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STD 11TH YEAR CSE

ROLL NO : 19

S.No.	Date	Title	Page No.	Te
01.	13/3/24	Design a DFA to accept string starts with '0' and ends with '1.'		
02	13/3/24	Consider a DFA $M = (Q, \Sigma, \delta, q_0, F)$ where $Q = \{q_0, q_1\}$, $\Sigma = \{0, 1\}$		
03	13/3/24	Construct NFA which accepts set of all strings with B consecutive 0's.		
04	13/3/24	Construct DFA which accepts even no. of zeroes followed by singles.		
05	13/3/24	Draw NFA with input symbols {0, 1} which accepts all the strings "01".		DAY 1
06	13/3/24	Draw NFA which starts with even no. of 0's & ends with 1.		
07	13/3/24	Draw NFA with E for the R.E		
08	13/3/24	Convert finite Automata for the given R.E		
09	13/3/24	Find regular expression for given DFA		
10.	13/3/24	Conversion of NFA to DFA.		
11.	14/3/24	minimise the DFA.		
12.	14/3/24	Identify the language by RE		
13.	14/3/24	Construct NFA with E-moves		
14.	14/3/24	Construct RE from DFA		DAY 2
15.	14/3/24	Prove the (R: E or not).		
16.	15/3/24	Write CFG for given language.		
17.	15/3/24	Write LMG & RMD		
18.	15/3/24	Eliminate E, infinite production		DAY 3
19.	15/3/24	Convert the grammar to CNF		
20.	15/3/24	Convert the grammar to CNF		
21.	18/3/24	Design a PDA		
22	18/3/24	Design a PDA		
23	18/3/24	Convert grammar to PDA		
24	18/3/24	Designing a TM.		
25.	18/3/24.	Design a TM		

Q6 Write CFG for languages given below.

i, set of all strings that start with a & end with b over $\Sigma = \{a, b\}$

ii, set of all strings over $\Sigma = \{a, b\}$ having 'aa' as a substring.

iii, set of all binary strings that starts & end with different digits.

Aim

To write CFG for given languages

PROCEDURE

i, start with a & end with b

$$\Sigma = \{a, b\}, L = \{ab, aab, abb, \dots\}$$

CFG $S \rightarrow aB$

$$B \rightarrow aB \mid b \mid \epsilon$$

ii, 'aa' as a substring.

$$\Sigma = \{a, b\}, L = \{aa, aaa, aab, baa, \dots\}$$

CFG $S \rightarrow xaa \mid xaa \cdot aa \mid aay \mid aaxy \mid xaa yaa$

$$x \rightarrow ax \mid bx \mid \epsilon$$

$$y \rightarrow ay \mid by \mid \epsilon$$

iii, start & end with different digits

$$\Sigma = \{0, 1\}, L = \{01, 10, 001, 110, \dots\}$$

CFG $S \rightarrow 0A1 \mid 1B0$

$$A \rightarrow 0A \mid 2A \mid \epsilon$$

$$B \rightarrow 0B \mid 1B \mid \epsilon$$

Page 19

? expansion (exp) not part of test
X(111)C(000)E(011110)

ENDCODE

addition of B, thus triple
addition of S, $\{S, A, B\} = \Sigma$

$S \rightarrow S - C \quad PE$
 $S \mid d \mid S \rightarrow S$

partitioned B, C & '00' in
addition and $\{00, 00^2, \dots, 0\} \cup \{d, 0\} = \Sigma$

complexity of calculation $x \mid x \rightarrow x - e \quad PE$
 $S \mid xd \mid xd \rightarrow x - y$
 $S \mid xd \mid xd \rightarrow x - y$

thus partitioned B, C & '00' in
 $S \mid 00 \mid 00^2 \mid 00^3 \mid \dots \mid 0 \quad PE$

$S \mid d \mid d \rightarrow d - e \quad PE$
 $S \mid d \mid d \rightarrow d - e$
 $S \mid d \mid d \rightarrow d - e$

RESULT

thus CFG for given languages is
written successfully.

17. Write leftmost & rightmost derivations & draw parse tree for the string.
id+id*id from the CFG

AIM

To write LMD & RMD & draw parse tree
for the string given below.

