

ANKARA UNIVERSITY
COM364
AUTOMATA THEORY

Week 12

Example
Questions

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EXAMPLE QUESTION 1

Recall the CFG G_4 that we gave in Example 2.4. For convenience, let's rename its variables with single letters as follows.

$$\begin{aligned} E &\rightarrow E + T \mid T \\ T &\rightarrow T \times F \mid F \\ F &\rightarrow (E) \mid a \end{aligned}$$

Give parse trees and derivations for each string.

a. a

b. a+a

c. a+a+a

d. ((a))

EXAMPLE QUESTION 2

Give a context-free grammar (CFG) that generate the following language. The alphabet is $\{0,1\}$.

$\{w \mid \text{the length of } w \text{ is odd}\}$

EXAMPLE QUESTION 3

Let $G = (V, \Sigma, R, S)$ be the following grammar. $V = \{S, T, U\}$; $\Sigma = \{0, \#\}$; and R is the set of rules:

$$S \rightarrow TT \mid U$$

$$T \rightarrow 0T \mid T0 \mid \#$$

$$U \rightarrow 0U00 \mid \#$$

- a. Describe $L(G)$ in English.
- b. Prove that $L(G)$ is not regular.

EXAMPLE QUESTION 4

Convert the following CFG into an equivalent CFG in Chomsky normal form, using the procedure given in Theorem 2.9.

$$\begin{aligned} A &\rightarrow BAB \mid B \mid \epsilon \\ B &\rightarrow 00 \mid \epsilon \end{aligned}$$

EXAMPLE QUESTION 5

Consider the following CFG G :

$$\begin{aligned} S &\rightarrow SS \mid T \\ T &\rightarrow aTb \mid ab \end{aligned}$$

Describe $L(G)$ and show that G is ambiguous. Give an unambiguous grammar H where $L(H) = L(G)$ ~~and sketch a proof that H is unambiguous.~~

EXAMPLE QUESTION 6

Design pushdown automata (PDAs) that recognize the languages given in questions 5 and 3.