

TUTORIAL 7

119CS012

1. $S \rightarrow aAb \mid \epsilon$

$A \rightarrow aAb \mid \epsilon$

For the given grammar, find out the terminals and start symbols.

Terminals $\Rightarrow \{a, b, \epsilon\}$

Non-terminals $\Rightarrow \{S, A\}$

Start symbol $\Rightarrow \{S\}$

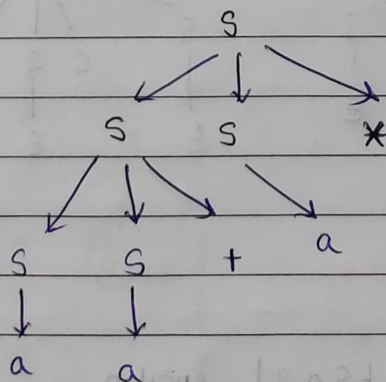
2. Consider the context free grammar

$S \rightarrow SS+ \mid SS* \mid a$

a) Show how the string $aa+a^*$ can be generated by the grammar.

$S \rightarrow SS^* \rightarrow SS+S^* \rightarrow aS+S^* \rightarrow aa+S^* \rightarrow aa+a^*$

b) Construct a parse tree for the string.



c) What language does this grammar generate? Justify your answer.

$L = \{ \text{Postfix expression of digit, plus and multiply signs} \}$

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3. > What language is generated by the following grammars? In each case justify your answer.

a) $S \rightarrow OS1 \mid O1$

$\Rightarrow L = \{ 0^n 1^n \mid n \geq 1 \}$

Grammar is not ambiguous

b) $S \rightarrow +SS \mid -SS \mid a$

$\Rightarrow L = \{ \text{Prefix expression consisting of plus and minus signs} \}$

Grammar is not ambiguous

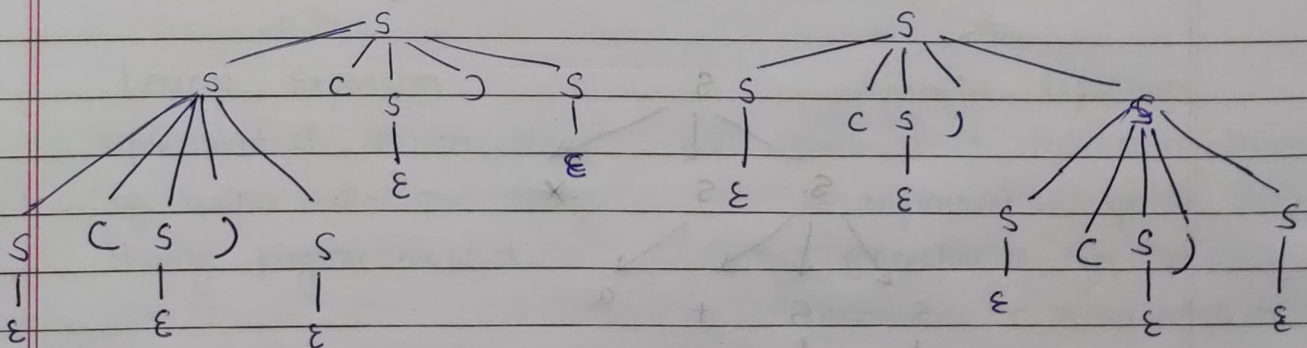
[Extra]

$S \rightarrow S(S)S \mid \epsilon \mid *22 \mid +22 \leftarrow ?$

$\Rightarrow L = \{ \text{string with equal number of a and b, also includes} \}$
 $\{ \text{Matched brackets of arbitrary arrangement \& nesting, includes } \epsilon \}$

