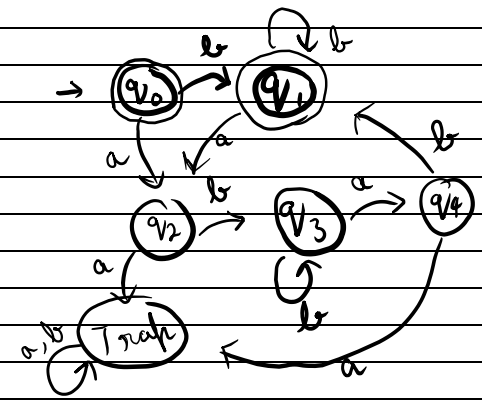
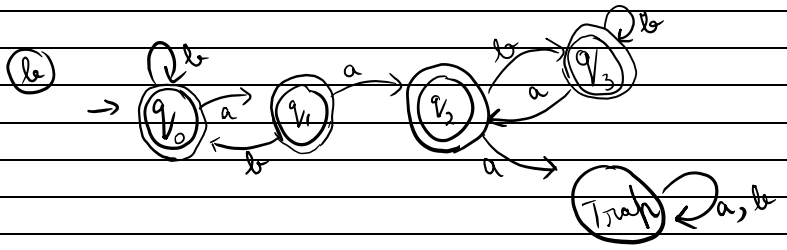
Q1) L1 = { b, abab, ababb, ababab, ... }

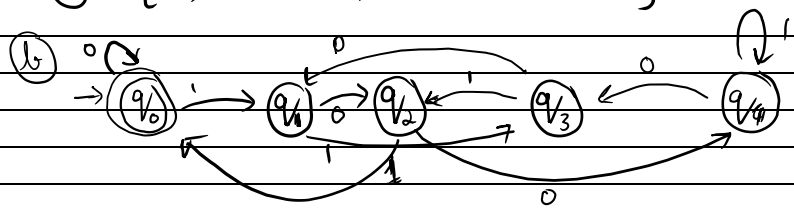
b)



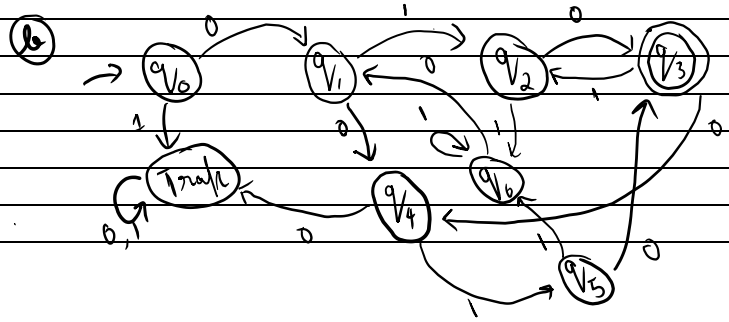
L4 @ = { baab, baabb, aab, aabbb, ... }



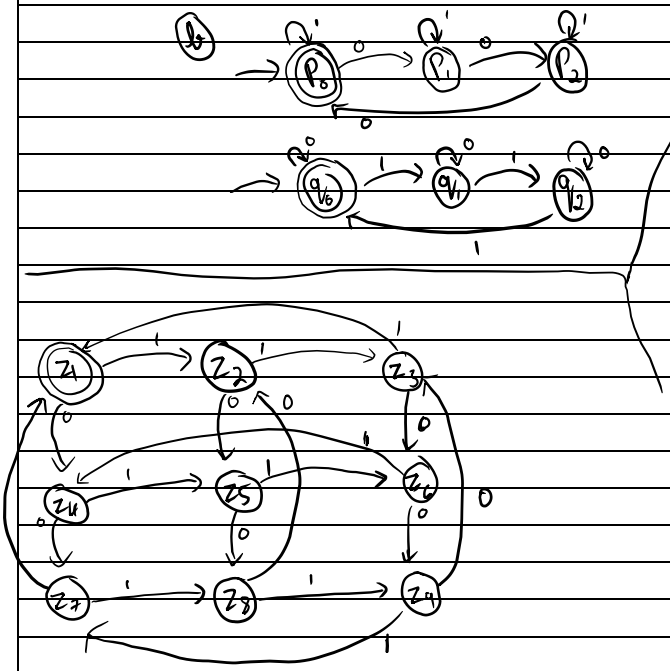
Q2a) L1 @ = { 0, 101, 1010, 1111, 10100, ... }



