* Pushdown Automata:

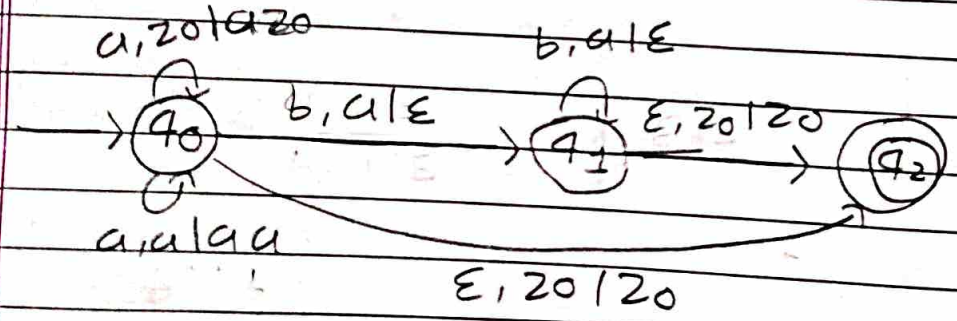
=> A Pushdown Automata is defined by 7 Tuples.

$P = \{Q, \Sigma, \Gamma, \delta, q_0, z_0, F\}$

Where,

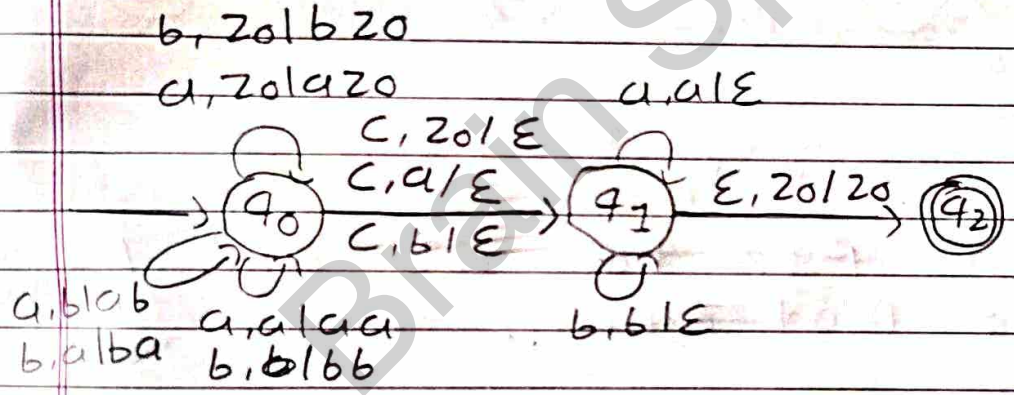
Q -> Set of Finite states
Σ -> Input Symbols
Γ -> Stack Symbols
δ -> Transition Function
q_0 -> Initial states
z_0 -> Start stack symbol
F -> Final states.

Ex. Draw PDA For $P = \{a^n b^n, n \geq 0\}$.



No.	State	i/P	stack	Move
1	q_0	^	z_0	(q_0, z_0)
2	q_0	a	z_0	(q_0, az_0)
3	q_0	a	a	(q_0, aa)
4	q_0	b	a	(q_1, ε)
5	q_1	b	a	(q_2, ε)
6	q_1	ε	z_0	(q_0, z_0)

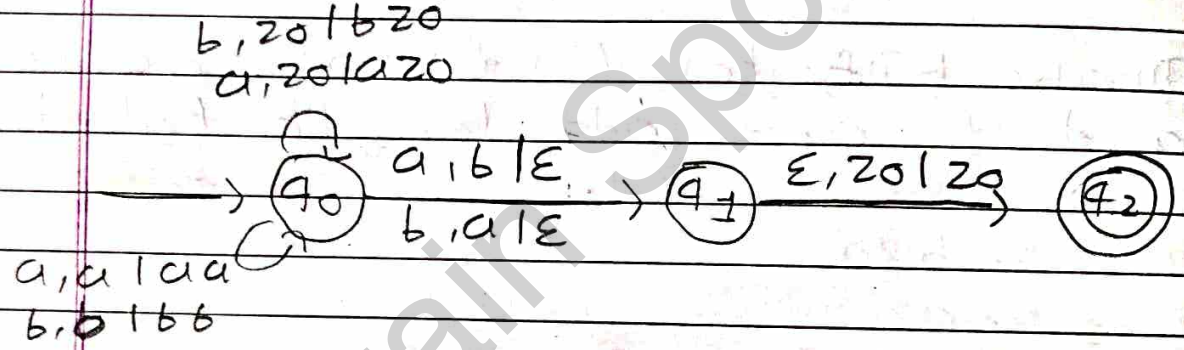
Ex. Draw PDA For $L = \{x x^r / x \in (a,b)^*\}$ and L are odd length Palindrome



