Tutorial-8

1) Convert the following Grammes to CNF

(a) $S \to AAA | B$
      $A \to Aa | \xi$
      $B \to \xi$.

Solve

① Remove ξ the Nullable variable
   an. $\{S, B\}$.
   the Grammes after Removing.
   Nullable variable an.

   $S \to AAA$
   $A \to Aa | b$.
Generating Symbol an.
   $S \to AAA$
   $A \to Aa$
   $A \to b$.
There is no Unreachable Symbol
So Grammes is
   $S \to AAA$
   $A \to Aa$.
   $A \to b$.
CNF form
   $S \to AB$
   $B \to AA$ (New form)
   $A \to AC$.
   $A \to b$
   $C \to a$

B)

$$S \to aAaB \mid baB \mid ac \mid D$$
$$A \to aA \mid B \mid C \mid \varepsilon$$
$$B \to bB$$
$$C \to cC \mid Dab \mid \varepsilon$$
$$D \to dbB \mid a \mid b \mid \varepsilon$$

Solve

① Remove ε the Nullable sets are · $\{A, S, C, D\}$

$$A \to aA \mid B \mid C$$
$$B \to bB$$
$$C \to cC \mid Dab \mid \varepsilon$$
$$D \to db \mid B \mid a \mid b.$$

$$A \to a \mid A \mid aA \mid B \mid C.$$
$$B \to aB$$
$$C \to c \mid C \mid cC \mid ab \mid D \mid Dab.$$
$$D \to dbB \mid a \mid b.$$

Generating variable (A, C, D).
Removing B.

$$A \to a \mid A \mid aA \mid C.$$
$$C \to c \mid C \mid cC \mid ab \mid D \mid Dab$$
$$D \to a \mid b.$$

Every State is Reachable so nothing. i's Removed

CNF form

$A \to a$.	$C \to c$	$D \to a$
$A \to aA$	$C \to cC$	$D \to b$.
$A \to C$.	$C \to ab$	
	$C \to a$	
	$C \to b$	
	$C \to Dab$	

$A \to a$

$A \to xA$

$A \to C$

$X \to a$

$C \to c$

$C \to YC$

$Y \to C$

$C \to PQ$

$P \to a$

$Q \to b$

$C \to a$

$C \to b$

$~~C \to DPQ~~$

$C \to DR$

$R \to PQ$

$D \to a$

$D \to b.$

2) Convert the following grammar to GNF

a)
$S \to AB \mid BC$
$A \to AB \mid a$
$B \to AA \mid CB \mid b$
$C \to a \mid b.$

Solve

The grammar is already in.
CNF form ~~nm~~.

$S \to AB \mid BC$
$A \to AB \mid a$
$B \to AA \mid CB \mid b$
$C \to a \mid b.$

Replace non terminal with
Some another variable.

$S \to A_1$	$A_1 \to A_2 A_3 \mid A_3 A_4$
$A \to A_2$	$A_2 \to A_2 A_3 \mid a$
$B \to A_3$	$A_3 \to A_2 A_2 \mid A_4 A_3 \mid b$
$C \to A_4$	$A_4 \to a \mid b.$

$A \to aA_3 \mid bA_4$

$A_2 \to A_2 A_3 \mid a$

left ~~Recursion~~. Recursion.

define New variale Z.

$Z \to A_3 Z$ ~~(??)~~

$A_2 \to A_3 \mid a \mid A_3 Z \mid aZ$

$A_2 \to b \mid a \mid aZ \mid aZ$

~~A~~ put the value of A_2 and A_4 in.

A_3 we got

$A_3 \to bA_2 \mid aA_2 \mid aZA_2 \mid aZA_2 \mid aA_3 \mid b$

put the A_3 in Z.

~~$Z \to bA_2 \mid aA$~~

$Z \to bA_2 Z \mid aA_2 Z \mid aZA_2 Z \mid aZA_2 Z \mid aA_3 Z \mid$
           bZ

GNF form

$A_1 \to aA_3 \mid bA_4$

$A_2 \to b \mid a \mid aZ \mid aZ$

$A_3 \to bA_2 \mid aA_2 \mid aZA_2 \mid aZA_2 \mid aA_3 \mid b$

$A_4 \to a \mid b$

$Z \to bA_2 Z \mid aA_2 Z \mid aZA_2 Z \mid aZA_2 Z \mid aA_3 Z$
           $\mid bZ$

(B) $S \to AB$

      $A \to BS \mid b$

      $B \to SA \mid a$.

Solve   The Gromme is already in.

      CNF Form.

         $S \to AB$

         $A \to BS \mid b$

         $B \to SA \mid a$.

Replace Non terminal with.
New variable.

$$S \to A_1$$
$$A \to A_2$$
$$B \to A_3$$

After Replacing the Grammer is.

$$A_1 \to A_2 A_3$$
$$A_2 \to A_3 A_1 \mid b$$
$$A_3 \to A_1 A_2 \mid a,$$

in A_1 put A_2 value in place.
of A_2

$$A_1 \to b A_3$$

in A_2 put A_3 value in place.
of A_3

$$A_2 \to a A_1 \mid b.$$

In A_3 put A_1 value.

$$A_3 \to b A_3 A_2 \mid a.$$

__GNF form__

$$A_1 \to b A_3$$
$$A_2 \to a A_1 \mid b$$
$$A_3 \to b A_3 A_2 \mid a.$$