$S \to \epsilon$

$\{a^n b^n \mid n \geq 0\}$

Symbols

/ NT

/ variables

G → G' (Simplified version)

$L(G) \Longleftrightarrow L(G')$

$\{\epsilon$

$\epsilon \in L(G')$

Steps of simplification

iminate Symbol

useless

hseless production

CFG G → CFL L

Eliminate Null productions

↳ $A \to \epsilon$

↳ Nullable production

$A \to BC$

$B \to \epsilon \mid \ldots$

A

$S \longrightarrow \ldots$

$\epsilon \in L(G')$

$A \longrightarrow \ldots$

$B \longrightarrow \ldots$

(3) Elimination of unit productions

$A \longrightarrow B$

minate
seless
mbols

$A' \rightarrow aS \mid bD$

$B' \rightarrow aBa \mid b$

$C' \rightarrow abb \mid DD$

$D \rightarrow aDa$

D is not generating

$S \rightarrow aAa \mid aBC$

$A \rightarrow aS$

$B \rightarrow aBa \mid b$

$C \rightarrow abb$

Ans. B & C are N

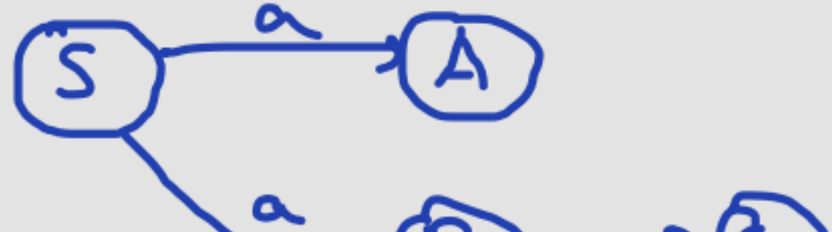
Which are generat

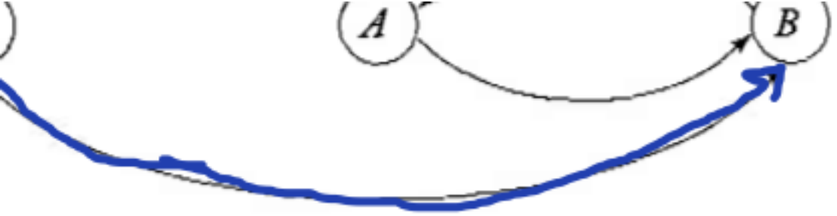
S is also generatin

because $S \rightarrow aBC$

A is also generati

because $A \rightarrow aS$





nove all unit-productions from

$$S \to Aa|B,$$
$$B \to A|bb,$$
$$A \to a\,|bc|\,B.$$

Substitution Rule

S → Aa

S → B

B → A

S →

S →

B → bb

B →

① S → Aa | a | bc | bb

② B → bb | a | bc

③ A → a | bc | bb

③ A → a

④ A → bc

A → B

$F \rightarrow I \mid (E)$

$T \rightarrow F \mid T * F$

$E \rightarrow T \mid E + T$

E is a Starting N

$G = (\{E, T, F, I\}$

$/ \{a, b, 0, 1, (,), *, +\}$

$/ E, P)$

ns.

$I \rightarrow a \mid b \mid Ia \mid Ib \mid I0 \mid I1$

$F \rightarrow (E) \mid a \mid b \mid Ia \mid Ib \mid I0 \mid I1$

$T \rightarrow T*F \mid (E) \mid a \mid b \mid Ia \mid Ib \mid I0 \mid I1$

$E \rightarrow E+T \mid T*F \mid (E) \mid a \mid b \mid Ia \mid Ib \mid I0 \mid I1$

$A \rightarrow B$