Day-3

15/8/24

Experiment 16

16) Write CFG for language given below,

i) set of all strings that start with a & ends 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 start & ends with different digits.

AIM: To write CFG for given languages.

Procedure:

i) start with a & end with b

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

CFG: $S \rightarrow aB$

$B \rightarrow aB \mid b \mid \varepsilon$

ii) 'aa' as a substring

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

CFG: $S \rightarrow xaay \mid xyaa$

$X \rightarrow aX \mid bX \mid \varepsilon$

$Y \rightarrow aY \mid bY \mid \varepsilon$

(iii) start & end with different digits

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

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

$A \rightarrow 0A \mid 1A \mid \varepsilon$

$B \rightarrow 0B \mid 1B \mid \varepsilon$

Result: Thus CFG for given language is written sucessfully.

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Experiment 17.

17) Write leftmost & right most derivations & draw parse tree for the string.
id + id * id from the CFG
E → E+E / E*E / (E) / id.

Aim: To write lmd & rmd & draw parse tree for the string given below

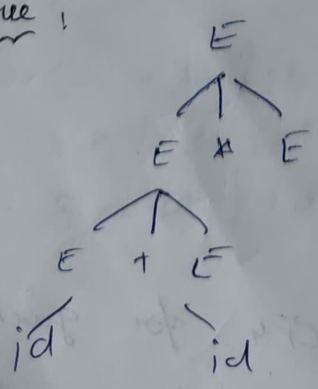
Procedure:

E => E * E
=> E + E * E
=> id + E * E
=> id + id * E
=> id + id * id

E => rm E * E
=> E * id
=> E + E * id
=> E + id * id
=> id + id * id

Diagram:

Parse tree:



Result:

Thus, the lmd & rmd & parse tree for given string is written successfully.

Experiment - 18

18) Eliminate ε- productions, unit productions & useless symbols from gramma

S → ASB/ε
A → aAS/a
B → SbS/A/bb.

Aim:

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

Procedure:-

step 1: Eliminating ε- productions

S is nullable

S → ASB/AB
A → aAS/aA/a
B → SbS/Sb/b/A/bb.

step 2: Eliminating unit productions.

unit pairs	Productions
(S,S)	S → ASB/AB
(A,A)	A → aAS/aA/a
(B,B)	B → SbS/Sb/b/bb
(B,A)	B → aAS/aA/a

Final grammar.

S → ASB/AB
A → aAS/aA/a
B → SbS/Sb/b/bb/aAS/aA/a

Step 3: Eliminate useless symbols

There are no useless symbols.

Result: Thus, the ε- productions, unit productions & useless symbols eliminated successfully

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Experiment 1a

1a) Convert the given grammar to CNF
S → aSA | bSb | a | b.

Aim: To convert given grammar to CNF

CNF: A → BC and A → a

Procedure:

1. The given grammar is optimized
2. Introduce the Productions.

A → a
B → b

3. Rewrite the grammar
S → ASA | BSB | a | b
A → a
B → b

4. Break productions
S → AP1 | BP2 | a | b
P1 → SA
P2 → SB
A → a
B → b

Result:

Thus the given grammar is converted to CNF successfully.

Experiment 20

20) Convert the given grammar to CNF

$S \rightarrow ABA$

$A \rightarrow aA / \varepsilon$

$B \rightarrow bB / c.$

Aim: To convert given grammar to CNF

CNF) $A \rightarrow ax$ or $A \rightarrow a$

Procedure:

1. Eliminate ε-productions

S, A, B are nullable

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

$A \rightarrow aA / b$

$B \rightarrow bB / b$

2. Eliminate unit productions

unit pairs	Productions
(S, S)	$S \rightarrow ABA / AB / BA / AA$
(S, A)	$S \rightarrow aA / a$
(S, B)	$S \rightarrow bB / b$
(A, A)	$A \rightarrow aA / b$
(B, B)	$B \rightarrow bB / b$

Final grammar is

S → ABA / BA / AB / AA / aA / a / bB / b.

A → aA / a

B → bB / b.

[(A∝B) are in (GNF)

a/ Lemma 3,

Sub A∝B productions in S

S → aABA / aBA / bBA / bA & aAB / aB / aAA / aA / a / bB / b.

A → aA / b

B → bB / b.

Result: Thus the given grammar is converted to GNF successfully.