

29/9/22

Page No.

Date

□ Push Down Automata (PDA)

PDA is a machine used to implement CFG as FA is used to implement Regular Grammar

PDA is more powerful compared to FA, as it has a stack associated with itself

Defⁿ:

Mathematical, PDA is defined as a 7-tuple collection $(Q, \Sigma, q_0, F, \delta, Z, \Gamma)$

$S =$

$Z =$ Start top

$\Gamma =$ tape symbols

Q1. Construct PDA to accept $L = \{a^n b^n \mid n \geq 1\}$

$\delta(q_0, a, z_0) = (q_0, az_0)$ // Push
current state input symbol stack top

$\delta(q_0, a, a) = (q_0, aa)$

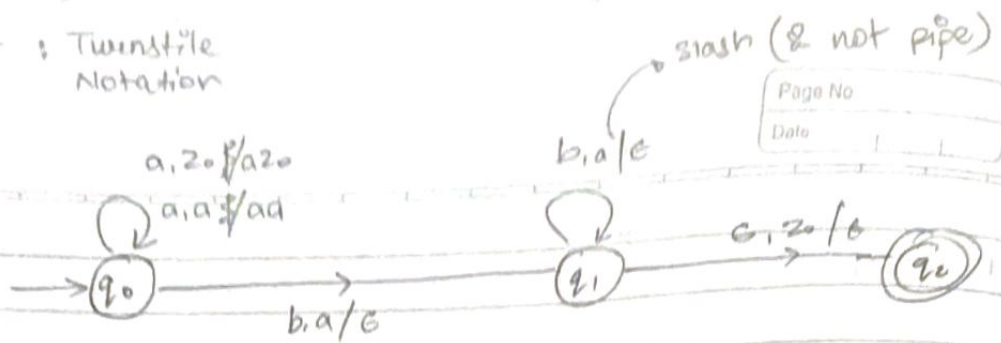
$\delta(q_0, b, a) = (q_1, \epsilon)$ // Pop

$\delta(q_1, b, a) = (q_1, \epsilon)$

$\delta(q_1, \epsilon, z_0) = (q_2, \epsilon)$

$q_2 \in F$

↑ : Twiststile Notation



Describing the work of PDA with an ex. through instantaneous description (ID)

$\vdash S(q_0, aaabbb, z_0)$
 $\vdash S(q_0, aabbb, az_0)$
 $\vdash S(q_0, abbb, aaaz_0)$
 $\vdash S(q_0, bbb, aaaaaz_0)$
 $\vdash S(q_1, bbb, aaaz_0)$
 $\vdash S(q_1, b, aaz_0)$
 $\vdash S(q_1, \epsilon, z_0)$
 $\vdash S(q_2, \epsilon)$

$q_2 \in F$

Tuples:

$$M = (\{q_0, q_1, q_2\}, \{a, b\}, \delta, q_0, \{a, b, z_0\}, z_0)$$

Q2. Construct PDA to accept lang. $L = \{a^n b^n\}$

* write logic: for every a , we push 2 a 's. For every b we pop 1 a .

