$P = (Q, \Sigma, \Gamma, S, q_0, Z_0, F)$

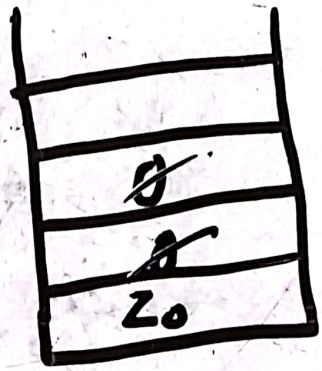
$L = \{0^n 1^{2n}, n>0\}$

Gramar: $S \rightarrow 0S11 \mid \varepsilon$

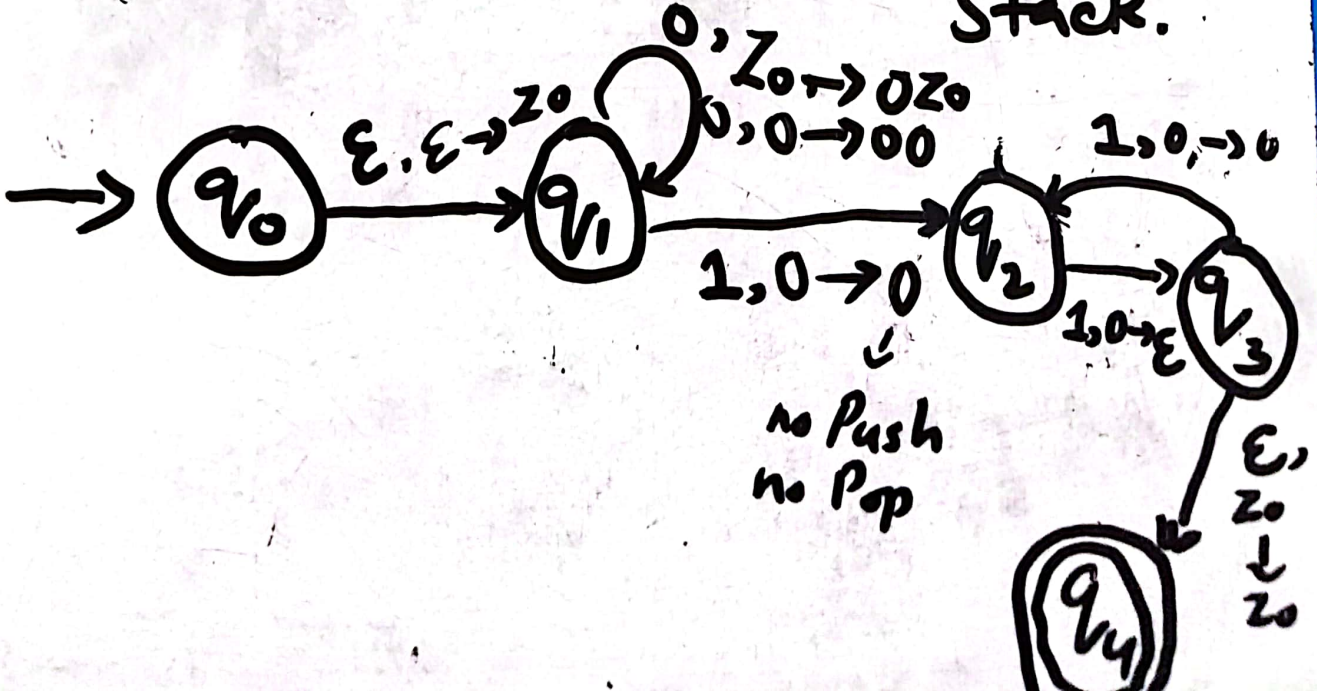
Rules:- if 0, Push

if 11, Pop.

Input tape:- | 0 | 0 | 1 | 1 | 1 | 1 | ε |



Stack.



$\delta_1 : (q_0, \varepsilon, \varepsilon) \rightarrow (q_1, Z_0)$

$\delta_2 : (q_1, 0, Z_0) \rightarrow (q_1, 0Z_0)$

$\delta_3 : (q_1, 1, 0) \rightarrow (q_2, 0)$ only change state.

$\delta_4 : (q_2, 1, 0) \rightarrow (q_3, \varepsilon)$

$\delta_5 : (q_3, 1, 0) \rightarrow (q_2, 0)$

$\delta_6 : (q_3, \varepsilon, Z_0) \rightarrow (q_4, Z_0)$

① Language: $L = a^n b^{2n}$. $n > 0$.

Strings: abb, aabbb, aaabbbbbb

CFG: $S \rightarrow aSbb \mid abb$

PDA

Input.