L2 @ = { 010, 0010, 01010, 011010, ... }

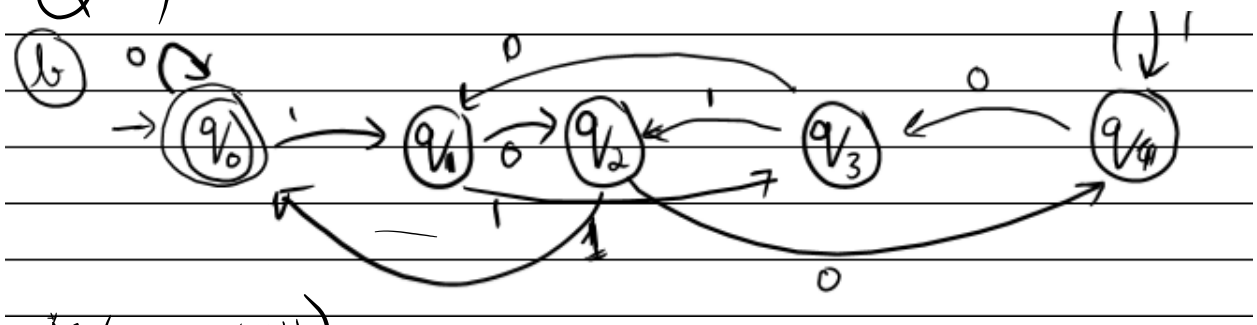


14 @ = { ∅, 00, 11, 000111, 010101, ... }



Old State	0	1
+ $p_0 q_0 = z_1$	$p_1 q_0 = z_4$	$p_0 q_1 = z_2$
$p_0 q_1 = z_2$	$p_1 q_1 = z_5$	$p_0 q_2 = z_3$
$p_0 q_2 = z_3$	$p_1 q_2 = z_6$	$p_0 q_0 = z_1$
$p_1 q_0 = z_4$	$p_2 q_0 = z_7$	$p_1 q_1 = z_5$
$p_1 q_1 = z_5$	$p_2 q_1 = z_8$	$p_1 q_2 = z_6$
$p_1 q_2 = z_6$	$p_2 q_2 = z_9$	$p_1 q_0 = z_4$
$p_2 q_0 = z_7$	$p_0 q_0 = z_1$	$p_2 q_1 = z_8$
$p_2 q_1 = z_8$	$p_0 q_1 = z_2$	$p_2 q_2 = z_9$
$p_2 q_2 = z_9$	$p_0 q_2 = z_3$	$p_2 q_0 = z_7$

Q2b)