The above grammar is Ambiguous, "it generates two parse tree for

$\Rightarrow S(S)S(S)S$



c) $S \rightarrow aSbS \mid bSas \mid \text{epsilon}$

$L = \{ \text{string has the same amount of a and b,} \}$

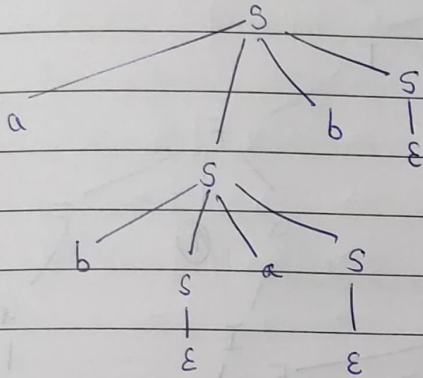
includes ϵ

To check

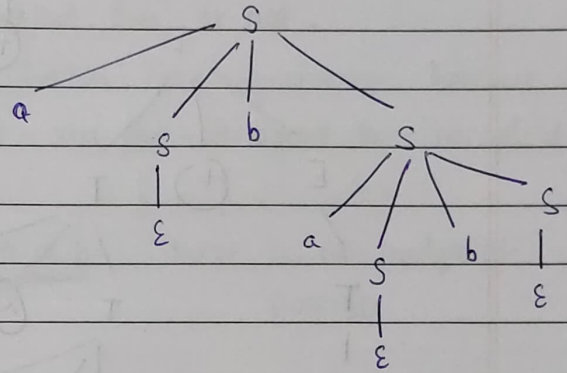
Grammar \rightarrow

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let us consider string $w = abab$
 Parse tree (s) for 'w' —



Parse tree 1



Parse tree 2

Thus, two parse tree exist for same grammar, thus, the
 Grammar is Ambiguous

Draw parse tree for the string

4. $E \rightarrow E + T / E - T / T$

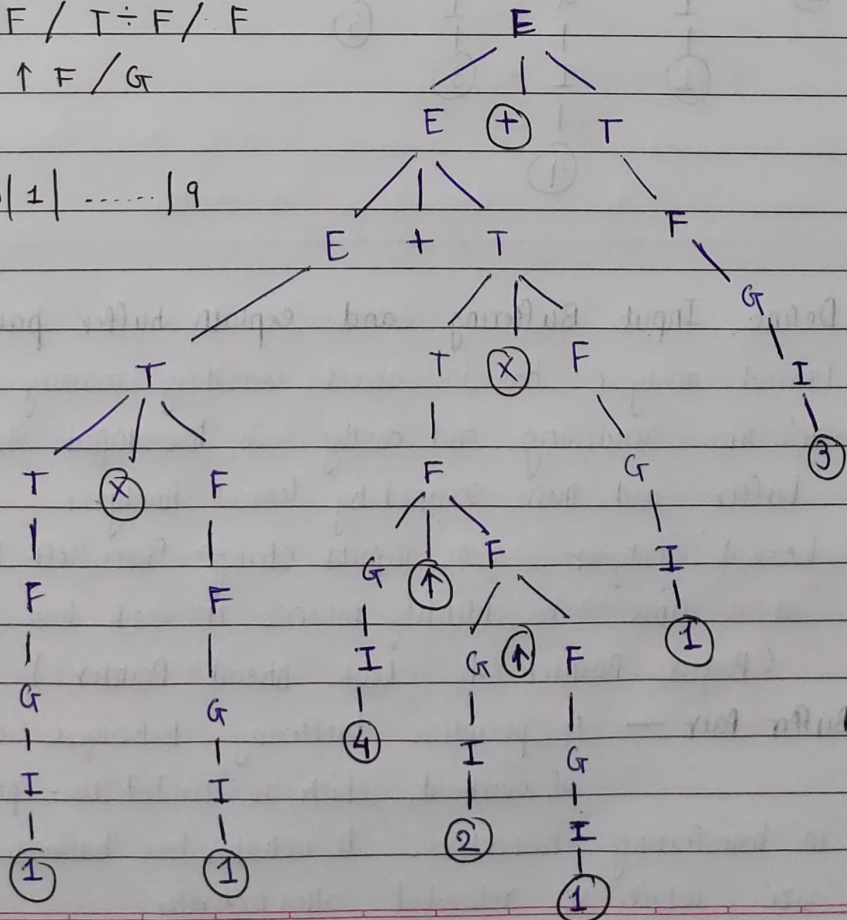
① $2 \times 1 + 4 \uparrow 2 \uparrow 1 \times 1 + 3$