$$\delta(q_0, a, z_0) = (q_0, aa, z_0)$$

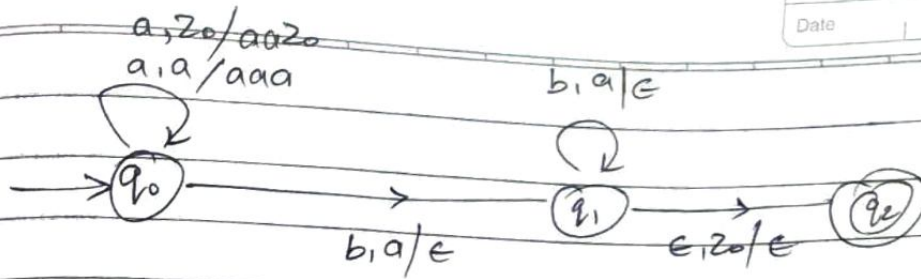
$$\delta(q_0, a, a) = (q_0, aaa)$$

$$\delta(q_0, b, a) = (q_1, \epsilon)$$

$$\delta(q_1, b, a) = (q_1, \epsilon)$$

$$\delta(q_1, \epsilon, z_0) = (q_2, \epsilon)$$

$q_2 \in F$



Q3. PDA for lang. $L = \{0^n 1^n 0^m \mid n, m \geq 1\}$

$$\delta(q_0, 0, z_0) = (q_0, 0 z_0)$$

$$\delta(q_0, 0, 0) = (q_0, 00)$$

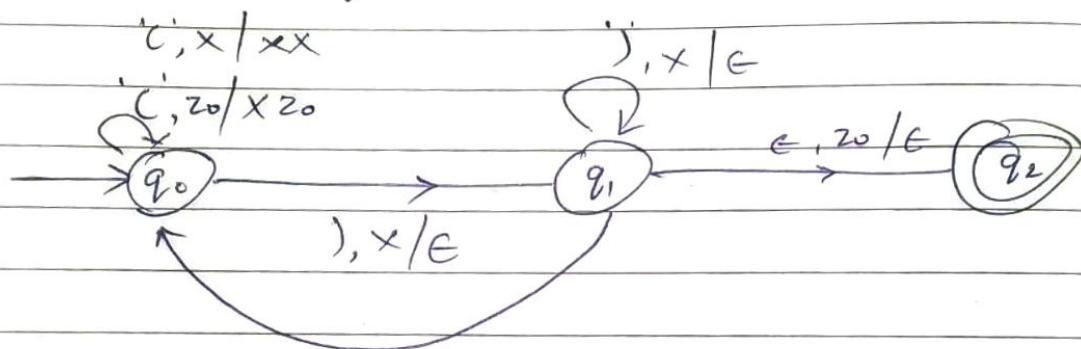
$$\delta(q_0, 1, 0) = (q_1, 0)$$

$$\delta(q_1, 1, 0) = (q_1, 0)$$

$$\delta(q_1, 0, 0) = (q_1, 0)$$

By doing this we are ignoring 1's

Q4 PDA for well formedness of parentheses.



'C', z₀ / x z₀
'C', x / x x

Q5 $L = \{w c w^R \mid w \in \{0,1\}^*\}$

→ odd length palindrome

0,0/00

0,20/020

0,1/01

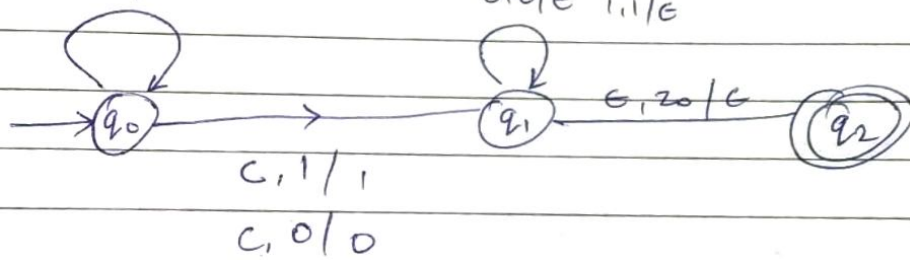
1,1/11

1,20/120

1,0/10

~~0,1/01~~ ~~1,1/11~~

0,0/e 1,1/e



HW

cl. PDA for, $L = \{0^n 1^m 0^{m+n}\}$

$$(q_0, 0, z_0) = (q_0, 0z_0)$$

$$(q_0, 0, 0) = (q_0, 00)$$

$$(q_0, 1, 0) = (q_1, 10)$$

$$(q_1, 1, 1) = (q_1, 11)$$

$$(q_1, 0, 1) = (q_2, \epsilon)$$

$$(q_2, 0, 0) = (q_2, \epsilon)$$

$$(q_2, \epsilon, z_0) = (q_3, \epsilon)$$

$$q_3 \in F$$