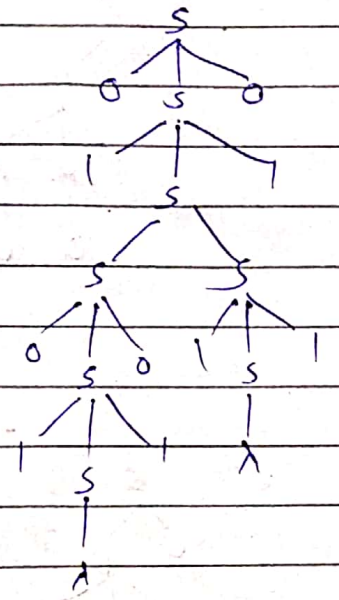
Roll No. 17103011

ToC Assignment-3

① $S \rightarrow 0S0 \mid 1S1 \mid SS \mid \wedge$

String = 0101101110

Leftmost der. tree =>



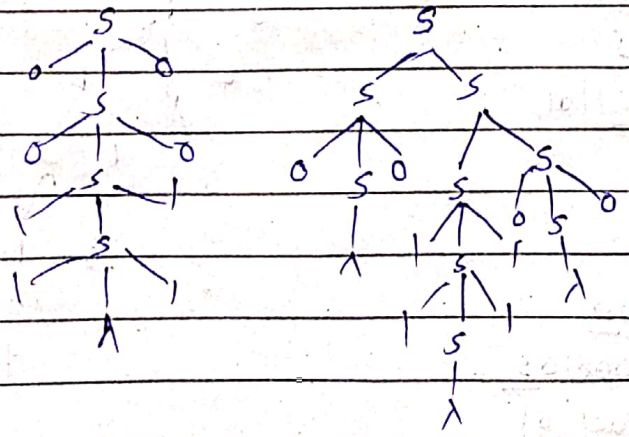
$S \rightarrow 0\underline{S}0 \rightarrow 01\underline{S}10 \rightarrow 01\underline{SS}10$
$\rightarrow 0101\underline{S}10S10 \rightarrow 0101\underline{S}10S10$
$\rightarrow 01011\underline{0S}10 \rightarrow 0101101\underline{S}110$
$\rightarrow 0101101110.$

Right most derivation tree

$S \rightarrow 0\underline{S}0 \rightarrow 01\underline{S}10 \rightarrow 01\underline{SS}10 \rightarrow 01S1\underline{S}110$
$\rightarrow 01\underline{S}1110 \rightarrow 010\underline{S}01110 \rightarrow 0101\underline{S}01110$
$\rightarrow 0101101110$

the tree is same as left most derivation tree.

② For the given ~~grammar~~ string => 00111100



from above trees we can say that there can be ∞ trees possible

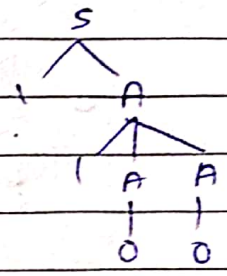
③ $S \rightarrow 0B \mid 1A$

$A \rightarrow 0 \mid 0S \mid 1AA$

$B \rightarrow 1 \mid 1S \mid 0BB$

for 1100 =>

Leftmost der: $S \rightarrow 1A \rightarrow 11AA \rightarrow 110A \rightarrow 1100$



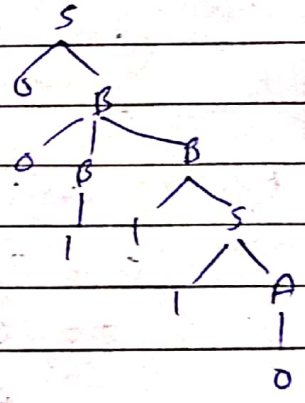
Rightmost =>

$S \rightarrow 1A \rightarrow 11AA \rightarrow 11A0 \rightarrow 1100$

String 001110 :

Leftmost der:

$S \rightarrow 0B \rightarrow 00BB \rightarrow 001B \rightarrow 0011S \rightarrow 00111A \rightarrow 001110$



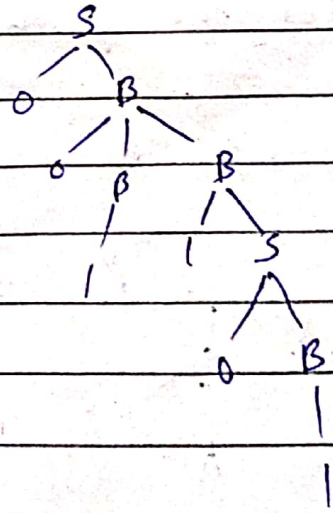
Rightmost der:

$S \rightarrow 0B \rightarrow 00BB \rightarrow 00B1S \rightarrow 00B11A \rightarrow 00B110 \rightarrow 001110$

String 00101:

Leftmost der:-

$S \rightarrow 0B \rightarrow 00BB \rightarrow 001B \rightarrow 0011S \rightarrow 00110B \rightarrow 00101$

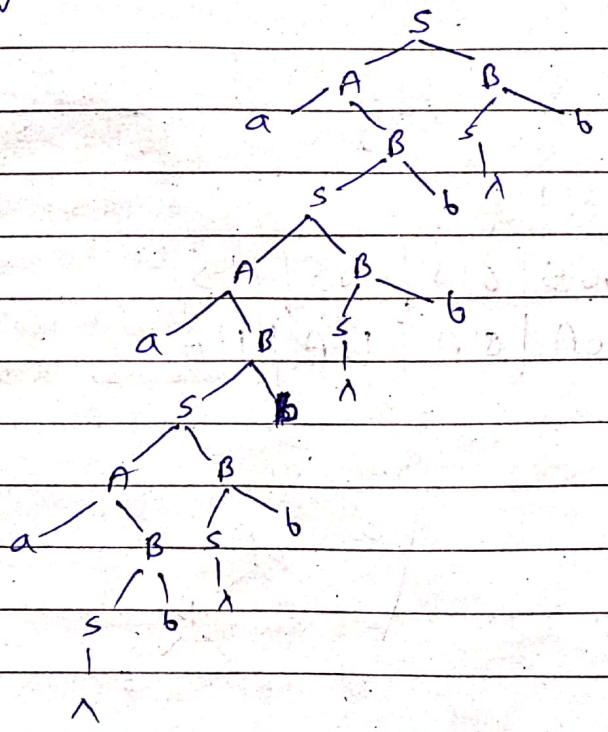


Rightmost der:-

$S \rightarrow 0B \rightarrow 00BB \rightarrow 00B1S \rightarrow 00B10B \rightarrow 00B101 \rightarrow 00101$

(9.) $S \rightarrow AB \mid \lambda$, $A \rightarrow aB$, $B \rightarrow Sb$

String = aaabbbbbb



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⑤ $L(G) = \{ w \mid \text{length}(w) = 3 \times \text{no. of } a\text{'s in } w \}$

P: $S \to aX \mid Xa \mid bA \mid Ab \mid CA \mid Ac \mid \epsilon$

$A \to aY \mid Ya \mid bB \mid Bb \mid CB \mid Bc$

$B \to aS \mid Sa$

$X \to bY \mid Yb \mid cY \mid Yc$

$Y \to bS \mid Sb \mid cS \mid Sc$

then G: $\{ \{S, A, B, X, Y\}, \{a, b, c\}, P, S \}$

here the productions in G has single nonterminals on the left side. So it is a context free grammer.