

lecture 22:-
 1- Removing Null productions.
 2- " " Unit " " " "

Λ -Production:- in a CFG, we call a non-terminal N , nullable if \exists a production of the form.
 $N \rightarrow \Lambda$. or.
 there is a sequence $N \rightarrow \dots \rightarrow \Lambda$.

$N \rightarrow \Lambda$. ✓

$N \rightarrow X_1 \rightarrow X_2 \rightarrow \dots \rightarrow X_n \rightarrow \Lambda$. ✓

Procedure for Removing Null Productions.

Ex:-

$S \rightarrow Xa$

$X \rightarrow \Lambda$.

$X \rightarrow aX | bX | \Lambda$.

$S \rightarrow Xa/a$

$X \rightarrow aX | bX | a/b$.

Ex:-

$S \rightarrow aSaSb/\Lambda$.

$S \rightarrow \Lambda$.

$S \rightarrow aSaSb/aasb/asab/aab$.

Ex:-

$S \rightarrow aXa$

$X \rightarrow \Lambda$.

$X \rightarrow b/\Lambda$.

$S \rightarrow aXa/aa$.

$X \rightarrow b$.

Ex:-

$$S \rightarrow XY$$

$$X \rightarrow Zb$$

$$Y \rightarrow bW$$

$$Z \rightarrow AB$$

$$W \rightarrow Z$$

$$A \rightarrow \lambda$$

$$B \rightarrow \lambda.$$

$$A \rightarrow aA / bA / \lambda.$$

$$B \rightarrow Ba / Bb / \lambda.$$

$$S \rightarrow XY$$

$$X \rightarrow Zb / b.$$

$$Y \rightarrow bW / b.$$

$$Z \rightarrow AB / B / A$$

$$W \rightarrow Z$$

$$A \rightarrow \lambda$$

$$B \rightarrow \lambda.$$

$$\boxed{Z \rightarrow \lambda. \\ W \rightarrow \lambda.}$$

$$A \rightarrow aA / bA / a / b$$

$$B \rightarrow Ba / Bb / a / b.$$

Killing Unit Productions.

NonTerminal \rightarrow One NonTerminal.

$$S \rightarrow a / b / abc \ X.$$

$$S \rightarrow AB \cdot X$$

$$S \rightarrow A \cdot \checkmark.$$

$$A \rightarrow X_1 \rightarrow X_2 \rightarrow \dots \rightarrow X_n \rightarrow B.$$

B is a non Unit production. of the form.
small.

$$B \rightarrow s_1 | s_2 | \dots$$

$$A \rightarrow s_1 | s_2 | \dots$$

Ex:-

$$\begin{aligned} M &\rightarrow N | QNng, Q \\ N &\rightarrow ng, N | n. \\ Q &\rightarrow q, Q | h. \end{aligned}$$

Unit production removal.

$$M \rightarrow N.$$

$$M \rightarrow n.$$

$$\begin{aligned} M &\rightarrow n. | QNng, Q \\ N &\rightarrow ng, N | n. \\ Q &\rightarrow q, Q | h. \end{aligned}$$

Null production removal.

$$\begin{aligned} M &\rightarrow n. | QNng, Q | Nng, Q | QNng | Nng, \\ N &\rightarrow ng, N | n. \\ Q &\rightarrow q, Q | q \end{aligned}$$

Ex:-

$$S \rightarrow Aa | B | c$$

$$B \rightarrow A | bb.$$

$$A \rightarrow a/bc | B.$$

$$S \rightarrow B$$

$$B \rightarrow A.$$

$$A \rightarrow B.$$

$$S \rightarrow Aa | c | a/bc | bb.$$

$$B \rightarrow a/bc | bb.$$

$$A \rightarrow a/bc | bb$$

Quiz # 8

03/Nov/2022.

Remove all Null Productions.

$$S \rightarrow AB / + / ++$$

$$B \rightarrow +- / () / * / A.$$

$$A \rightarrow h. / -$$

Terminals
 $= \{ +, -, (,),
/, * \}.$

