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Tutorial-6

1) Grammer to CNF

G = S → bA | aB

A → bAA | aS | a

B → aBB | bS | b

After removing RHS with terminal and more than two non terminals.

$S_0 \to S$	$S_0 \to S$
$P \to a \quad Q \to b$	$P \to a \quad Q \to b$
$S \to QA \mid PB$	$T \to AA \quad U \to BB$
$A \to QAA \mid PS \mid a$	$A \to QT \mid PS \mid a$
$B \to PBB \mid QS \mid b$	$B \to PU \mid QS \mid b$

2) S → aAbB A → aA | a B → bB | b

Convert to CNF

Let P → a, Q → b

S → PAQB A → PA | a B → QB | b

Let R → PA T → QB

S → RT

A → R | a

B → T | b

R → PA

T → QB

4) S → ASB | ε

B → SbS | A | bb

A → aAS | a

Eliminating ε production,

$S \to ASB \mid AB$

$B \to SbS \mid A \mid bb \mid Sb \mid bS \mid b$

$A \to aAS \mid a \mid aA$

Eliminating

$S \to ASB \mid AB \quad A \to aAS \mid a \mid aA$

$B \to SbS \mid bb \mid Sb \mid bS \mid b \mid aAS \mid a \mid aA$

Simplifying,

$S_0 \to S \quad S \to ASB \mid AB \quad A \to aAS \mid a \mid aA$

$B \to SbS \mid bb \mid Sb \mid bS \mid b \mid aAS \mid a \mid aA$

Removing unit productions:

$S_0 \to ASB \mid AB \quad S \to ASB \mid AB \quad A \to aAS \mid a \mid aA$

$B \to SbS \mid bb \mid Sb \mid bS \mid b \mid aAS \mid a \mid aA$

Let $P \to a \quad Q \to b \quad R \to aA \quad T \to bS \quad U \to SB$

$S_0 \to AU \mid AB \quad S \to AU \mid AB \quad A \to RS \mid a \mid PA$

$B \to ST \mid QQ \mid SQ \mid QS \mid RS \mid b \mid a \mid AA$