

Greibach Normal Form (GNF)

GNF makes the parsing or derivation linear.

-> Every step in derivation introduces exactly one terminal symbol

-> so that with GNF and LMD exactly n steps later, a string of length n is derived

Every Production in GNF looks like

$A \rightarrow a \alpha$

$a \in T$

$\alpha \in V^*$

Or

$A \rightarrow \lambda$

Leftmost symbol on RHS of every production is a terminal

There cannot be more than one terminal symbol on RHS

Note: There is specific algorithm to convert CFG to GNF

Example 1:

$S \rightarrow aSb \mid bSb \mid SS \mid \lambda$

GNF:

$S \rightarrow aSB$

$S \rightarrow bSA$

$S \rightarrow \lambda$

$B \rightarrow b$

$A \rightarrow A$

For $S \rightarrow SS$ (Replace the first S by $S \rightarrow aSB \mid bSA$)

Hence we get,

$S \rightarrow aSbS \mid aSAS$

Therefore the grammar in GNF is

$S \rightarrow aSB \mid bSA \mid aSBA \mid bSAS \mid \lambda$

$A \rightarrow a$

$B \rightarrow b$

Example 2:

$S \rightarrow XY \mid Xn \mid p$

$X \rightarrow mX \mid m$

$Y \rightarrow Wn \mid o$

Replace X in S and Y

$S \rightarrow mXY \mid mY \mid mXn \mid mn \mid p$

$Y \rightarrow mXn \mid mn \mid o$

Grammar in GNF is :

$S \rightarrow mXY \mid mY \mid mXN \mid mN \mid p$

$X \rightarrow mXN \mid mN \mid o$

$N \rightarrow n$