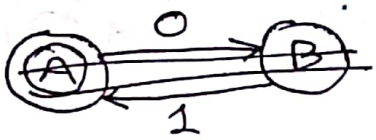
CSE307

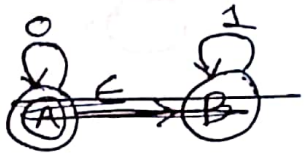
Chap-4

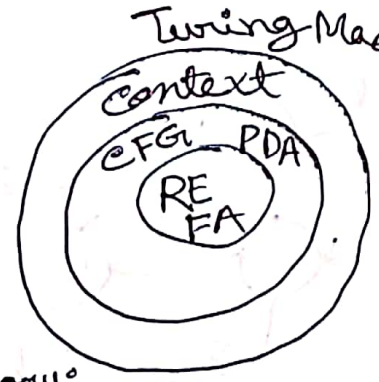
Regular Language

0^N1^N → এটা বের করার না। So, Solve impossible.

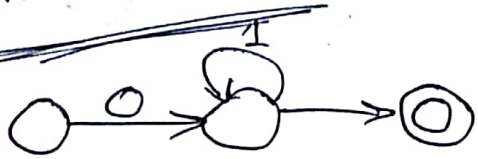
↳ FA দিয়ে এটা Solve করা যাবে না।







Pumping Lemma Theory:



RE = 01^*0

যেকোনো Language regular হলে FA এর কোনো ~~প্রত্যেক~~ তথ্য থাকবে যা বারবার Pump করা যাবে,

CSE 307

Prove $L = 0^N 1^N$ is not regular by using pumping lemma theory.

Ans:

Case 1:

Let, $w = 000111$

As, $w = xyz$. let, $x = 00$, $y = 0$, $z = 111$

$|w| = 6$

$|xy| = 3$

So, there are values of $n(6, 5, 4, 3)$ where

$|w| >= n >= |xy|$

According to pumping lemma theory, if we pump y three times, we get the string 000000111 which clearly does not belong to L. So, L is not regular.

Case-2:

Let, w = 00001111

As, w = xyz ; let, x=000, y=01, z = 111

|w| = 8

|xy| = 5

So, there are values of n(8,7,6,5) where

|w| >= n >= |xy|

According to 000010101
111

..... .

Case-3:

Let, w = 00001111

x = 0000, y = 11, z = 11

|w| = 8

|xy| = 6

..... (8,7,6) .....

.....

CSE307

Context Free Grammar (CFG)

~~Conte~~

CFG এর,

→ Left side এ 1টা Single Variable থাকবে. Variable সবসময় Uppercase. একটা Grammar এ যতগুলো Uppercase থাকবে তার ততগুলো Production থাকবে.

→ Right side এ Terminal, Variable, etc. এর any combination থাকতে পারে.

Terminal এর কোনো Production থাকবে না.
↳ এরা Symbol.

Non Terminal, Variable এর Production থাকবে.

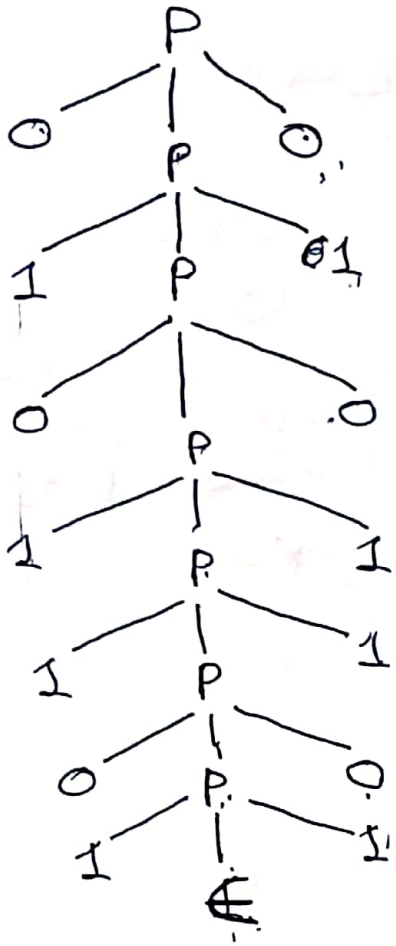
Symbol, Terminal এর combination এ CFG এর output হবে String.

