

## L3.3 - Chomsky Normal Form & CFG to CNF Conversion

## Chomsky Normal Form

In Chomsky Normal Form (CNF) we have a restriction on the length of RHS; which is; elements in RHS should either be two variables or a Terminal.

A CFG is in Chomsky Normal Form if the productions are in the following forms:

$$A \rightarrow a$$

$$A \rightarrow BC$$

where  $A$ ,  $B$  and  $C$  are non-terminals and  $a$  is a terminal

## Steps to convert a given CFG to Chomsky Normal Form:

- Step 1: If the Start Symbol  $S$  occurs on some right side, create a new Start Symbol  $S'$  and a new Production  $S' \rightarrow S$ .
- Step 2: Remove Null Productions. (Using the Null Production Removal discussed in previous Lecture)
- Step 3: Remove Unit Productions. (Using the Unit Production Removal discussed in previous Lecture)
- Step 4: Replace each Production  $A \rightarrow B_1 \dots B_n$  where  $n > 2$ , with  $A \rightarrow B_1 C$  where  $C \rightarrow B_2 \dots B_n$ . Repeat this step for all Productions having two or more Symbols on the right side.
- Step 5: If the right side of any Production is in the form  $A \rightarrow aB$  where 'a' is a terminal and  $A$  and  $B$  are non-terminals, then the Production is replaced by  $A \rightarrow XB$  and  $X \rightarrow a$ . Repeat this step for every Production which is of the form  $A \rightarrow aB$

Questions????