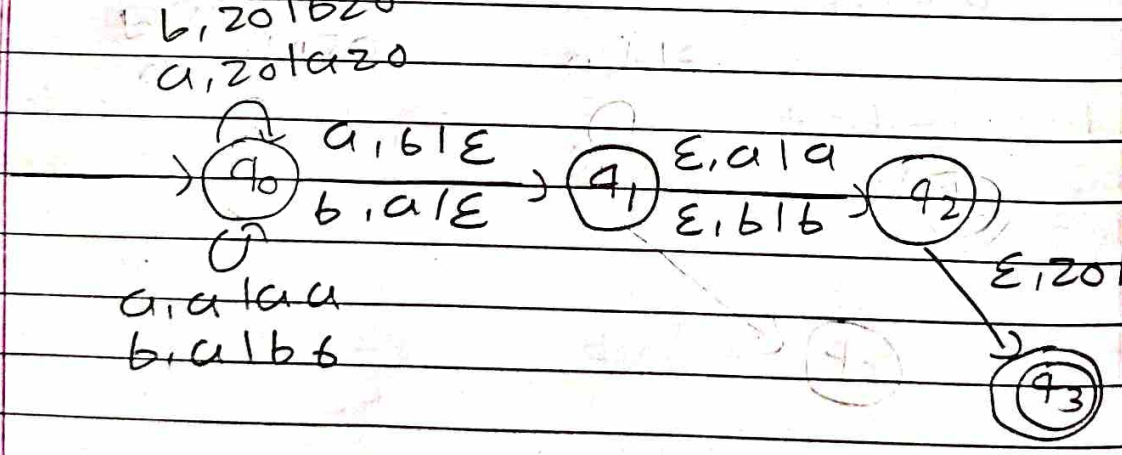
No.	State	i/P	stack	Move
1	q_0	^	z_0	(q_0, z_0)
2	q_0	a	z_0	(q_0, az_0)
3	q_0	b	z_0	(q_0, bz_0)
4	q_0	a	a	(q_0, aa)
5	q_0	b	b	(q_0, bb)
6	q_0	a	b	(q_0, ab)
7	q_0	b	a	(q_0, ba)
8	q_0	c	z_0	(q_1, z_0)

9	q_0	C	a	(q_1, a)
10	q_0	C	b	(q_1, b)
11	q_1	a	a	(q_1, ε)
12	q_1	b	b	(q_1, ε)
13	q_1	ε	z_0	(q_2, z_0)