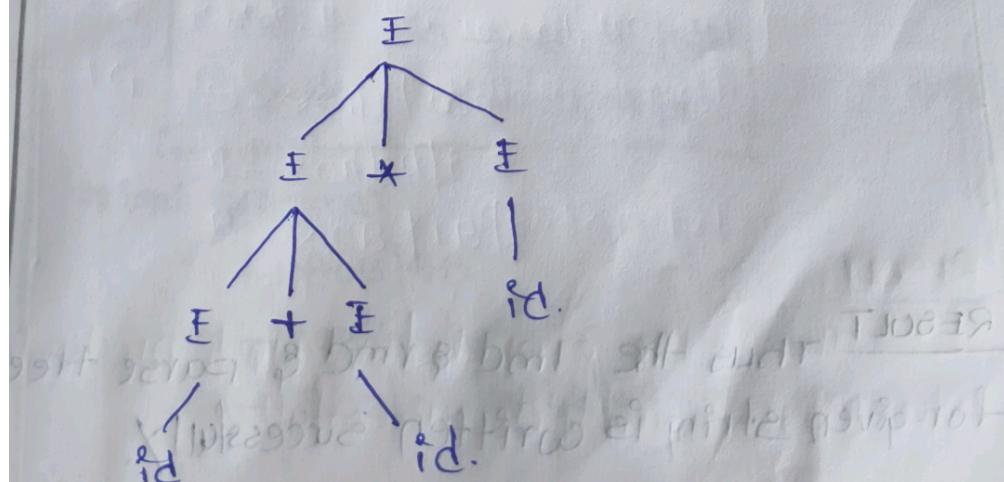
PROCEDURE

$$\begin{aligned} E^{\text{Lm}} &\Rightarrow E * E \\ &\Rightarrow E + E * E \\ &\Rightarrow id + E * E \\ &\Rightarrow id + id * E \\ &\Rightarrow id + id * id. \end{aligned}$$

$$\begin{aligned} E^{\text{Rm}} &\Rightarrow E * E \\ &\Rightarrow E * id. \\ &\Rightarrow E + E * id. \\ &\Rightarrow E + id * id. \\ &\Rightarrow id + id * E. \end{aligned}$$

DIAGRAM

PARSE TREE

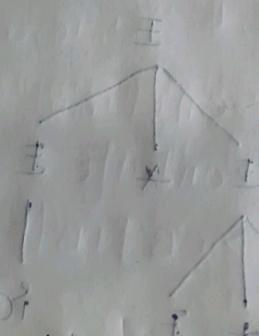


STRUCTURE

$$\begin{aligned} S \times E &\Leftarrow T \\ S \times E &= \\ S \times T \times E &= \\ S \times T \times b \times i &= \\ S \times T \times b \times i \times b \times i &= \\ S \times T \times b \times i \times b \times i &= \\ T \times T &\Leftarrow T \\ b \times i \times T &= \\ b \times i \times T \times T &= \\ b \times i \times T \times T &= \\ T \times b \times i \times T &= \end{aligned}$$

(MATERIAL)

PARSE TREE



RESULT

Thus the LRD & RRD of parse tree for given string is written successfully.

student class starting 1/2/19
class duration 1 hr

18 Eliminate ϵ productions, Unit productions & useless symbols from grammar.

$$\begin{aligned} S &\rightarrow ASB\epsilon \\ A &\rightarrow aAa/a \\ B &\rightarrow sbS/b/b \end{aligned}$$

AIM

To eliminate ϵ -productions, unit production & useless symbols from given grammar.

PROCEDURE

STEP 1.

Eliminating ϵ productions.

S is nullable.

$$\begin{aligned} S &\rightarrow ASB/A/B \\ A &\rightarrow aAs/aAa/a \\ B &\rightarrow sbS/sb/b/b/b \end{aligned}$$

STEP 2 Eliminating unit productions.

Unit pairs	Productions
(S, S)	$S \rightarrow ASB/A/B$
(A, A)	$A \rightarrow aAs/aAa/a$
(B, B)	$B \rightarrow sbS/sb/b/b/b$
(B, A)	$B \rightarrow aAs/b/a/a$