Grammar: $P \to \in / 0 / 1 / 0P0 / 1P1$

Palindrome CFG:

0 1 0 1 1 0 1 1 0 1 1 0 1 0

0 1 0 1 1 0 1 0 1 1 0 1 0

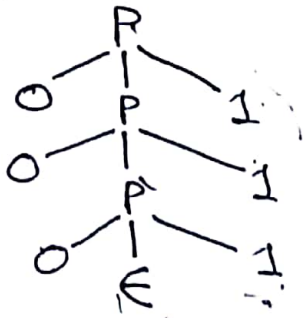


0101

0^n1^n

Grammar: $P \to \in / 01 / 0P1$

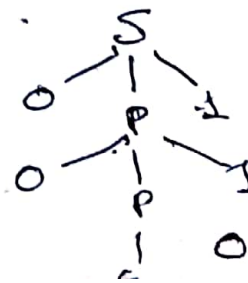
000111



$S \to 0P1$

$P \to 0P1 / \in$

যদি ∈ দিয়ে Start Accept না করি।



0011

Fig. 5.2:

Terminal – +, *, (,), a, b, 0, 1

Variable – E, I

$E \to I$

$E \to E+E$

$E \to E*E$

$E \to (E)$

$I \to a \quad I \to Ib$

$I \to b \quad I \to I0$

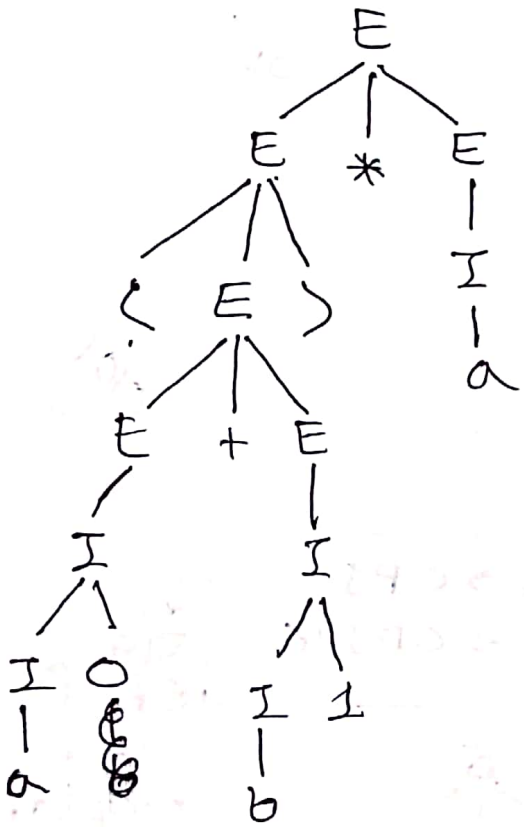
$I \to Ia \quad I \to I1$

→ Left most Tree

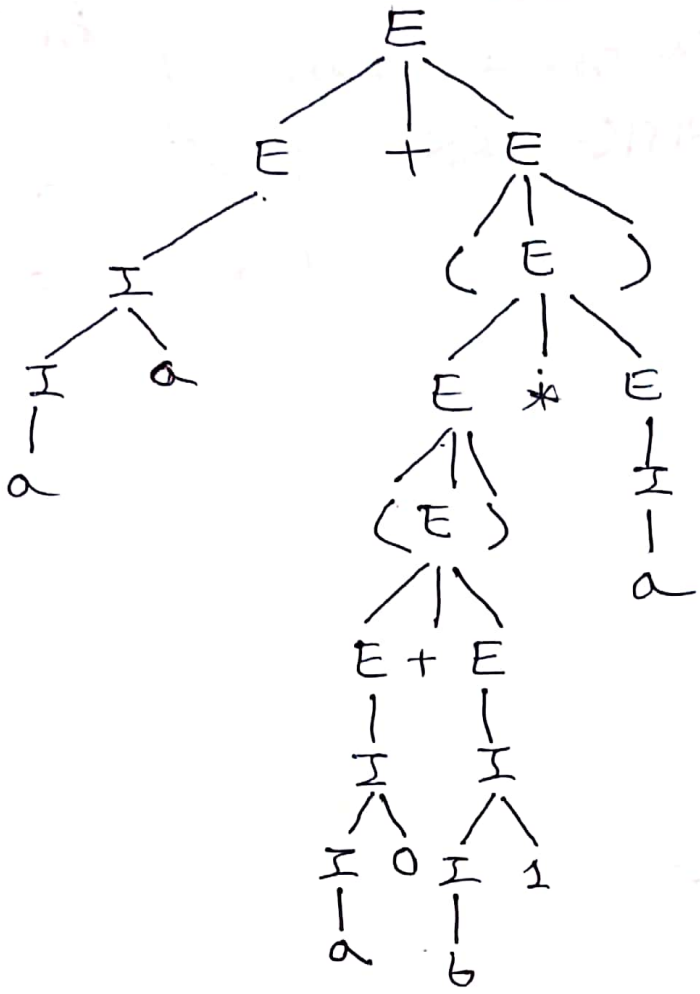
→ Right " "

→ Parse " "

Grammar → $\underbrace{(a0+b1)}_{E} * \underbrace{a}_{E}$



aa+((a0+b1)*a)



Leftmost Tree :

a1+b0

বাম দিকের টা কে Always Terminal বানাতে হবে।

$E \xrightarrow{lm} \underline{E}+E$

$\rightarrow \underline{I}+E$

$\rightarrow \underline{I}1+E$

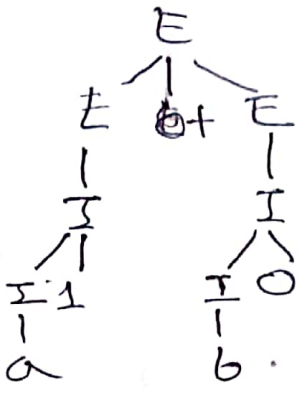
$\rightarrow \underline{a}1+E$

