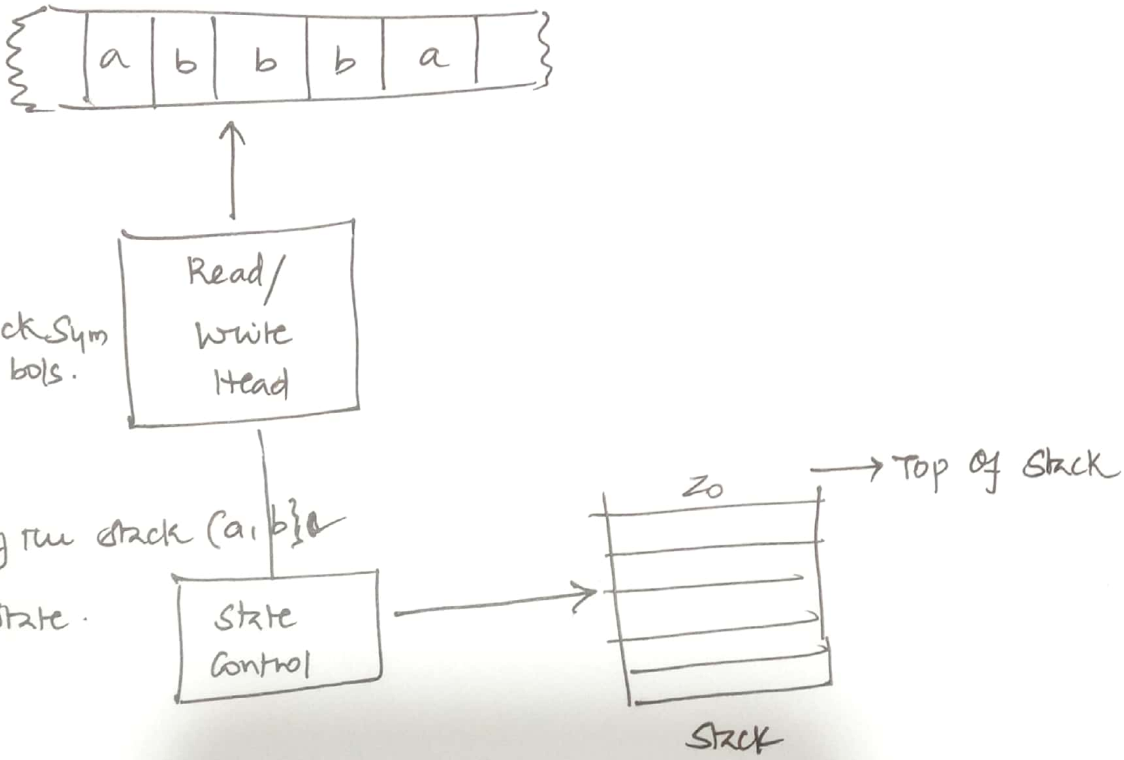
Push Down Automata

7 Tuples

1) Q =
2) Σ =
3) Γ = S → stack Symbols.
4) δ =
5) q_0 = A
6) Z_0 → Top of the stack (a, b}a
7) F → Final state.
=> {D.}