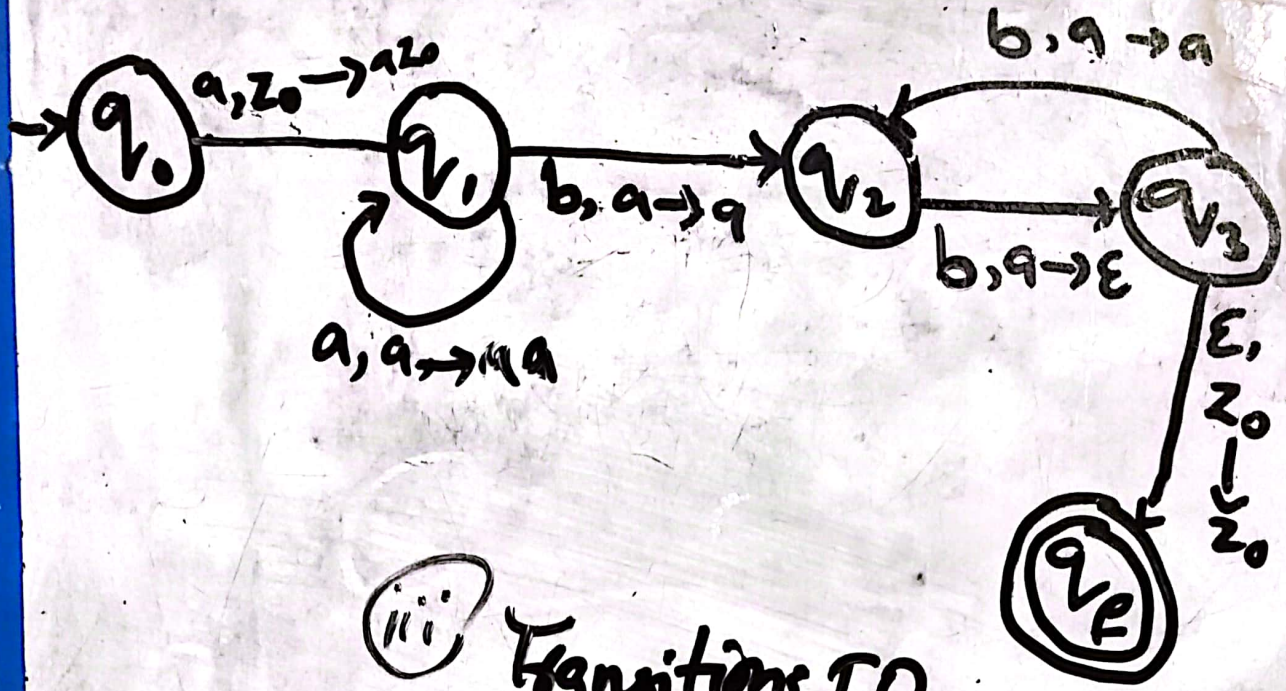
Input Tape:-

a	a	a	b	b	b	b	b	b	ε

① Table

Step	State	Input	Transition fun:	After Stack	State After
①	q_0	a	$(q_0, a, Z_0) = (q_1, aZ_0)$	aZ_0	q_1
②	q_1	a	$(q_1, a, a) = (q_1, aa)$	aaZ_0	q_1
③	q_1	a	$(q_1, a, a) = (q_1, aa)$	$aaaZ_0$	q_1
④	q_1	b	$(q_1, b, a) = (q_2, a)$	$aaaZ_0$	q_2
⑤	q_2	b	$(q_2, b, a) \rightarrow (q_3, \varepsilon)$	aaZ_0	q_3
⑥	q_3	b	$(q_3, b, a) \rightarrow (q_2, a)$	aaZ_0	q_2
⑦	q_2	b	$(q_2, b, a) \rightarrow (q_3, \varepsilon)$	aZ_0	q_3
⑧	q_3	b	$(q_3, b, a) \rightarrow (q_2, a)$	aZ_0	q_2
⑨	q_2	b	$(q_2, b, a) \rightarrow (q_3, \varepsilon)$	Z_0	q_3
⑩	q_3	ε	$(q_3, \varepsilon, Z_0) \rightarrow (q_f, Z_0)$	Z_0	q_f

(ii) Graph



(iii) Transitions IO

(i) $\delta: (q_0, a, z_0) \longrightarrow (q_1, az_0)$

(ii) $\delta: (q_1, a, a) \rightarrow (q_1, aa)$

(iii) $\delta: (q_1, b, a) \rightarrow (q_2, a)$ → nothing change in Stack.

(iv) $\delta: (q_2, b, a) \rightarrow (q_3, \varepsilon)$

(v) $\delta: (q_3, b, a) \rightarrow (q_2, a)$

(vi) $\delta: (q_3, \varepsilon, z_0) \rightarrow (q_f, z_0)$.