i) $\hat{f}(q_0, 000111)$

$= f(\hat{f}(q_0, 00011), 1)$

$= f(f(\hat{f}(q_0, 0001), 1), 1)$

$= f(f(f(\hat{f}(q_0, 000), 1), 1), 1)$

$= f(f(f(f(\hat{f}(q_0, 00), 0), 1), 1), 1)$

$= f(f(f(f(f(\hat{f}(q_0, 0), 0), 0), 1), 1), 1)$

$= f(f(f(f(f(f(\hat{f}(q_0, \wedge), 0), 0), 0), 1), 1), 1)$

$\hat{f}(q, \wedge) \rightarrow q$

$\hat{f}(q, xa) \rightarrow f(\hat{f}(q, x), a)$

$\hat{f}(q, xy) \rightarrow \hat{f}(\hat{f}(q, x), y)$

$= f(f(f(f(f(f(q_0,0),0),0),1),1),1)$

$= f(f(f(f(f(q_0,0),0),1),1),1)$

$= f(f(f(f(q_0,0),1),1),1)$

$= f(f(f(q_0,1),1),1)$

$= f(f(q_1,1),1)$

$= f(q_3,1) \Rightarrow q_2$

Hence, Rejected

ii) $^*f(q_0, 101000)$

$= f(^*f(q_0,10100),0)$

$= f(f(^*f(q_0,1010),0),0)$

$= f(f(f(^*f(q_0,101),0),0),0)$

$= f(f(f(f(^*f(q_0,10),1),0),0),0)$

$= f(f(f(f(f(^*f(q_0,1),0),1),0),0),0)$

$= f(f(f(f(f(f(^*f(q_0,\Lambda),1),0),1),0),0),0)$

$= f(f(f(f(f(f(q_0,1),0),1),0),0),0)$

$= f(f(f(f(f(q_1,0),1),0),0),0)$

$= f(f(f(f(q_2,1),0),0),0)$

$= f(f(f(q_6,0),0),0)$

$= f(f(q_0,0),0)$

$= f(q_0,0) \Rightarrow q_0$

Hence, Accepted

iii) $\hat{\delta}(q_0, 10110100)$

$= \hat{\delta}(\hat{\delta}(q_0, 101), 10100)$ From ①

$= \hat{\delta}(q_0, 10100)$

$= \hat{\delta}(\hat{\delta}(q_0, 101), 00)$

$= \hat{\delta}(q_0, 00)$

$= \delta(\hat{\delta}(q_0, 0), 0)$

$= \delta(\delta(\hat{\delta}(q_0, \lambda), 0), 0)$

$= \delta(\delta(q_0, 0), 0)$

$= \delta(q_0, 0) \Rightarrow q_0$

Hence, Accepted

$\hat{\delta}(q_0, 101)$

$= \delta(\hat{\delta}(q_0, 10), 1)$

$= \delta(\delta(\hat{\delta}(q_0, 1), 0), 1)$

$= \delta(\delta(\delta(\hat{\delta}(q_0, \lambda), 1), 0), 1)$

$= \delta(\delta(\delta(q_0, 1), 0), 1)$

$= \delta(\delta(q_1, 0), 1)$

$= \delta(q_2, 1) = q_0$ — ①

$\hat{\delta}(q_0, 101) = q_0$

iv) $\hat{\delta}(q_0, 000\ 010\ 0000)$

$= \hat{\delta}(\hat{\delta}(q_0, 000), 010000)$ From ②

$= \hat{\delta}(q_0, 010000)$

$= \delta(\hat{\delta}(q_0, 01000), 0)$

$= \delta(\delta(\hat{\delta}(q_0, 0100), 0), 0)$

$= \delta(\delta(\delta(\hat{\delta}(q_0, 010), 0), 0), 0)$

$= \delta(\delta(\delta(\delta(\hat{\delta}(q_0, 01), 0), 0), 0), 0)$

$= \delta(\delta(\delta(\delta(\delta(\hat{\delta}(q_0, 0), 1), 0), 0), 0), 0)$

$= \delta(\delta(\delta(\delta(\delta(\delta(\hat{\delta}(q_0, \lambda), 0), 1), 0), 0), 0), 0)$

$\hat{\delta}(q_0, 000)$

$= \delta(\hat{\delta}(q_0, 00), 0)$

$= \delta(\delta(\hat{\delta}(q_0, 0), 0), 0)$

$= \delta(\delta(\delta(\hat{\delta}(q_0, \lambda), 0), 0), 0)$

$= \delta(\delta(\delta(q_0, 0), 0), 0)$ — ②

$= \delta(\delta(\delta(q_0, 0), 0), 0) \Rightarrow q_0$

$= \delta(\delta(q_0, 0), 0)$

$= \delta(q_0, 0)$

$= \delta(\delta(\delta(\delta(\delta(\delta(q_0, 0), 1), 0), 0), 0), 0), 0)$

$= \delta(\delta(\delta(\delta(\delta(\delta(q_0, 1), 0), 0), 0), 0), 0)$

$= \delta(\delta(\delta(\delta(\delta(q_1, 0), 0), 0), 0), 0)$

$= \delta(\delta(\delta(\delta(q_2, 0), 0), 0), 0)$

$= \delta(\delta(\delta(q_4, 0), 0), 0)$

$= \delta(q_3, 0) \Rightarrow q_1$

Hence, rejected