Q#1 $a^n \circ b^n$ $|a| = |b|$

String:- $a^n \circ b^n$ → Assume Regular Language: because the cardinality of a's and b's are same.

Convert into Pumping length.

$a^p \circ b^p$

convert the string into xy^iz where

$|xy| \leq p$, $|x| \neq 0$, $i \geq 0$.

$x = \varepsilon$

$y = a^p$

$z = \circ b^p$ $\Rightarrow$

xy^iz.

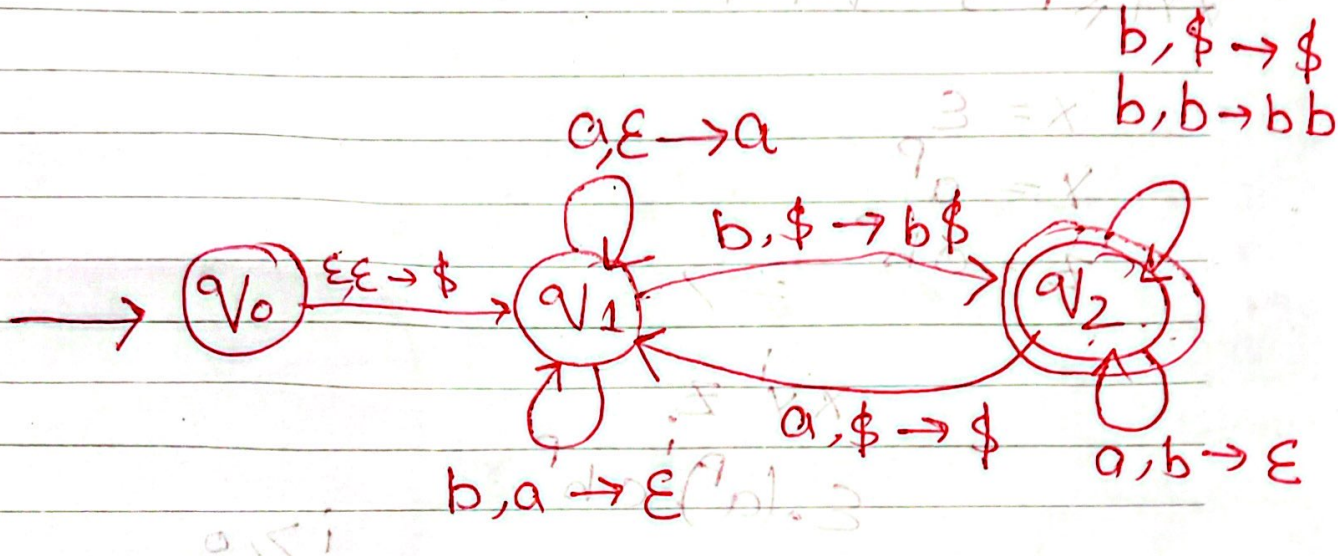
$\varepsilon \cdot (a^p)^i \circ b^p$ $\quad i \geq 0$

Lets take $i = 0$

$(a^p)^0 \cdot \circ b^p$

$= \circ b^p \notin L$

Q NO: 2 Design PDA:



Deterministic Push Down Automata.

Q#3

$S \rightarrow AB|BC$
$A \rightarrow BA|a$
$B \rightarrow CC|b|CS$
$C \rightarrow AB|C|a$

Start new symbol

$S_0 \rightarrow S$
$S \rightarrow AB|BC$
$A \rightarrow BA|a$
$B \rightarrow CC|b|CS$
$C \rightarrow AB|C|a$

Remove unit Production :-

$S_0 \rightarrow AB|BC$
$S \rightarrow AB|BC$
$A \rightarrow BA|a$
$B \rightarrow CC|b|CS$
$C \rightarrow AB|a$

	4	3	2	1
1	B	ϕ	S, S_0, C	A, C
2	A	ϕ	B	X
3	S_0, S, A	B	X	X
4	A, C	X	X	X

STRING: abba Not Belong to the Gramar