#s1->s2;s5#s2->s3,s3->s4,s4->s2,s5->s6,s6->s7,s7->s8,s8->s5#s2->s3,s3->s4,s4->s2,s5->s6,s6->s7,s7->s8,s8->s5

If the inputs are as follow:
a
ab
bbb
baaa
ababa
aaaaab
bbaabbb

then, the outputs should be as follows:
a REJECTED
ab REJECTED
bbb ACCEPTED
baaa ACCEPTED
ababa REJECTED
aaaaab ACCEPTED
bbaabbb REJECTED

4.b) Example 2: The description of an automaton recognizing the language

$$\mathtt{L_2} = \{w \mid \text{the second symbol of } w \text{ from the end is } b\}$$

is given below:

3#s3##s1->s1,s2->s3,s3->s1#s1->s2,s2->s2;s3,s3->s2

If the inputs are as follow:
a
b
ab
ba
aab
abab
abaaba
ababab
baaabba
abbbbbaa

then, the outputs should be as follows:
a REJECTED
b REJECTED
ab REJECTED
ba ACCEPTED
aab REJECTED
abab REJECTED
abaaba ACCEPTED
ababab REJECTED
baaabba ACCEPTED
abbbbbaa REJECTED

4.c) Example 3: The description of an automaton recognizing the language

$$\mathtt{L_3} = \{w \mid \text{the third symbol of } w \text{ from the end is } b\}$$

is given below:

4#s4##s1->s1,s2->s3,s3->s4,s4->s1#s1->s2,s2->s2;s3,s3->s2;s4,s4->s2

If the inputs are as follow:
abb
baa
abab

aabb
aaabaa
bbbaaa
abababb
aaaaabaa
bbbbbaab
baabaabaa
baabaaaabb
aaaaaaaaba
bbbbbbbabaa

then, the outputs should be as follows:
abb REJECTED
baa ACCEPTED
abab ACCEPTED
aabb REJECTED
aaabaa ACCEPTED
bbbaaa REJECTED
abababb REJECTED
aaaaabaa ACCEPTED
bbbbbaab REJECTED
baabaabaa ACCEPTED
baabaaaabb REJECTED
aaaaaaaaba REJECTED
bbbbbbbabaa ACCEPTED