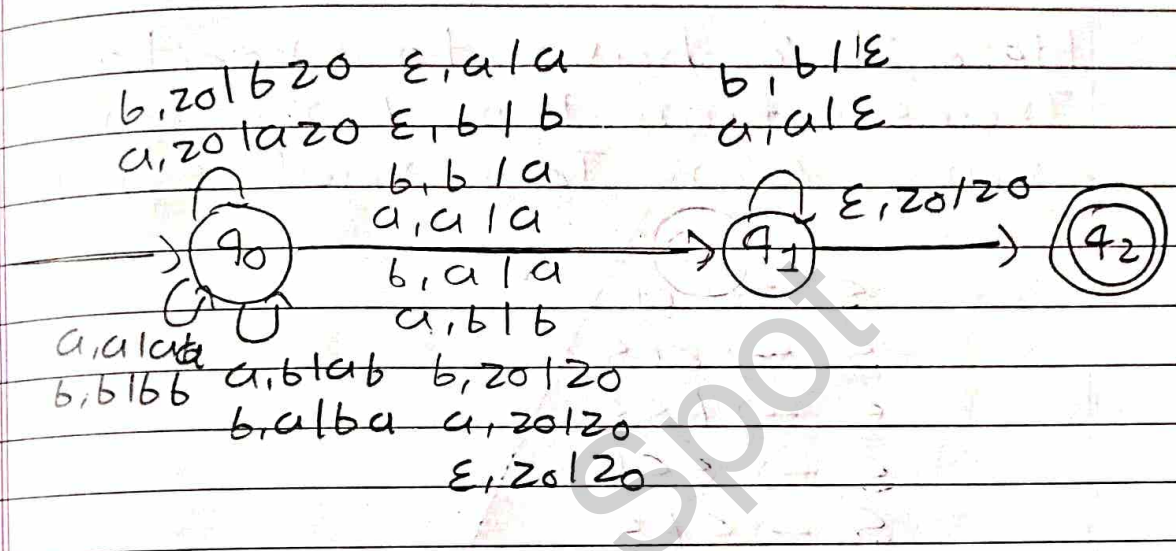
Ex. Draw PDA For a's and b's are same



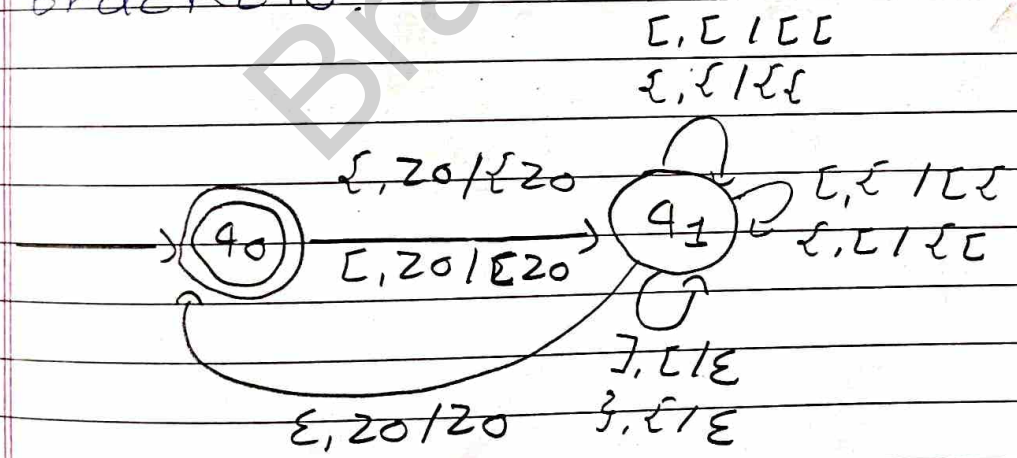
Ex. Draw PDA For a's and b's are Not equal.



Ex. PDA For All the Length Palindrome.



* PDA For Balance String of brackets.



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* Convert CFG to PDA

Ex. S -> aSa
S -> bSb
S -> c

=> Here, We have to write Production Rule For every Terminals are Non-Terminals.

Production Rules:

1 $\delta(q_0, \varepsilon, \varepsilon) \Rightarrow (q_0, \varepsilon)$
2 $\delta(q_0, \varepsilon, S) \Rightarrow (q_0, aSa)$
3 $\delta(q_0, \varepsilon, S) \Rightarrow (q_0, bSb)$
4 $\delta(q_0, \varepsilon, S) \Rightarrow (q_0, c)$
5 $\delta(q_0, a, a) \Rightarrow (q_1, a)$
6 $\delta(q_0, b, b) \Rightarrow (q_1, b)$
7 $\delta(q_0, c, c) \Rightarrow (q_3, c)$

After that we have to create Transaction Table for or Function Any string.

Production Rule

$(q_0, abbcbba, \varepsilon)$
$\vdash (q_0, abbcbba, S)$ — (1)
$\vdash (q_0, abbcbba, aSa)$ — 2
$\vdash (q_1, bbcbba, Sa)$ — 5
$\vdash (q_0, bbcbba, bSba)$ — 3
$\vdash (q_2, bcbba, Sba)$ — 6

$\rightarrow (q_0, bcbba, bSbba) - 3$
$\rightarrow (q_2, cbba, Sbba) - c$
$\rightarrow (q_0, cbba, cbba) - 4$
$\rightarrow (q_3, bba, bba) - 7$
$\rightarrow (q_2, ba, ba) - 6$
$\rightarrow (q_2, a, a) - 6$
$\rightarrow (q_1, \varepsilon, \varepsilon) \rightarrow 5$
$\rightarrow (q_1, \varepsilon) \rightarrow 1$