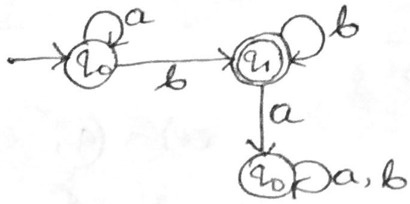
TOC

Gr-'B'

2) $L = \{a^m b^n \mid m \geq 0 \text{ and } n \geq 1\}$

$\therefore L = \{b, ab, aab, abb, aabb, \ldots\}$

So, the DFA for the following language is,



3) Construction of PDA –

$P = (Q, \Sigma, \Gamma, \delta, q_0, Z, F)$

$L = \{a^n b^n \mid n \geq 1\}$

Considering a String, $w = \{aaabbb\}$

$\delta(q_0, a, Z_0) = (q_0, aZ_0)$

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

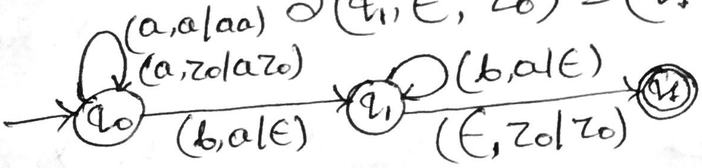
$\delta(q_0, a, a) = (q_0, aa)$

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

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

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

$\delta(q_1, \epsilon, Z_0) = (q_f, Z_0)$



$(q_0, aaabbb, Z_0) \vdash (q_0, aabbb, aZ_0) \vdash (q_0, abbb, aaZ_0)$

$\vdash (q_0, bbb, aaaZ_0) \vdash (q_1, bb, aaZ_0) \vdash (q_1, b, aZ_0)$

$\vdash (q_1, \epsilon, Z_0) \vdash (q_f, \epsilon, Z_0).$

Gr-'C'

5>(a) $P = S \rightarrow aB \mid bA$

$A \rightarrow aS \mid bAA \mid a$

$B \rightarrow bS \mid aBB \mid b$

Construction of PDA $\Rightarrow$

$\delta(q_0, \epsilon, Z_0) = \{(q_1, SZ_0)\}$

$\delta(q_1, a, S) = \{(q_1, B)\}$

$\delta(q_1, b, S) = \{(q_1, A)\}$

$\delta(q_1, a, A) = \{(q_1, S), (q_1, \epsilon)\}$

$\delta(q_1, b, A) = \{(q_1, AA)\}$

$\delta(q_1, b, B) = \{(q_1, S), (q_1, \epsilon)\}$

$\delta(q_1, a, B) = \{(q_1, BB)\}$

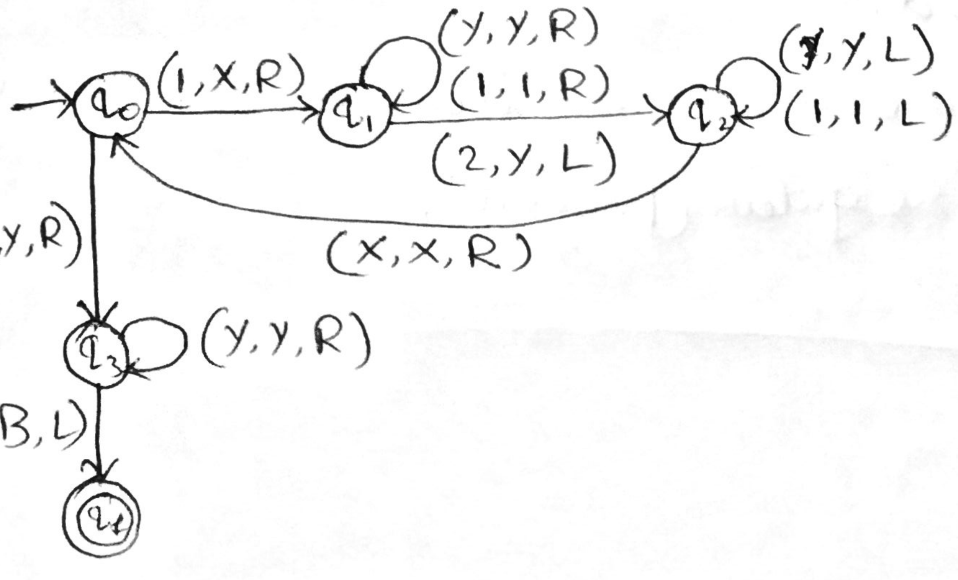
$\delta(q_1, \epsilon, Z_0) = \{(q_f, Z_0)\}$

(b) $L = \{1^n 2^n : n \geq 1\}$

Considering a string, $w = \{111222\}$

B	1	1	1	2	2	2	B

R|W head



$\delta(q_0, 1) = (q_1, X, \text{right})$
$\delta(q_1, 1) = (q_1, 1, \text{right})$
$\delta(q_1, 2) = (q_2, Y, \text{left})$
$\delta(q_2, 1) = (q_2, 1, \text{left})$
$\delta(q_2, X) = (q_0, X, \text{right})$
$\delta(q_1, Y) = (q_1, Y, \text{right})$
$\delta(q_2, Y) = (q_2, Y, \text{left})$
$\delta(q_0, Y) = (q_3, Y, \text{right})$
$\delta(q_3, Y) = (q_3, Y, \text{right})$
$\delta(q_3, \#) = (q_4, \#, \text{left})$

6)(a) $L = \{0^n 1^n | n \geq 1\}$

As we can see L is an infinite language so, we can use pumping lemma theory to check whether the language is regular or not.

Considering a string, $w = \{000111\}$.

~~Now, let x = {000,~~

After dividing the string into 3 parts we consider,

$x = 000$, $y = 11$, $z = 1$.

$\therefore$ for $i = 1$, $xy^iz = \underline{000}\underline{11}\underline{1}$

for $i = 2$, $xy^iz = \underline{000}\underline{1111}\underline{1}$

So, for $i = 2$, when y is getting pumped, the pumping lemma theory failed.

From here we can easily say that the the given language is not regular (Proved).