Home Assignment-2

J. Asvitha
2300033628

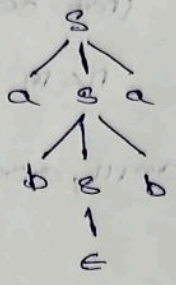
1) $S \rightarrow asb / bsb / \epsilon$

given string abba.

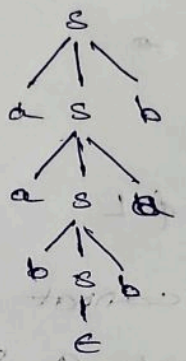
For following the above string we need to make some changes in production.

$S \rightarrow Sasb / bsb / asa / bsa / \epsilon$

String = abba



String = aabbab



The first production P: { S → asb /
bsb /
asa /
bsa / ϵ

2) $S \rightarrow AA / a$

$A \rightarrow SS / b$

normal form.

$V = \{ S, A \}$

$\downarrow \quad \downarrow$

$A_1 \quad A_2$

$P : \{ A_1 \rightarrow SA_2A_2 / a$

$A_2 \rightarrow A_1A_1 / 1 \}$

$A_2 \rightarrow A_2A_2A_2 / 0A_1 / 1$

$A_2 \rightarrow 0A_12 / 12 / 0A_1 / 1$

$Z \rightarrow A_2A_1Z / A_2A_1$

$A_1 \rightarrow 0A_1 zA_2 / 1zA_2 / 0A_1A_2 / 1A_2 / 0$

$z \rightarrow A_2A_1 z / A_2A_1$

$z \rightarrow 0A_1zA_1z / 1zA_1z / 0A_1A_1z / 1A_1z$

$z \rightarrow 0A_1zA_1 / 1zA_1 / 0A_1A_1 / 1A_1$

3) $L = \{0^n 1^m / n \leq m\}$ (not regular)

let string = 00111 $n \leq m$

$L = \{1, 01, 011, 0011, 00111, 000111 - - -\}$

let $i = 3$

String = $\underset{u}{00} \underset{v}{111} \underset{w}{}$

$= 0(0)^3 111$

$= 0000111 \notin L$

The given string cannot be in L

So not a regular language

(pumping lemma)

4) Given CFG $S \rightarrow AB$

$A \rightarrow a$

$B \rightarrow C / b$

$C \rightarrow D$

$D \rightarrow \epsilon$

$\epsilon \rightarrow a$

Here we need to perform 3 conditions

1. Eliminate useless symbol
2. Eliminate Epsilon symbol
3. Eliminate Unit production.

5) CFG ⟶ CNF

$S \to aAbSb / a / aAb$

$A \to bS / aAAb$

Step 1 : length 1 string

$S \to a$: in CNF

Step 2 : length 2 string

$A \to bS$

$A \to BbS$

$b \to Bb$ in CNF

Step 3 : length 3 string

$S \to aAb$

$S \to AA$ in CNF

$ab \to Aab$

Step 4 : length 4 string.

$S \to aAbSb$.

$A \to aAAb$

$S \to AabSb$ } in CNF

$A \to AabAAb$ }

$Sb \to Sb$

$AA \to Aaa$

Final production P : { $S \to a / Aab / AabSb$.

$A \to BbS / AabAAb$ }