Faculty of Mathematics and informatics
Computer science department
Level: L2
Course: Theory of computation
A/Y: 2025/2026

TD Series N°4

Exercice1

Let the grammar G has the following rewriting rules:

$$P = (S \to abS|abcA; A \to \varepsilon)$$

- Does G regular? Does G k-grammar?
- If not transform G to k-grammar.

Exercise2

Le Σ is a finite alphabet set:

- Prove that each finite language on the alphabet Σ is a regular language (use previously studied properties).

Exercise3

Let the following two regular expressions:

$$R1 = (0^*10)^*$$
$$R2 = (0 + (11)^*)^*$$

- Give set of words generated by R1
- Give set of words generated by R2
- check if the word **10100010** is generated by R1
- check if the word **01110110** is generated by R2

Exercise4

Let $A = \{0, 1\}$ be an alphabet

Give the regular expression for each of the following languages:

- Language of words contain at least one 0.
- Language of words having even length.
- Language of words where each 0 followed by 1
- Language of words ending in 00
- Language of words start and finish by the same alphabet
- Language of words composed from 0 and 1 alternatively.
- Language of words having at least 3 occurrences of 0

Exercise5

Specify in natural language then formally, the language specified by each regular expression:

- $(\boldsymbol{aa})^*$
- $\boldsymbol{a}(\boldsymbol{aa})^*$
- $(\boldsymbol{b}^*(\boldsymbol{aaa})^*\boldsymbol{b}^*)^*$
- $(\boldsymbol{a}+\boldsymbol{b})^*\boldsymbol{abb}+(\boldsymbol{a}+\boldsymbol{b})^*\boldsymbol{baa}$

Exercise6

Let L be a language defined by:

$$\boldsymbol{L}=\{\boldsymbol{a}^{\boldsymbol{n}}\boldsymbol{b}^{\boldsymbol{n}},\boldsymbol{n}\in\boldsymbol{N}\}$$

- Give a set of words belong to L
- Propose a formal grammar that generates L.
- Prove that L is not a regular language.(using pumping lemma).