$L = \{ wvw^R \mid w = (a+b)^* \}$.

String:- ε, aa, bb, abba, baab....

CFG: $S \rightarrow aSa \mid bSb \mid \varepsilon$

Input Tape:

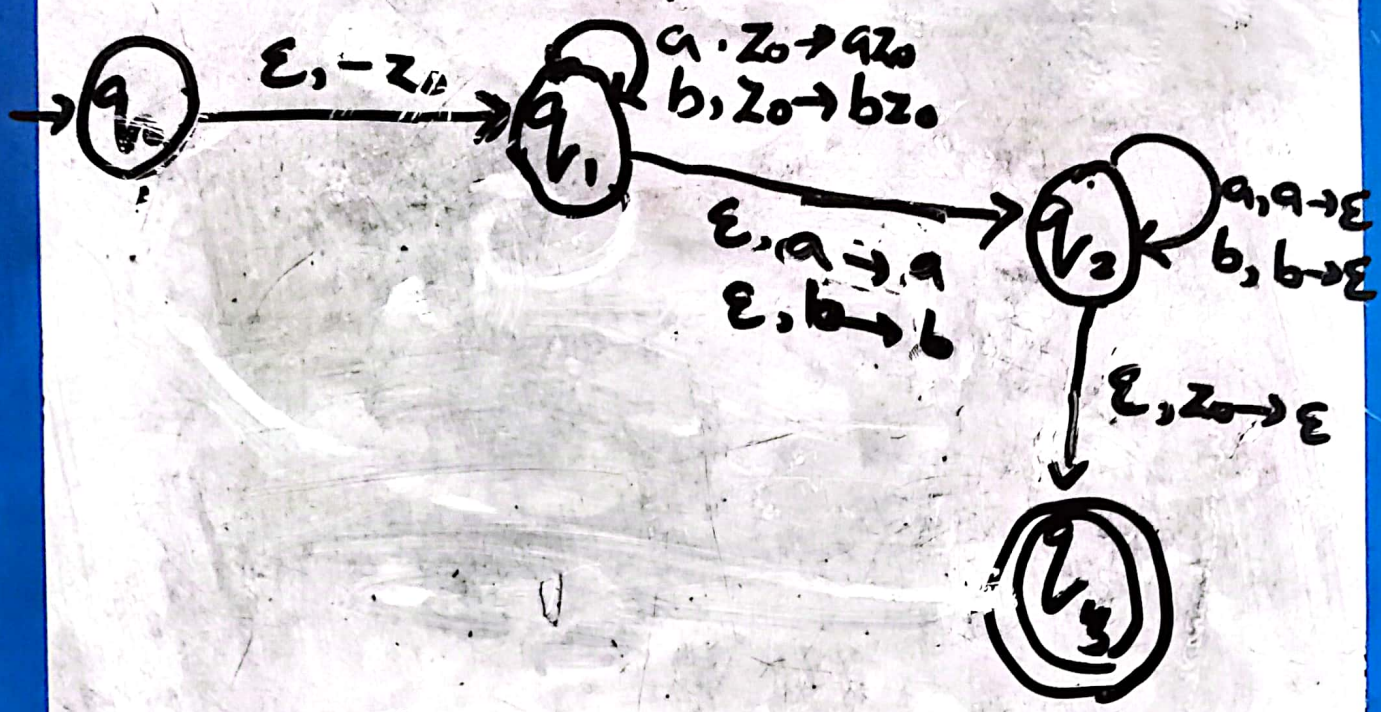
b	a	a	b	ε

PDA

① Table

Step	State	Input	Stack Top	Action	State After
①	q_0	ε	—	Push z_0	q_1
②	q_0	b	z_0	Push b	q_1
③	q_1	a	b	Push a	q_1
④	q_1	ε	a, b	change State	q_2
⑤	q_2	a	a	Pop a	q_2
⑥	q_2	b	b	Pop b	q_2
⑦	q_2	ε	z_0	—	q_f

② Graph



③ Transition ID

① $\delta: (q_0, \varepsilon, -) \rightarrow (q_1, z_0)$

② $\delta: (q_1, b, z_0) \rightarrow (q_1, bz_0)$

③ $\delta: (q_1, a, z_0) \rightarrow (q_1, az_0)$

④ $\delta: (q_1, \varepsilon, a) \rightarrow (q_2, a)$ → nothing change in Stack.

⑤ $\delta: (q_2, a, a) \rightarrow (q_2, \varepsilon)$

⑥ $\delta: (q_2, b, b) \rightarrow (q_2, \varepsilon)$

⑦ $\delta: (q_2, \varepsilon, z_0) \rightarrow (q_f, \varepsilon)$