NAME: Mareena Fernandes   ROLL NO: 8669   CLASS: SEIT.

AT TUTORIAL NO: 5

Q.1] Write a CFG to generate strings starting and ending with different letter over $\Sigma = \{a, b\}$.

Ans. CFG to generate string starting and ending with different letter over $\{a, b\}$ possible strings are: $a(a+b)^* b \mid b(a+b)^* a$.

∴ minimum requirement : $S \longrightarrow ab \mid ba$

Let $T \longrightarrow aT \mid bT \mid \varepsilon$

In general $S \longrightarrow aTb \mid bTa$

$G = (U, T, P, S)$ where $U = \{S, T\}$

$T = \{a, b\}$

$P = \{S \longrightarrow aTb, S \longrightarrow bTa,$
$T \longrightarrow aT, T \longrightarrow bT, T \longrightarrow \varepsilon\}$

S = start symbol.

Q.2] Construct a CFG for the language with equal number of a's and b's

Ans. Possible strings are: $b^m a^n b^p a^m b^n a^p \mid m \geqslant 0, n \geqslant 0, p \geqslant 0$

$S \longrightarrow \varepsilon$ $m = n = p$

$S \longrightarrow aSb$ $m = 0$

$S \longrightarrow bSaS$ $m \neq 0$

$G = (U, T, P, S)$ where, $U = \{S\}$ $T = \{a, b\}$

$P = \{S \longrightarrow \varepsilon, S \longrightarrow aSbS, S \longrightarrow bSaS\}$

S = start symbol.

Q.3] Construct right linear grammar and left linear grammar for the ~~e~~ regular expression $1(01)^*0(0+1)^*$

Ans. Right and left linear grammar for $1(01)^*0(0+1)^*$. All strings consist of at least single 1 to 0.

Linear grammar.

$S \longrightarrow 10B \mid 1A$

$A \longrightarrow 01A \mid \varepsilon$

$B \longrightarrow 0011B \mid \varepsilon$

Left linear grammar

$S \longrightarrow 01 \mid A0 \mid B$

$A \longrightarrow 1 \mid A01$

$B \longrightarrow 10 \mid B0 \mid B1$

Q.4] Let G be the grammar. Find the leftmost derivation, rightmost derivation and parse tree for the string 001 222.

G: $S \longrightarrow 0S \mid 1A \mid 2B \mid \varepsilon$

$A \longrightarrow 1A \mid 2B \mid \varepsilon$

$B \longrightarrow 2B \mid \varepsilon$

Ans:

LMD

$S \longrightarrow 0S$

$\longrightarrow 00S$

$\longrightarrow 001A$

$\longrightarrow 0012B$

$\longrightarrow 00122B$

$\longrightarrow 001222B$

$\longrightarrow 1001222 \varepsilon$

i.e 001222

RMD

$S \longrightarrow 0S$

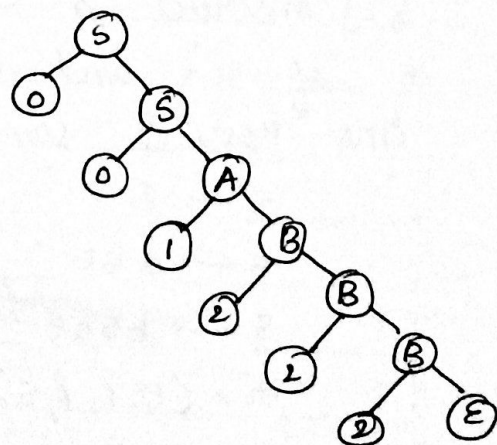$\longrightarrow 00S$

$\longrightarrow 001A$

$\longrightarrow 0012B$

$\longrightarrow 00122B$

$\longrightarrow 001222B$

$\longrightarrow 1001222 \varepsilon$

i.e 001222

Q.5] Test whether 001100, 001010 are in the language generated by grammar:

$$S \longrightarrow 0S0 \mid 0A \mid 1B \mid 0 \mid 1$$
$$A \longrightarrow 0A \mid 0$$
$$B \longrightarrow 1B \mid 1$$

Ans. G : $S \longrightarrow 0S0 \mid 0A \mid 1B \mid 0 \mid 1$

for 001100

$$S \longrightarrow 0S0$$
$$\longrightarrow 00S00$$
$$\longrightarrow 001B00$$
$$\longrightarrow 0101100$$

∴ 001100 is in the language and 001010 is not in the language.