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CSE-B

TOC Assignment - 2

(1)

$S \rightarrow aAS \mid b$

$A \rightarrow SbA \mid ba$

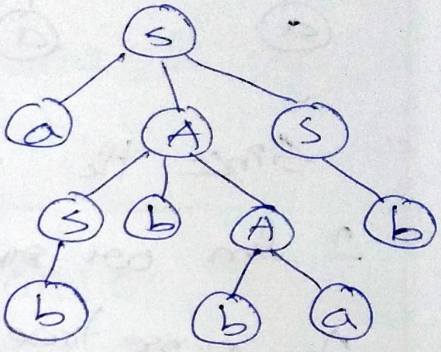
$S \Rightarrow aSbAS$

$S \Rightarrow abbAS$

$S \Rightarrow abbbas$

$S \Rightarrow abbbab$

Parse tree



(2)

$S \rightarrow SbS \mid a$, String = ababa.

Derivations

$S \Rightarrow SbS$

$\Rightarrow SbSbS$

$\Rightarrow abSbS$

$\Rightarrow ababS$

$\Rightarrow ababa$

$\Rightarrow abSbS$

$\Rightarrow abSba$

$\Rightarrow ababa$

$S \Rightarrow SbS$

$\Rightarrow SbSbS$

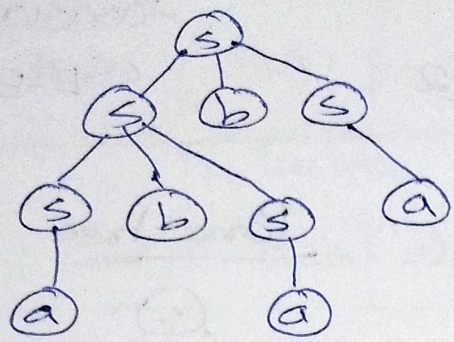
$\Rightarrow SbSba$

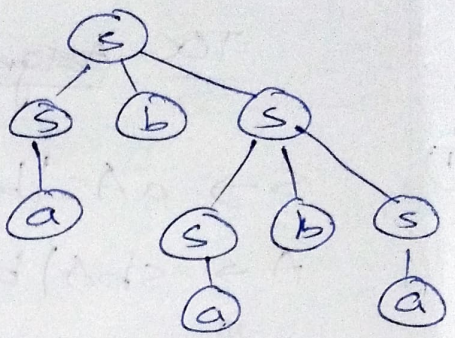
$\Rightarrow SbaSba$

$\Rightarrow abaSba$

$\Rightarrow abaaba$

Parse tree





Since the string ababa has more than 1 lm or rm derivation or more than 1 parse tree, then G is ambiguous grammar.

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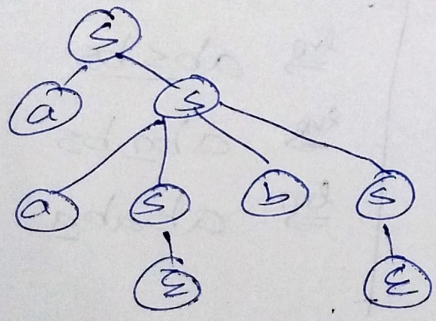
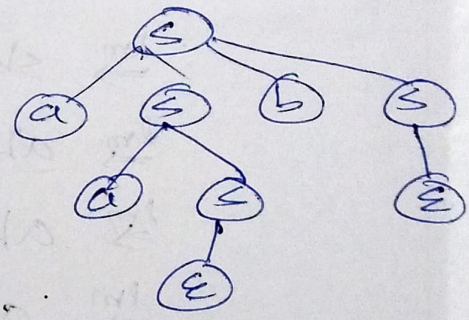
(3) $S \to aS \mid aSbS \mid \varepsilon$, string: aab

(a) parse trees





(b) lm derivation:

$S \underset{lm}{\Rightarrow} aS$

$\underset{lm}{\Rightarrow} aaSbS$

$\underset{lm}{\Rightarrow} aa\varepsilon bS$

$\underset{lm}{\Rightarrow} aab\varepsilon$

$\underset{lm}{\Rightarrow} aab$

$S \underset{lm}{\Rightarrow} aSbS$

$\underset{lm}{\Rightarrow} aaSbS$

$\underset{lm}{\Rightarrow} aa\varepsilon bS$

$\underset{lm}{\Rightarrow} aab\varepsilon$

$\underset{lm}{\Rightarrow} aab$

(c) rm derivation:

$S \xRightarrow{rm} aS$

$\xRightarrow{rm} aaSbS$

$\xRightarrow{rm} aaSb\varepsilon$

$\xRightarrow{rm} aa\varepsilon b$

$\xRightarrow{rm} aab$

$S \xRightarrow{rm} aSbS$

$\xRightarrow{rm} aSb\varepsilon$

$\xRightarrow{rm} aaSb$

$\xRightarrow{rm} aa\varepsilon b$

$\xRightarrow{rm} aab$

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(4)

$S \rightarrow A1B$ string = 00101

$A \rightarrow 0A \mid \varepsilon$

$B \rightarrow 0B \mid 1B \mid \varepsilon$

(a) leftmost derivation:

$S \xRightarrow{lm} A1B$

$\xRightarrow{lm} 0A1B$

$\xRightarrow{lm} 00A1B$

$\xRightarrow{lm} 00\varepsilon 1B$

$\xRightarrow{lm} 0010B$

$\xRightarrow{lm} 00101B$

$\xRightarrow{lm} 00101\varepsilon$

$\xRightarrow{lm} 00101$

(b) rightmost derivation

$S \xRightarrow{rm} A1B$

$\xRightarrow{rm} A10B$

$\xRightarrow{rm} A101B$

$\xRightarrow{rm} A101\varepsilon$

$\xRightarrow{rm} 0A101$

$\xRightarrow{rm} 00A101$

$\xRightarrow{rm} 00\varepsilon 101$

$\xRightarrow{rm} 00101$

(5) CFG for $L = \{a^n b^n \mid n \in z^+\}$

$G = (\{S\}, \{a, b\}, P, S)$

Production rules P

$S \rightarrow aSb \mid ab \mid \varepsilon$

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(6) $\Sigma = \{a, b, (,), +, *, \cdot, \varepsilon\}$

CFG for Σ^* that are regular expression over alphabet $\{a, b\}$

$G = (\{S, A\}, \{a, b, (,), +, *, \cdot, \varepsilon\}, P, S)$

Production rules P

$S \rightarrow aA / bA / (S) A$

$A \rightarrow +S / \cdot S / *S / * / \varepsilon$