Context Free Grammar:

$$V \longrightarrow (V + T)^*$$

Example:

$$S \rightarrow AaSA \mid b$$
$$A \rightarrow a \mid \varepsilon$$

$S \rightarrow aA$

$aA \rightarrow aa$

not CFG

Derivation Techniques :

1) Left Most Derivation (LMD)

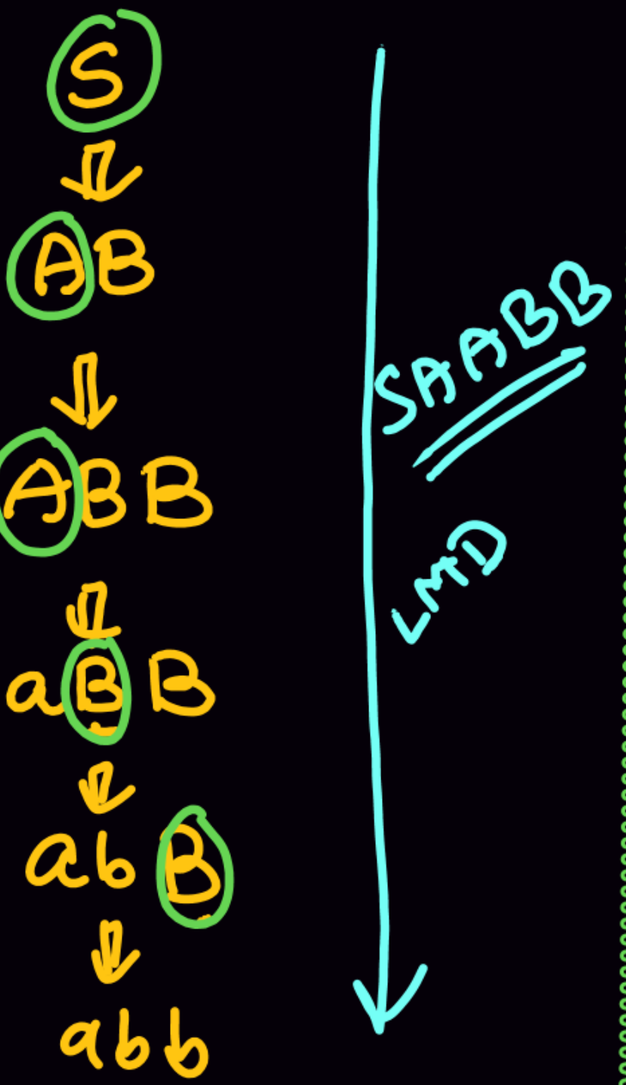
2) Right " " (RMD)

3) Parse Tree (Derivation Tree)

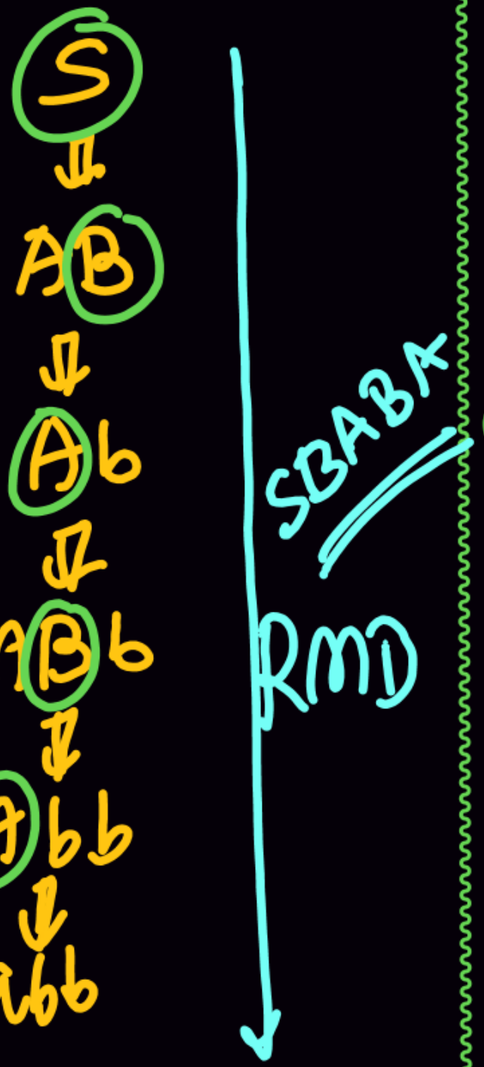
S → AB
A → AB | a
B → b

String:
"abb"

