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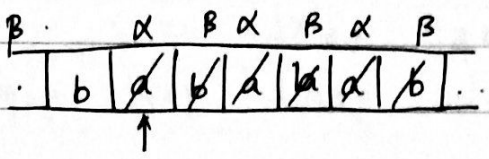
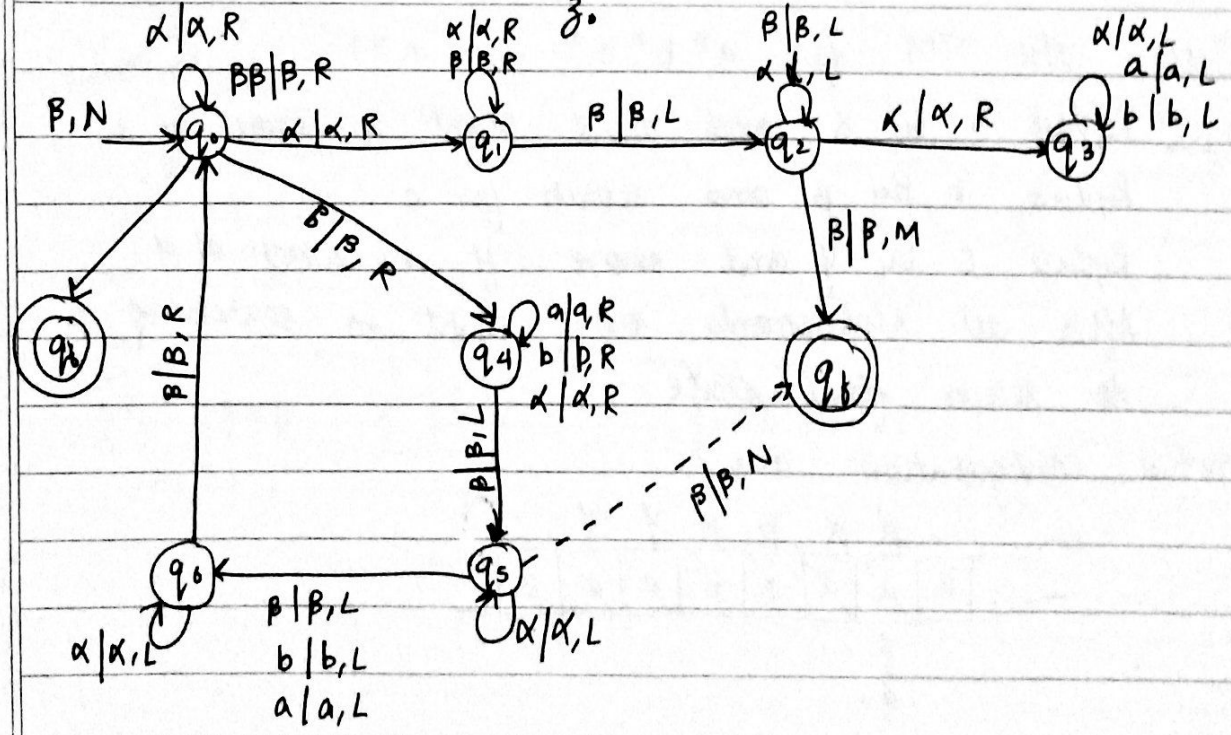
AT TUTORIAL NO: 8

Q.1] Construct TM to check palindrome over $\Sigma = \{0, 1\}$

Ans: Logic: Here palindrome strings can start with $\Sigma = \{a, b\}$ we will need string from L to R whatever encountered 1st, either a or b, we replace that by α/β correspondingly and move in right direction till β from there will move in left till β.

Repeat this till all as & bs replaced by α and β.





$M = (Q, \Sigma, \Gamma, \delta, q_0, \beta, F)$

$Q = \{q_0, q_1, q_2, q_3, q_4, q_5, q_6, q_f\}$

$\Sigma = \{0, 1\}$

$\Gamma = \{0, 1, \alpha, \beta, \beta\}$

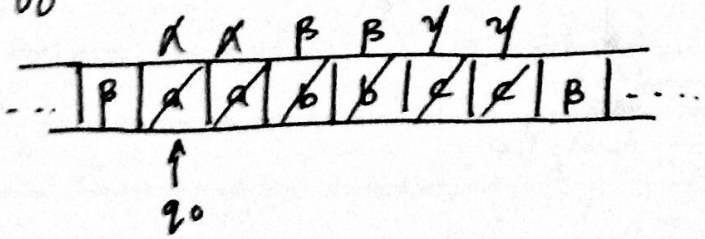
Transition Table:

	0	1	α	β	β
q_0	$q_1 \alpha R$	$q_2 \beta R$	$q_0 \alpha R$	-	-
q_1	$q_1 \alpha R$	$q_1 b R$	$q_1 \alpha R$	$q_1 \beta R$	$q_2 \beta L$
q_2	$q_3 \alpha L$	-	$q_2 \alpha L$	$q_2 \beta L$	$q_0 \beta N$
q_3	$q_3 a L$	$q_3 a L$	$q_3 \alpha L$	-	$q_0 \beta R$
q_4	$q_4 a R$	$q_2 b R$	$q_4 \alpha R$	-	$q_5 \beta L$
q_5	-	$q_6 \beta L$	$q_5 \alpha L$	-	-
q_6	$q_0 a L$	$q_6 b L$	$q_6 \alpha L$	$q_6 \beta L$	$q_1 \beta R$

