

Chomsky Normal Form (CNF)

A CFG is said to be in CNF, if production are of the form $A \rightarrow BC$ or $A \rightarrow a$ where A, B, C are non-terminals & a is a terminal

Q) $S \rightarrow \underline{b}A \mid \underline{a}B$
 $A \rightarrow \underline{b}AA \mid \underline{a}S \mid \underline{a}$
 $B \rightarrow \underline{a}BB \mid \underline{b}S \mid \underline{b}$

$A \rightarrow a$
 $B \rightarrow b$

Find the equivalent grammar in CNF

$S \rightarrow bA$
 $S \rightarrow c_b A$
 $c_b \rightarrow b$

$S \rightarrow aB$
 $S \rightarrow c_a B$
 $c_a \rightarrow a$

$A \rightarrow bAA$
 $A \rightarrow c_b AA$
 $c_b \rightarrow b$

$A \rightarrow aS$
 $A \rightarrow c_a S$
 $c_a \rightarrow a$

$B \rightarrow aBB$ $B \rightarrow bS$
 $B \rightarrow c_a BB$ $B \rightarrow c_b S$
 $c_a \rightarrow a$ $c_b \rightarrow b$

$A \rightarrow c_b AA$ $B \rightarrow c_a BB$
 $A \rightarrow c_b D_1$ $B \rightarrow c_a D_2$
 $D_1 \rightarrow AA$ $D_2 \rightarrow BB$

- ① removal of unit production
- ② removal of null (ϵ)
- ③ removal of useless symbol