THEORY OF COMPUTATION

DEPARTMENT OF COMPUTER ENGINEERING

Subject : TOC **ASSIGNMENT NO – 03** **Unit : III**

THEORY QUESTION

1. Write in brief about **"Sentential form"** with reference to context free Grammar
2. Explain with suitable examples, any **two applications of Context Free Grammar**.
3. Discuss **applications of Context Free Grammar in XML.**
4. Discuss applications of Context Free Grammar in **Syntax Analysis of a Compiler**.
5. What are the different types of **Normal Forms of Context Free Grammar**? Explain it with example
6. Write short notes on 1. **CNF 2. GNF**

CONTEXT FREE GRAMMAR(CFG)

1. Construct the Context Free Grammar for the language having **any number of a's** over the set $\Sigma = \{a\}$.
2. Write the grammar generating all **strings consisting of a's and b's with at least two a's.**
3. **Write context free grammar f**or the following language
   I. 0(0+l)* 0l(0+l)* l
   II. (a+b)* bbb (a+b)*
4. **Write the CFG for following language**.
   $L=\{a^{m+n} b^m c^n | n,m>=0\}$
5. **Write CFG for following Language.**
   $L=\{a^n b^m a^n | n>=0, m>=l\}$
6. Describe the language L for given **Context Free Grammar** G = [{S},{a,b}, P, {S}] where P = {S $\rightarrow$ aSb, S $\rightarrow$ ab}.

7. Write CFG for the following languages.

$L=\{0^i 1^j 0^k \mid j > i+k\}$

$L=\{0^i 1^j 2^k \mid i = j+k\}$

Write CFGs for given CFLs : **[8]**

i) Languages containing the strings with equal number of a's and b's

ii) Languages containing the strings containing a's and b's with at least 2 a's

Give context free grammars for the following languages: **[6]**

i) L = { x |x Є { (,)}* with strings having well-formed parentheses (WFP)}

ii) L = { $a^m b^n c^{m+n}$|m,n > = 0}

Write the CFG for language L = {$0^i 1^j 0^k$ | j > i +k}.

Show the derivation of the string '0111100'.

SIMPLIFY/ELIMINATE GRAMMAR

1. Simplify the grammar:

S → Ab, A → a, B → C|b, C → D, D → E, E → a

2. Eliminate Є-productions from the grammar G

A→ aBb|bBa

B→ aB|bB|Є

3. **Optimize the CFG given below by reducing the grammar** where S is a start symbol.

S → A | 0C1

A → B | 01 | 10

C → ε | CD

4. Consider the grammar G={(A,B),(a,b), P,A}where P consists of

A → B

B→ a|b

Eliminate unit productions

5. Simplify the following Context Free Grammar (CFG).

S → ASB | ∈

A → aAS | ∈

B → Sbs | A | bb

G = {(S,A,B), (a,b), S,P : Productions are given above

Simplify the following grammar

i) $S \rightarrow Ab, A \rightarrow a, B \rightarrow C \mid b, C \rightarrow D, D \rightarrow E, E \rightarrow a$

ii) $S \rightarrow 0A0 \mid 1B1 \mid BB, A \rightarrow C, B \rightarrow S \mid A, C \rightarrow S \mid \in$

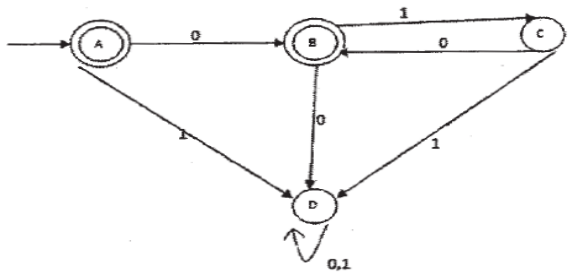
LEFT LINEAR AND RIGHT LINEAR GRAMMAR

1. Write an equivalent **right linear grammar for following left linear grammar**
S→ Sl0|0.

2. Write equivalent left linear grammar for the following right liner grammar.
S→ 0A
A→ l0A|C

3. Write an equivalent left-linear grammar for the right-linear grammar.
S→ 0A|lB
A→ 0C|lA|0
B→ lB|lA|l
C→ 0|0A

Give the Right & Left linear grammar for the following DFA shown in Fig1 **[8]**



Construct a DFA for the following left linear grammar

$S \rightarrow B1|A0|C0, \quad B \rightarrow B1|1, \quad A \rightarrow A1|B1|C0|0, \quad C \rightarrow A0$

CFG, CNF and GNF

1. Convert following CFG to CNF.

S → AACD
A → aAb|∈
C → aC|a
D → aDa|bDb|∈

2. .Write CFL for following CFG

S→ aB|bA
A→ a|aS|bAA
B→ b|bS|Abb

3. Convert the following grammar to GNF

S→ ABA| AB| BA| AA| A B
A → aAa
B → bB|b

4. Convert the following grammar to CNF.

S → bA|aB
A → bAA|as|a
B → aBB|bs|b

5.

Convert the following CFG into Chomksy Normal Form (CNF):

S -> AB
A -> CA | ^
B -> DB | ^
C -> 011 | 1
D -> 01

6.

Check whether the given grammar is in CNF. If not then find its equivalent CNF. **[8]**

$S \rightarrow bA \mid aB,\ A \rightarrow bAA \mid aS \mid a,\ B \rightarrow aBB \mid bS \mid b$

************************THE END************************