Final grammar

$$S \rightarrow ASB/A/B$$

$$A \rightarrow aAs/aAa/a$$

$$B \rightarrow sbS/sb/b/b/b/aAs/aA/a$$



STEP 3 Eliminate useless symbols
 There are no useless symbols.
RESULT
 $\text{S} \rightarrow \text{A} \mid \text{B}$
 $\text{A} \rightarrow \text{C} \mid \text{D}$
 $\text{B} \rightarrow \text{E} \mid \text{F}$
 $\text{C} \rightarrow \text{G} \mid \text{H}$
 $\text{D} \rightarrow \text{I} \mid \text{J}$
 $\text{E} \rightarrow \text{K} \mid \text{L}$
 $\text{F} \rightarrow \text{M} \mid \text{N}$
 $\text{G} \rightarrow \text{O} \mid \text{P}$
 $\text{H} \rightarrow \text{Q} \mid \text{R}$
 $\text{I} \rightarrow \text{S} \mid \text{T}$
 $\text{J} \rightarrow \text{U} \mid \text{V}$
 $\text{K} \rightarrow \text{W} \mid \text{X}$
 $\text{L} \rightarrow \text{Y} \mid \text{Z}$
 $\text{M} \rightarrow \text{AA} \mid \text{BB}$
 $\text{N} \rightarrow \text{CC} \mid \text{DD}$
 $\text{O} \rightarrow \text{EE} \mid \text{FF}$
 $\text{P} \rightarrow \text{GG} \mid \text{HH}$
 $\text{Q} \rightarrow \text{II} \mid \text{JJ}$
 $\text{R} \rightarrow \text{KK} \mid \text{LL}$
 $\text{S} \rightarrow \text{MM} \mid \text{NN}$
 $\text{T} \rightarrow \text{OO} \mid \text{PP}$
 $\text{U} \rightarrow \text{QQ} \mid \text{RR}$
 $\text{V} \rightarrow \text{SS} \mid \text{TT}$
 $\text{W} \rightarrow \text{UU} \mid \text{VV}$
 $\text{X} \rightarrow \text{WW} \mid \text{XX}$
 $\text{Y} \rightarrow \text{YY} \mid \text{ZZ}$
 $\text{Z} \rightarrow \text{ZZ}$

RESULT

Thus the ϵ -productions, Unit production & useless eliminated successfully.

19. convert the given grammar to CNF

$$S \rightarrow aSa \mid bSb \mid a \mid b$$

Aim

To convert given grammar to CNF.

CNF $\rightarrow A \rightarrow BC$ and $\rightarrow a$.

PROCEDURE

1. the given grammar is optimized

2. Introduce the Production

$$\rightarrow A \rightarrow a$$

$$B \rightarrow b$$

3. Rewrite the grammar.

$$S \rightarrow AaA \mid BbB \mid a \mid b$$

$$\rightarrow A \rightarrow a$$

$$B \rightarrow b$$

4. Break productions

$$S \rightarrow AP_1 \mid BP_2 \mid a \mid b$$

$$P_1 \rightarrow SA$$

$$P_2 \rightarrow SB$$

$$\rightarrow A \rightarrow a$$

$$B \rightarrow b.$$

RESULT

Thus the given grammar is converted into CNF successfully.

20 Convert the given grammar to GNF.

$$S \rightarrow ABA$$

$$A \rightarrow aB/a$$

$$B \rightarrow bB/b$$

Aim

To convert given grammar into GNF.

GNF

$$A \rightarrow ax \text{ or } A \rightarrow a.$$

PROCEDURE

1. Eliminate ϵ -production

S, A, B are nullable

$$S \rightarrow ABA \mid AB \mid BA \mid AA \mid A \mid B$$

$$A \rightarrow aA \mid b$$

$$B \rightarrow bB \mid b$$

2. Eliminate unit production.

Unit pair	Production
(S, S)	$S \rightarrow ABA \mid AB \mid BA \mid AA$
(S, A)	$S \rightarrow aA \mid a$
(S, B)	$S \rightarrow bB \mid b$
(A, A)	$A \rightarrow aA \mid b$
(B, B)	$B \rightarrow bB \mid b$

Final grammar is

$$S \rightarrow aBa/bBb/abb/aaa/a/b/bb/bb$$

$$A \rightarrow a/b$$

$$B \rightarrow bB/b [(\text{A} \leftarrow \text{B}) \text{ are in CNF?}]$$

A, lemma 1,

sub A \leftarrow B production in S

$$S \rightarrow aAbB/aBb/abb/aaa/a/b/bb/bb$$

$$A \rightarrow a/b$$

$$B \rightarrow bB/b$$

$$a|b|ab|abb|aab|aaab|aabb|$$

$$d|ad|a$$

$$d|bd|b$$

neighbor find similarity

initial string relation

$$ab/abb/abb/aab/aab \leftarrow c$$

$$d/dc \leftarrow c \quad (\text{A}, \text{C})$$

$$d/bd \leftarrow c \quad (\text{B}, \text{C})$$

$$d/ad \leftarrow a \quad (\text{A}, \text{B})$$

$$d/bd \leftarrow B \quad (\text{B}, \text{B})$$

RESULT

Thus, the given grammar is converted into CNF successfully.