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Course: CSE 331

Section: 08

Assignment: 4

Ans to the Q: N: 1

$a^n b^m c^k d^k e^m f^n$; where $n, m, k \geq 0$

cfg:

$S \rightarrow a S f \mid b S e \mid c S d \mid \epsilon$ (AM)

Ans to the Q: N: 2

$a^n b^m c^m d^k e^k f^n$; $n \geq 0$, $m \geq 1$, $k \geq 2$

cfg: $S \rightarrow A B \mid a S f$

$A \rightarrow b A c \mid b c$

$B \rightarrow ddd B eee \mid dd B ee \mid ddee \mid dddeee$

variables: A, B

Terminators: a, b, c, d, e, f

Ans to the Q: N: 3

The number of 0s is greater than the number of 1's.

Variables: A

Terminals: 0, 1

CFG:

$S \rightarrow AOA$

$A \rightarrow OA \mid OA1 \mid 1A0 \mid \epsilon$ (Ans)

Ans to the Q: N: 4

$a^m b^n$; $m > 2n$ and $m, n \geq 1$

CFG: $S \rightarrow aaaXb$

$X \rightarrow aaXb \mid aX \mid \epsilon$

variables: X

Terminal : a, b

Ans to the Q:N: 5

$a^n b a^m b a^{n+m}$; $n, n > 1$

$\rightarrow a^n b a^n b a^m a^n$

Here, ~~total~~ number of a's in the beginning and the end is ~~are~~ same.

cfg:

$S \rightarrow abAa \mid aSa$

$A \rightarrow aba \mid aAa$

Variable: ~~A~~

Terminal: a, b

Ans to the Q: N: 6

(a)

$S \rightarrow aSc \mid X$

$X \rightarrow bXc \mid \epsilon$

Left most parse tree for 'aaabbccccc':

$S \rightarrow aSc$

$S \rightarrow aaScc$

~~$S \rightarrow aaaSccc$~~

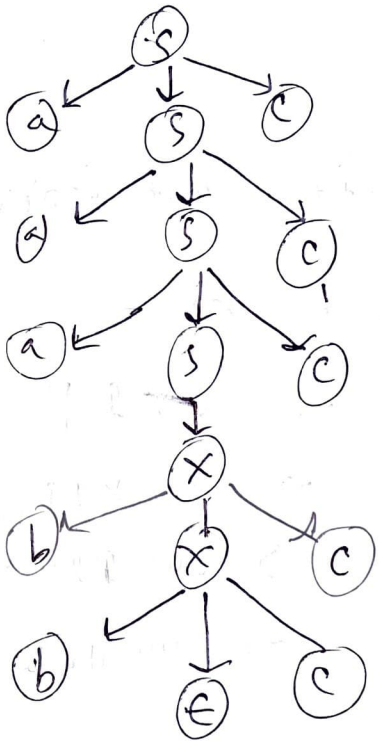
$S \rightarrow aaaScccc$

$S \rightarrow aaaXccc$

$S \rightarrow aaabXcbccc$

$S \rightarrow aaabbXccccc$

$S \rightarrow aaabbccccc$



(b)

$S \rightarrow aSc \mid X$

$X \rightarrow bXc \mid \epsilon$

· Right most parse tree for 'aaabbccccc

$S \rightarrow aSc$

$S \rightarrow aaScc$

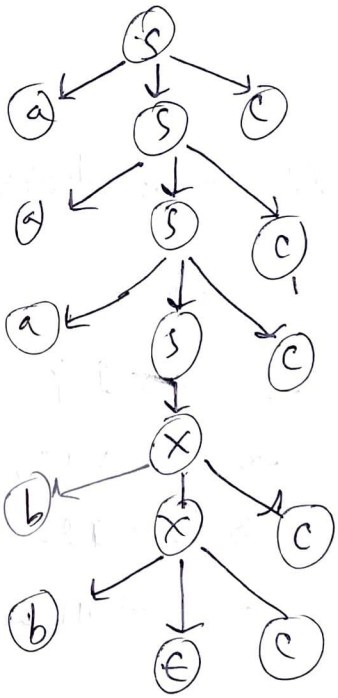
$S \rightarrow aaaScccc$

$S \rightarrow aaaXccc$

$S \rightarrow aaabXccc$

$S \rightarrow aaabbXccccc$

$S \rightarrow aaabbccccc$



This is the same tree as the Left most parse tree.

Ans to the Q. No. 2

$S \rightarrow XY \mid MN$

$X \rightarrow 0X1 \mid 01$

$Y \rightarrow 2Y \mid 2$

$M \rightarrow 0M \mid 0$

$N \rightarrow 1N2 \mid 12$

(a)

Left most derivation of '000111222'.

$S \rightarrow XY$

$\rightarrow 0X1Y$

$\rightarrow 00X11Y$

$\rightarrow 000111Y$

$\rightarrow 000111222$ (Ans)

(b)

Right most Derivation of 0001112

$S \rightarrow XY$

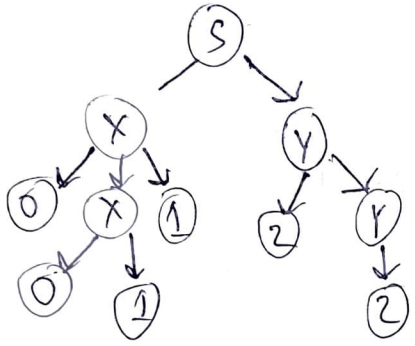
$\rightarrow X2$

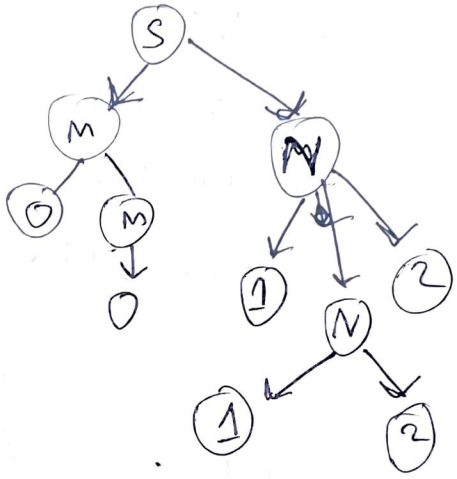
$\rightarrow 0X12$

$\rightarrow 00X112$

$\rightarrow 000 1112$ (A → ε)

Let's take a sample input 001122 and draw it's parse tree using the grammar.





So, for the same string 001122, there can be two different parse trees.

∴ The grammar is ambiguous.