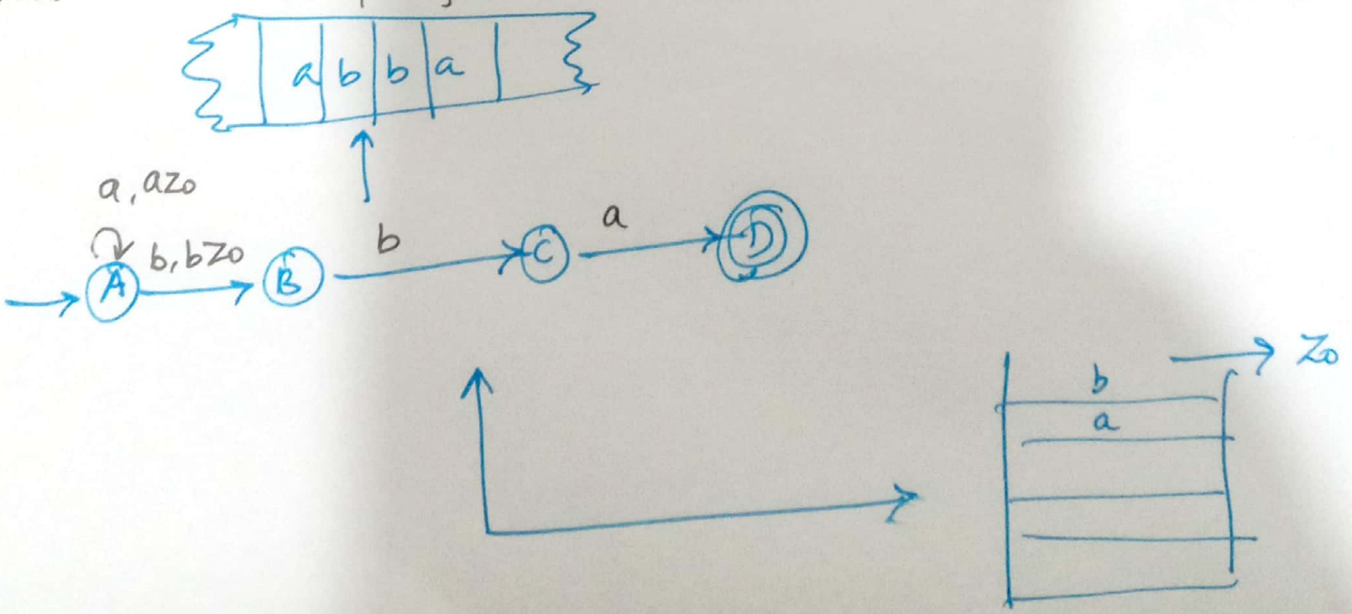


The LIFO → operation of a stack is Based on LIFO

Last in First out principle.

last Symbol pushed on the stack will be popped First.

L = ww^R $w \in \{a,b\}^*$ Construct Push Down Automata



Consider $w \rightarrow ab$ then $w^R = ba$

$L = ww^R \Rightarrow abba.$

Push Down Automata Tuples.

$q_0 \rightarrow A$

$F \rightarrow D$

$Q \rightarrow \{A, B, C, D\}$

$\Sigma \rightarrow \{a, b\}$

$\delta \longrightarrow$ $\delta(A, a, aZ_0) = (a, A)$ $\Rightarrow abba.$

$\delta(A, b, bZ_0) = (b, B)$

$\delta(B, b) = (b, C)$

$\delta(C, a) = (a, D)$

Transition Table.

States	Input Value	O/t State	Transition.
A	a, aZo	a, B	1
A	b, bZO	b, B	1
B	b	b, C	1
C	a	a, D	1

Design PDA for the language $L = \{ a^{2n} b^{n} c^{4} \mid n \geq 1$

(May 2019 – 5 marks)

So $n \Rightarrow 1$ or more than 1 then

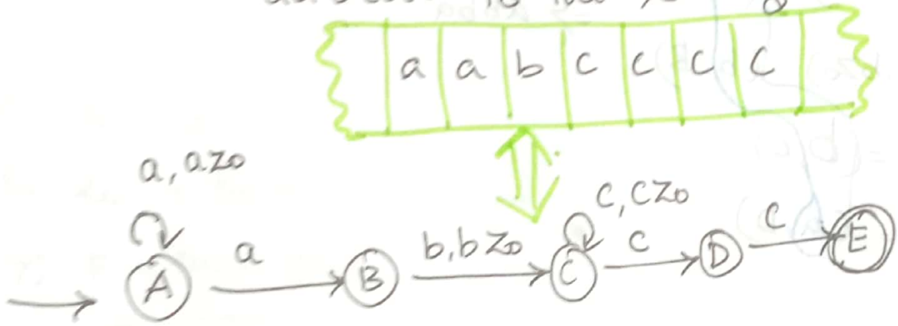
I am taking n value is 1.