$\rightarrow a1+\underline{E}$

$\rightarrow a1+\underline{I}$

$\rightarrow a1+\underline{I}0$

$\rightarrow a1+b0$



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Right most Tree :

$E \xrightarrow{RM} E+\underline{E}$

$\rightarrow E+\underline{I}$

$\rightarrow E+\underline{I}0$

$\rightarrow \underline{E}+b0$

$\rightarrow \underline{I}+b0$

$\rightarrow \underline{I}1+b0$

$\rightarrow \underline{a}1+b0$

~~aa~~(a0+b1)*a

$E \xrightarrow{LM} E*E$

$\rightarrow (E)*E$

$\rightarrow (E+E)*E$

$\rightarrow (I+E)*E$

$\rightarrow (I0+E)*E$

$\rightarrow (a0+E)*E$

$\rightarrow (a0+I)*E$

$\rightarrow (a0+I1)*E$

$\rightarrow (a0+b1)*E$

$\rightarrow (a0+b1)*I$

$\rightarrow (a0+b1)*a$

$E \xrightarrow{RM} E*E$

$\rightarrow E*I$

$\rightarrow E*a$

$\rightarrow (E)*a$

$\rightarrow (E+E)*a$

$\rightarrow (I+E)*a$

$\rightarrow (I0+E)*a$

$\rightarrow (a0+E)*a$

$\rightarrow (a0+I)*a$

$\rightarrow (a0+I1)*a$

$\rightarrow (a0+b1)*a$

aa+((a0+b1)*a)

