16.	15/3/24	write CFG for given Language.
17.	15/3/24	write LMD & RMD and draw strings
18	15/3/24	Eliminate ε-Productions, unit Productions
19	15/3/24	Convert the given grammer to CNF
20	15/3/24	Convert the given grammer to CNF

18/5/24 Day-3

Experiment-16

16. 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 start & end with different digits

Aim:- To write CFG for given language.

Procedure:-

i/ start with a & end with b

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

CFG :- $S \rightarrow aA$

$A \rightarrow aB \mid b \mid \varepsilon$

ii/ 'aa' as a substring

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

CFG :- $S \rightarrow XaaY \mid XY$

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

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

iii/ start & end with different digits

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

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 written successfully

15/3/24

Experiment-12

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:-

$E \overset{lm}{\Rightarrow} E*E$

$\Rightarrow E+E*E$

$\Rightarrow id+E*E$

$\Rightarrow id+id*E$

$\Rightarrow id+id*id$

$E \overset{rm}{\Rightarrow} E*E$

$\Rightarrow E*id$

$\Rightarrow E+E*id$

$\Rightarrow E+id*id$

$\Rightarrow id+id*id$

Experiment - 13

13) Eliminate ε-Productions, unit Productions & useless symbol from grammer

S → ASB/ε

A → aAS/a

B → SbS/A/bb

Aim :- To eliminate ε-Productions & unit Productions & useless symbols from given grammer.

Procedure

Step 1 :- Eliminate ε-Productions

S is nullable

S → ASB/AB

A → aAS/aA/a

B → SbS/Sb/bA/bb

Step 2 :- Eliminate unit Productions

UnitPairs	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 grammer

S → ASB/AB

A → aAS/aA/a

B → SbS/Sb/b/bb/aAS/aA

Step 3:- Eliminate useless symbols & There are no useless symbols.

Result:- Thus, the ε-Productions, Unit Productions useless symbols eliminate successfully

15/3/24

Experiment-19

A) Convert the given grammer to CNF.

S → aSa / bSb / a / b

Aim: To Convert given grammer is optimized

Procedure

1. The given grammer is optimized
2. Introduction the Production

A → a

B → b

3. Rewrite the grammer

S → ASA / BSB / a / b

A → a

B → b

4. Break Production

S → AP1 / BP2 / a / b

P1 → SA

P2 → SB

A → a

B → b

Result: Thus, the given grammar is converted to CNF successfully.

Experiment - 10

Q) Convert the given grammer to CNF

$S \rightarrow ABA$

$A \rightarrow aA/\varepsilon$

$B \rightarrow bB/\varepsilon$

Aim:- To convert given grammer to GNF

GNF :- $A \rightarrow ax$ or $A \rightarrow a$

Procedure

1. Eliminate ε - Production

S, A, B are Nullable.

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

$A \rightarrow aA/b$

$B \rightarrow bB/b$

2. Eliminate unit Production

unitPair	Production
(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 grammer is

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

A → aA / a

B → bB / b [(AxB) are in GNF]

By lemma 1,

Sub AxB Production in S.

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

A → aA / b

B → bB / b

Result :- Thus, the given grammer is Converted to GNF Successfully.