

RGPV 2020

Find the grammar in Chomsky Normal form equivalent to $S \rightarrow aAD; A \rightarrow aB/bAB; B \rightarrow b, D \rightarrow d$.

Ans. A context free grammar (CFG) is said to be in chomsky normal form (CNF) if all its productions are of the form-

1. $A \rightarrow BC$
2. $A \rightarrow a$

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

This CFG $S \rightarrow aAD; A \rightarrow aB/bAB; B \rightarrow b, D \rightarrow d$, can be written as

1. $S \rightarrow aAD$, Not in CNF
2. $A \rightarrow aB$, Not in CNF
3. $A \rightarrow bAB$, Not in CNF
4. $B \rightarrow b$, In CNF
5. $D \rightarrow d$, In CNF
6. $E \rightarrow a$, Generate new production, In CNF
7. $F \rightarrow AD$, Generate new production, In CNF
8. $G \rightarrow AB$, Generate new production, In CNF

Select 1 production:

$S \rightarrow aAD$

can be written as

$S \rightarrow EAD$, ($E \rightarrow a$)

$S \rightarrow EF$, ($F \rightarrow AD$)

Now its in CNF.

Select 2 production:

$A \rightarrow aB$

can be written as

$A \rightarrow EB, (E \rightarrow a)$

Now its in CNF.

Select 3 production:

$A \rightarrow bAB$

can be written as

$A \rightarrow BAB, (B \rightarrow b)$

$A \rightarrow BG, (G \rightarrow AB)$

Now its in CNF.

So, CNF of CFG given in question is:

$S \rightarrow EF$, Not in CNF

$A \rightarrow EB$, Not in CNF

$A \rightarrow BG$, Not in CNF

$B \rightarrow b$, In CNF

$D \rightarrow d$, In CNF

$E \rightarrow a$, Generate new production, In CNF

$F \rightarrow AD$, Generate new production, In CNF

$G \rightarrow AB$, Generate new production, In CNF

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