$E \xrightarrow{LM} E+E$

$\rightarrow I+E$

$\rightarrow Ia+E$

$\rightarrow aa+E$

$\rightarrow aa+(E)$

$\rightarrow aa+(E*E)$

$\rightarrow aa+((E)*E)$

$\rightarrow aa+((E+E)*E)$

$\rightarrow aa+((I+E)*E)$

$\rightarrow aa+((I0+E)*E)$

$\rightarrow aa+((a0+E)*E)$

$\rightarrow aa+((a0+I)*E)$

$\rightarrow aa+((a0+I1)*E)$

$\rightarrow aa+((a0+b1)*E)$

$\rightarrow aa+((a0+b1)*I)$

$\rightarrow aa+((a0+b1)*a)$

$E \xrightarrow{RM} E+E$

$\rightarrow E+(E)$

$\rightarrow E+(E*E)$

$\rightarrow E+(E*I)$

$\rightarrow E+(E*a)$

$\rightarrow E+((E)*a)$

$\rightarrow E+((E+E)*a)$

$\rightarrow E+((E+I)*a)$

$\rightarrow E+((E+I1)*a)$

$\rightarrow E+((E+61)*a)$

$\rightarrow E+((I+61)*a)$

$\rightarrow E+((I0+61)*a)$

$\rightarrow E+((a0+61)*a)$

$\rightarrow I+((a0+61)*a)$

$\rightarrow Ia+((a0+61)*a)$

$\rightarrow aa+((a0+61)*a)$

CSE 307
PDA (Push Down Automata)

#CFG and PDA ~~হয়~~ Equivalent.

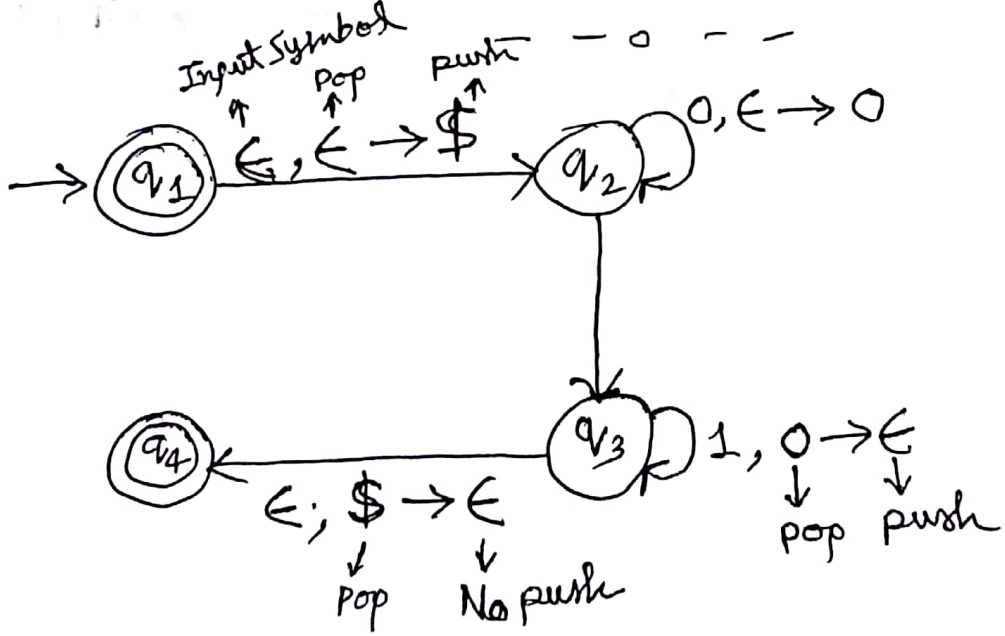
$ → Marker

* $\epsilon \rightarrow \epsilon$
  No Pop No push

* $\epsilon \rightarrow a$
  No pop a push

* $a \rightarrow \epsilon$
  a pop No push

* $a \rightarrow b$
  a pop a push



1. Marker Push → 2. ~~প্রথম~~ থেকে Push, Pop হবে। →
3. শেষেও আবার Marker pop হবে। 4. Last ~~এ~~ Empty.

Fig – 2.17:

State diagram for PDA.

$\{a^i . b^j c^k \mid i, j, k \geq 0$ and $i = j$ or $j = k$

→ $a^i b^j c^k$ → $a^i = c^k$ তখন b ইচ্ছামত ঘুরানো যাবে কিন্তু Push/Pop করানো যাবেনা।

→ $a^i b^j c^k$ → $a^i = b^j$ তখন c ইচ্ছামত ঘুরানো যাবে কিন্তু Push/Pop করা যাবে না।