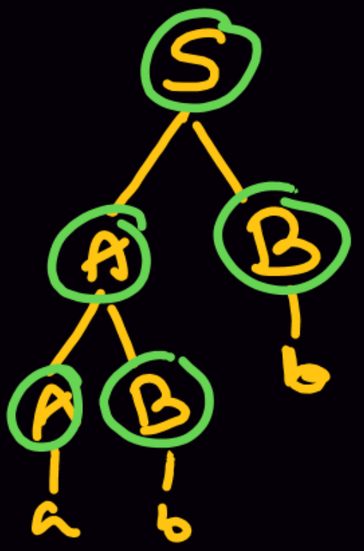
LMD



RMD



Parse Tree



Root: Start Symbol
Leaf: Terminal or ε
Non-leaf: Variable

1) $S \to Aa \mid Ba \mid b \mid a \mid \varepsilon$

$A \to \varepsilon$

$B \to \varepsilon$

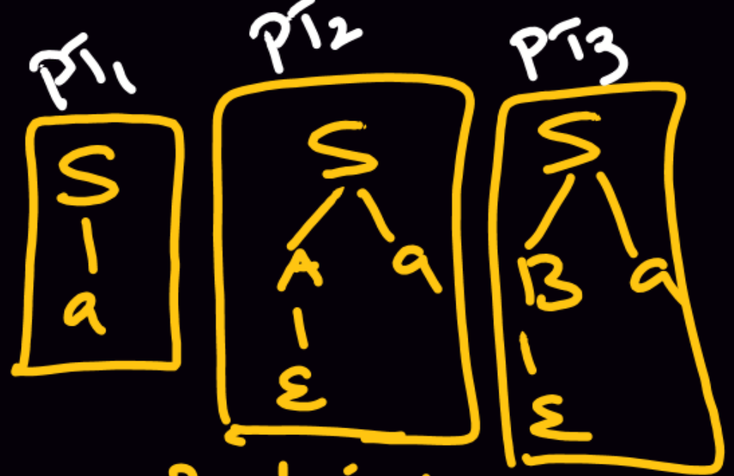
$W = a$

↳ No. of derivations = ?

No. of PT_S = ?

No. of LMD_S = ?

No. of RMD_S = ?



3 derivations

3 PT_S

3 LMD_S

3 RMD_S

LMD_1: $S \Rightarrow a$

RMD_1

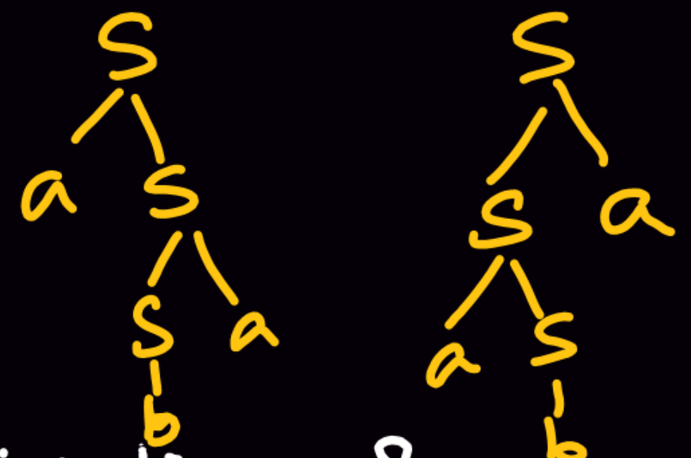
LMD_2: $S \Rightarrow Aa \Rightarrow \varepsilon a$

RMD_2

LMD_3: $S \Rightarrow Ba \Rightarrow \varepsilon a$

RMD_3

2) $S \to aS \mid Sa \mid b$



$w = aba$

↳ No. of derivations = ?

$= 2$

3) $S \to SS \mid \varepsilon$

$w = \varepsilon$ ⇒ No of derivations:

Infinite PTs

. . . .

Find CFL generated by following CFGs:

1) $S \to a \mid \varepsilon$

2) $S \to Sa \mid \varepsilon$

3) $S \to aS \mid \varepsilon$

4) $S \to Sa \mid a$

5) $S \to aS \mid a$

6) $S \to aS \mid bS \mid \varepsilon$

7) $S \to Sa \mid Sb \mid \varepsilon$

8) $S \to aS \mid bS \mid a \mid b$

9) $S \to Sa \mid Sb \mid a \mid b$

10) $S \to AB$
$A \to aA \mid \varepsilon$
$B \to bB \mid \varepsilon$

11) $S \to aSb \mid \varepsilon$

12) $S \to aSb \mid ab$

13) $S \to aSb \mid a$

14) $S \to aSb \mid b$

15) $S \to aSb \mid A$
$A \to cA \mid \varepsilon$

16) $S \rightarrow aSbb \mid \varepsilon$

17) $S \rightarrow aaSb \mid \varepsilon$

18) $S \rightarrow aS \mid Sb \mid \varepsilon$

19) $S \rightarrow bS \mid Sa \mid \varepsilon$

20) $S \rightarrow aSb \mid aSbb \mid aSbbb \mid \varepsilon$

21) $S \rightarrow aSb \mid aaSb \mid aaaSb \mid \varepsilon$

22) $S \rightarrow aSa \mid bSb \mid \varepsilon$

23) $S \rightarrow aSa \mid bSb \mid a \mid b$

24) $S \rightarrow aSa \mid bSb \mid \varepsilon \mid a \mid b$

25) $S \rightarrow AB$
$A \rightarrow aA \mid \varepsilon$
$B \rightarrow aBb \mid \varepsilon$

26) $S \rightarrow AB$
$A \rightarrow aAb \mid \varepsilon$
$B \rightarrow bB \mid \varepsilon$