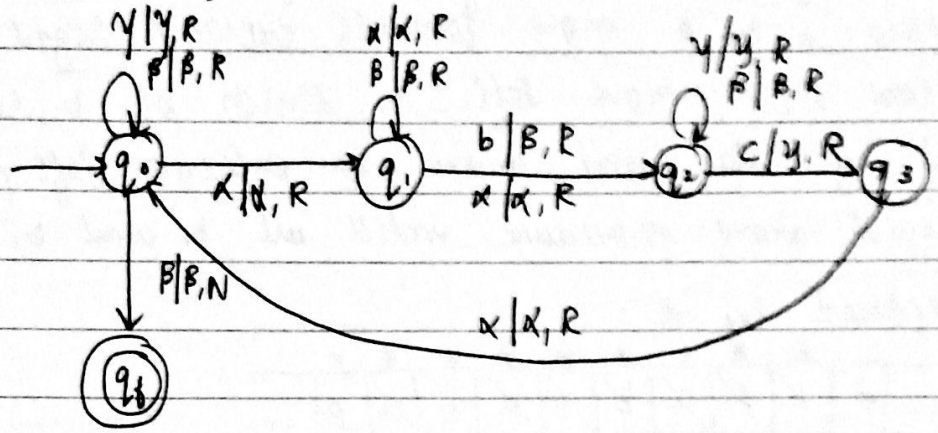
Q.3] Design the TM for $a^n b^n c^n$ for $n \geq 1$

Ans: Logic: Replace a by α and move right in search of b.
Replace b by β and search for c.
Replace c by γ and move left in search of a.
After all replacements move right in search of β to reach final state.

Initial configuration: $n = 2$



Transition diagram:



$M = (Q, \Sigma, \Gamma, \delta, q_0, \beta, F)$

$Q = \{q_0, q_1, q_2, q_3, q_f\}$

$\Sigma = \{a, b, c\}$

$\Gamma = \{a, b, c, \alpha, \beta, \gamma, \beta\}$

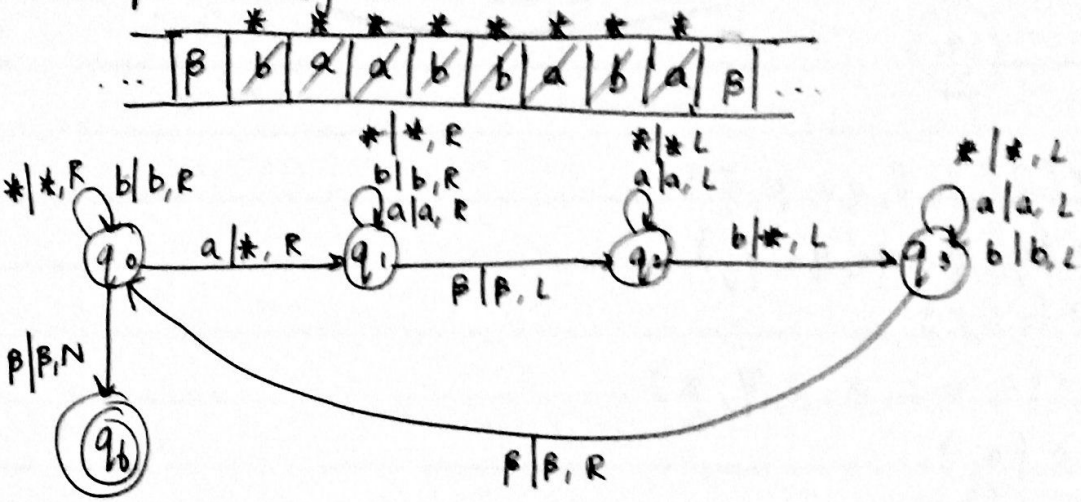
$F = \{q_f\}$

Transition Table:

	a	b	c	α	β	β
q_0	$q_1 \alpha R$	-	-	-	$q_0 \beta R$	$q_f \beta R$
q_1	$q_1 \alpha R$	$q_2 \beta R$		-	$q_1 \beta R$	-
q_2	-	$q_2 \beta R$	$q_0 bR$	-	-	-
q_3	$q_3 q_1$	$q_3 bL$	-	$q_0 \alpha R$	$q_3 BL$	-

Q.4] Construct TM for checking well formedness of parentheses

Ans: Logic: Search for 'a' moving in right direction.
Replace a by * move towards extreme right β.
From there move left in search of b, replace
'b' by star and move to extreme left β.
Repeat above procedure until all bs and as are
replaced by *.



$M = (Q, \Sigma, \Gamma, \delta, q_0, \beta, F)$

$Q = \{q_0, q_1, q_2, q_3\}$

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

$\Gamma = \{a, b, *, \beta\}$

$F = \{q_f\}$

Transition Table:

	a	b	*	β
q_0	$q_1 * R$	$q_0 b R$	$q_0 * R$	$q_f \beta N$
q_1	$q_1 a R$	$q_1 b R$	$q_1 * R$	$q_2 b L$
q_2	$q_2 a L$	$q_3 * L$	$q_4 * L$	-
q_3	$q_3 a L$	$q_3 b L$	$q_3 * L$	$q_0 \beta R$