

Linguaggi e Traduttori – Time: 2 hours

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13th of June 2022

Exercise 1 (3 points)

Consider the language $L = \{a^*a^n c^n | n > 0\} \cup \{a^k c^k a^* | k > 0\}$.

Write a non-ambiguous grammar that generates language L ; try to write a grammar of lowest level in the Chomsky classification (intending level 3 as minimum and 0 as maximum).

Classify the grammar according to the Chomsky hierarchy.

If possible, show the derivation tree for the string $aaacce$.

Exercise 2 (6 points)

Consider the grammar $G = (\{a, b, d\}, \{S, A, B, C\}, P, S)$, where

$$P = \begin{cases} S \rightarrow aAB \mid BAC. \\ A \rightarrow aAdA \mid \epsilon \\ B \rightarrow bAd \mid dCb \\ C \rightarrow dS \mid \epsilon \end{cases}$$

1. Classify the grammar according to the Chomsky hierarchy.
2. Is the grammar LL(1)? If so, write the parsing table of the recognizer PDA. If it is not LL(1), explain why.
3. If in the previous bullet you were able to obtain an automaton, write how such automaton recognizes the strings $ddabdb$ and $aadadb$ showing the evolution of the stack.

Esercizio 3 (4 punti)

Consider the language L generate by the regular expression

$$(a(b^* + b)^*a$$

Show an automaton for language L .

Is the automaton deterministic? If it is not, draw an equivalent deterministic automaton.