

CSE331 Assignment 4

Section 1

Deadline: 18th December, 2022 11:59 pm

Total Marks: 30

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Q1: Answer each of the following questions for the context-free grammar G.

$$\begin{aligned}R &\rightarrow XRX \mid S \\S &\rightarrow aTb \mid bTa \\T &\rightarrow XTX \mid X \mid \epsilon \\X &\rightarrow a \mid b\end{aligned}$$

- What are the variables of G?
- What are the terminals of G?
- Give three strings that are in $L(G)$. [$L(G)$ means the language recognized by the grammar G]
- Give three strings that are not in $L(G)$.
- Convert the given CFG into an equivalent CFG in Chomsky Normal Form.

Q2: Write CFG that generate the following languages.

- $\{w \mid w \text{ contains even number of 0s but odd number of 1s}\}$
- $\{w \mid w \text{ has equal number of 0s and 1s}\}$
- $\{w \mid w \text{ has more 0s than 1s}\}$
- $\{w \mid w \text{ is a palindrome}\}$
- $\{w \mid w \text{ is not a palindrome}\}$
- $\{w \mid w \text{ has exactly one more 0 than the number of 1s}\}$

Q3: Convert the following CFG into CNF.

- S, T, and U are the variables and 0 and # are the terminals.

$$\begin{aligned}S &\rightarrow TT \mid U \\T &\rightarrow 0T \mid T0 \mid \# \\U &\rightarrow 0U00 \mid \#\end{aligned}$$

- A and B are the variables and 0 is the only terminal.

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

c) R, S, and T are variables and a and b are two terminals.

$$R \rightarrow S \mid T$$

$$S \rightarrow aSb \mid ab$$

$$T \rightarrow aTbb \mid abb$$

Q4: Consider the following CFG, G:

$$S \rightarrow SS \mid T$$

$$T \rightarrow aTb \mid ab$$

Show that G is ambiguous. Find a string of length 8 which will have only one leftmost derivation or parse tree.