PES UNIVERSITY ONLINE

Automata Formal Languages & Logic

Preet Kanwal

Department of Computer Science & Engineering

Automata Formal Languages & Logic

Unit 3

Preet Kanwal

Department of Computer Science & Engineering

Example 1:

Construct CFG for $L=\{uvwv^R, |u|=|w|=2, |v|>1, w \in \{a,b\}^*\}$

Solution :

$S \rightarrow A\ B$

$A \rightarrow aa|bb|ab|bb$

$B \rightarrow aBa|bBb|A$

Example 2:

Construct a CFG for $L=\{n_a(w)=n_b(w) , w \in \{a,b\}^*\}$

Solution :

$S \rightarrow aSb|bSa|\lambda|SS$

Example 3:

Construct a CFG for $L=\{n_a(w)=n_b(w)+1, w \in \{a,b\}^*\}$

Solution :

$S \rightarrow AaA$

$A \rightarrow aAb|bAa|AA|\lambda$

or

$S \rightarrow aSb|bSa|abS|baS|a$

Example 4:

Construct a CFG for $L=\{n_a(w)=2\times n_b(w)\ ,\ w \in \{a,b\}^*\}$

Solution :

$S \rightarrow aSaSb|bSaSa|aSbSb|SS|\lambda$

Example 5:

Construct a CFG for $L=\{n_a(w)>n_b(w) , w \in \{a,b\}^*\}$

Solution :

$S \rightarrow AaA$

$A \rightarrow aAb|bAa|AA|aA|Aa|\lambda$

Example 6:

Construct a CFG for $L=\{n_a(w) \neq n_b(w) , w \in \{a,b\}^*\}$

Solution :

$S \rightarrow AaA|BbB$

$A \rightarrow aAb|bAa|Aa|aA|\lambda$

$B \rightarrow aBb|bBa|Bb|bB|\lambda$

Example 7:
Construct a CFG for $L=\{a^n b^n \cup a^n b^{2n}\}$.

Solution :

$S \rightarrow S1 \mid S2$

$S1 \rightarrow aS1b \mid \lambda$

$S2 \rightarrow aS2bb \mid \lambda$

Example 8:
Construct /a CFG for Language of proper nesting(parenthesis matching) where Σ = {(,)}.

Solution :

S⟶ (S) | SS
S⟶ λ

Example 9:
Construct /a CFG for Language of proper nesting(parenthesis matching) where Σ = {(,{,[,],},)}.

Solution :

$S \rightarrow (S) \mid \{S\} \mid [S] \mid SS \mid \lambda$

Example 10:
Construct a CFG for Language to generate arithmetic expressions.

Solution :

E⟶ E+E | E-E | E*E | E/E | (E) | id| number

Example 11:
Construct a CFG for nested if else.

Solution :

S⟶ if condition then S
S⟶ if condition then S else S
S⟶ {statement }

Example 12:
Construct a CFG to take care of variable declarations in C Language.

Solution :

D⟶ Type List
List⟶ List,id|id
Type⟶ int|float|char

Example 13:
Construct a CFG to generate nested while loops.

Solution :

S⟶ while(condition)S|{statement}

Do while loop:

S⟶ while(condition)S|do S while (condition){statement}

THANK YOU

Preet Kanwal

Department of Computer Science & Engineering

preetkanwal@pes.edu

+91 80 6666 3333 Extn 724