$n = 1$

$L = \{ a^{2(1)} b^{1} c^{4} \mid n \geq 1$

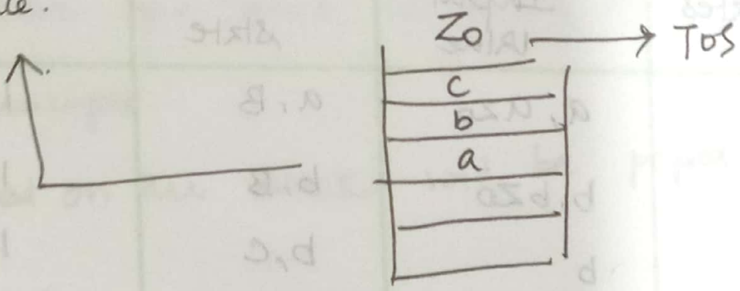
then $a^{2} b^{1} c^{4}$

aabcccc is the string.



$A \xrightarrow{a} A \xrightarrow{a} B \xrightarrow{b} C \xrightarrow{c} C \xrightarrow{c} C \xrightarrow{c} D \xrightarrow{c} E$

Transition sequence.



Tuples

$q_0 \rightarrow A$

$F \rightarrow E$

$Q \rightarrow \{A, B, C, D, E\}$

$\Sigma \rightarrow a, b, c$

$\delta \rightarrow \delta(A, a, aZ_0) = (A, a)$ $\delta(B, b, bZ_0) = (C, b)$ $\delta(C, c) = (C, c)$

$\delta(C, c, cZ_0) = (C, C)$ $\delta(C, c) = (D, c)$

$\delta(A, a) = (B, a)$

$\delta(D, c) = (E, c)$

Transitions Table

State	Input Values	O/P State	Transition
A	a, az_0	A, a	1
A	a	B, a	1
B	b, bz_0	C, b	1
C	c, Cz_0	C, C	1
C	c, Cz_0	C, C	2
C	c	D, C	1
D	c	E, C	1

Equivalence of CFL and PDA.

Step 1: Convert into GNF.

Step 2: Identify the Form,

$A \to a\beta$

$A \to$ productions

$a \to$ Input symbol (or) Terminal

$\beta \to$ out states.

Construct PDA for the following grammar. | Apr - 2018 R16 |

Ex: $S \to AA|a$

$A \to SA|b$

Step 1:

convert into GNF,

There is no useless, null, unit productions.

Then GNF is,

$S \to AA$

$\boxed{S \to bA}$

$A \to SA|b$
so consider b,
$A \to b$

$S \to a$
Already in the GNF.
$\boxed{S \to a}$

$A \to SA$

Substitute $S \to AA$

$A \to \underline{S}A$

$A \to \underline{A}AA$

$\boxed{A \to bAA}$

$A \to b$

$\boxed{S \to bA \mid a \\ A \to bAA \mid b}$

$A \to b$

Already in the GNF. $\boxed{A \to b}$

Step 2: Identify the productions of the Form,

$A \to a\beta$

a → Terminal

β → non-Terminal.

A → Input state or productions

$\boxed{\delta(q, a, A) = (q, \beta)}$

$S \to bA$

$\downarrow$

$A \to a\beta$

$A = S$

$a = b$

$\beta = A$

$\boxed{\delta(q, b, S) = (q, A)}$

$S \to a$

$\downarrow$

$A \to a\beta$

$A = S$

$a = a$

$\beta = \varphi$

$\boxed{\delta(q, a, A) = (q, \varphi)}$

$A \to b\underline{AA}$

$\downarrow$

$A \to a\beta$

$A \to A$

$a \to b$

$\beta \to AA$

$\boxed{\delta(q, b, A) = (q, AA)}$

$A \to b$?

$\downarrow$

$A \to a\beta$

$A \to A$

$a \to b$

$\beta = ?$

$\boxed{\delta(q, b, A) = (q, \varphi)}$

PDA is from the CFG,

M = $Q \rightarrow S, A$ $Z_0 \rightarrow a, b$

$\Sigma \rightarrow a, b$ $S \rightarrow \{a, b\}$

$q_0 \rightarrow S$

$F \rightarrow A$

$\delta(q, b, S) = (q, A)$

$\delta(q, a, A) = (q, \phi)$

$\delta(q, b, A) = (q, AA)$

$\delta(q, b, A) = (q, \phi)$