$T \rightarrow T \times F / T \div F / F$

$F \rightarrow G \uparrow F / G$

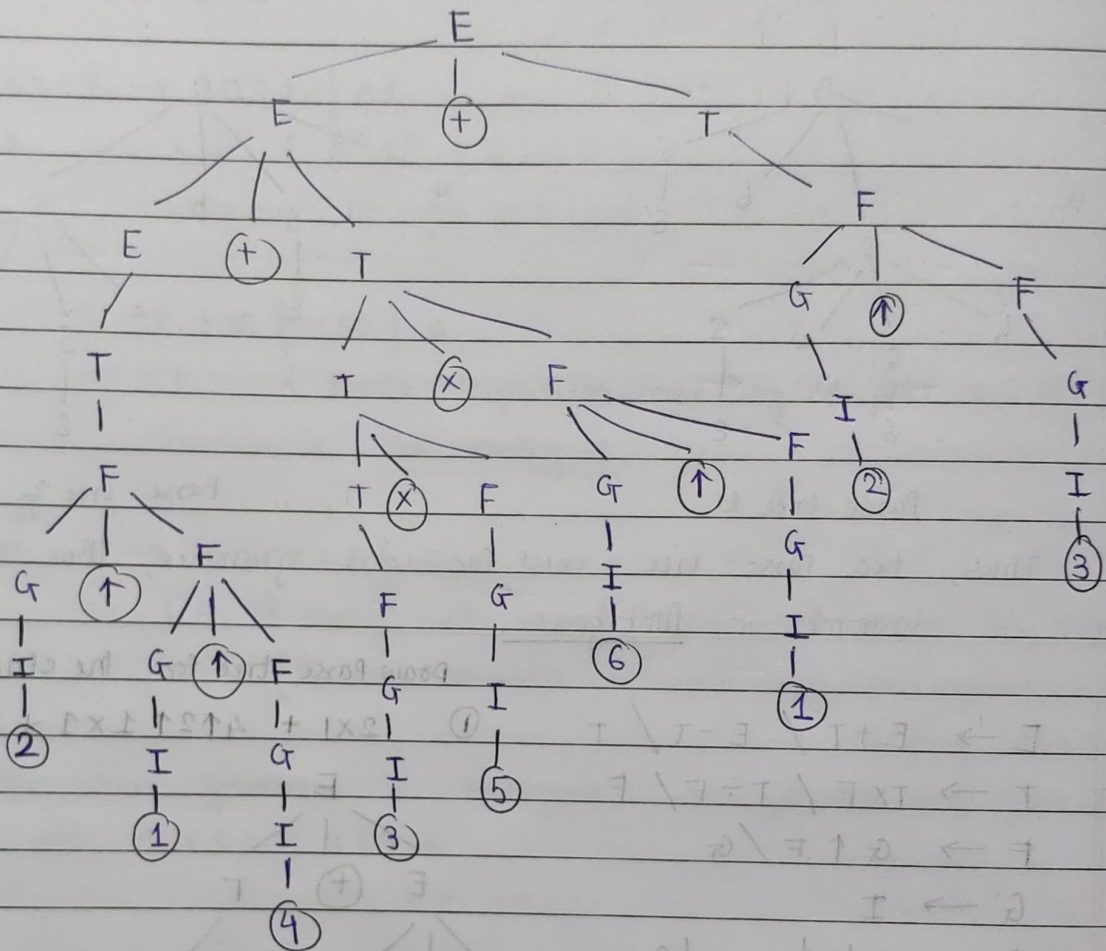
$G \rightarrow I$

$I \rightarrow 0 | 1 | \dots | 9$



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(2) $2 \uparrow 1 \uparrow 4 + 3 \times 5 \times 6 \uparrow 1 + 2 \uparrow 3$



5. Define Input Buffering and explain buffer pair. tokens

6. Lexical analyser has to access secondary memory each time to identify [^] tokens. It's time consuming and costly. So, the input strings are stored into buffer and then scanned by lexical analyser.

Lexical analyser scans input string from left to right one character at a time to identify tokens. It uses two pointers to scan tokens (Begin Pointer & Look Ahead Pointer).

Buffer Pair — A specialized buffering technique can decrease the amount of overhead, which is needed to process an input character in transferring characters. It includes two buffers, each includes N-character size which is reloaded alternately.