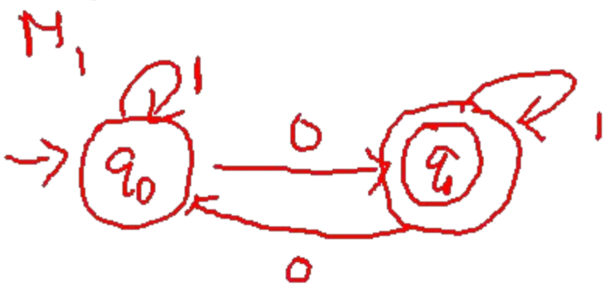
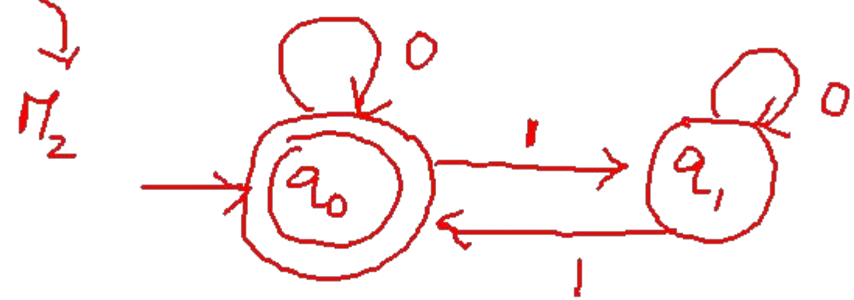
$L_1 = \{ x \mid x \in \{0,1\}^* \text{ x has ODD no. of 0's} \}$

$L_2 = \{ x \mid x \in \{0,1\}^* \text{ x has Even no. of 1's} \}$



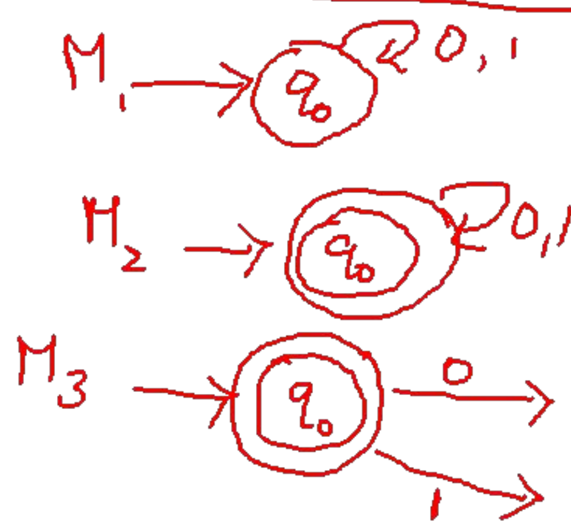


valid st

1 ... 10

110111101111110

00 ... 010 ... 01



$L(M_1) = \phi$

$L(M_2) = \Sigma^*$

If Start State is the final

FSA is allowed to Accept 'a string' without reading anything.

FSA accepts 'the empty string' (ϵ)

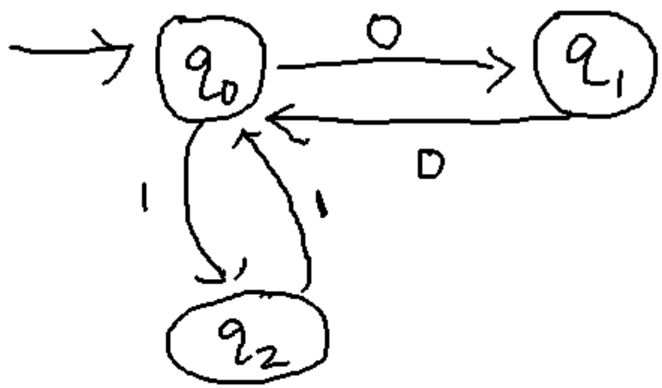
Epsilon

$= \{ \epsilon, 0, 00, 11, 0101, \ldots \}$

Zero no. of 1's

$L_5 = \{ x \mid x$ has 011 as a no. of 0's

$L_5 = \{ x \mid x \text{ has ODD no. of 0's} \wedge \text{Even no. of 1's} \}$



$\delta(q_0, 1)$ — q_1 / — q_2

$L_5 = \{ 0,$

0, 000, 00110,

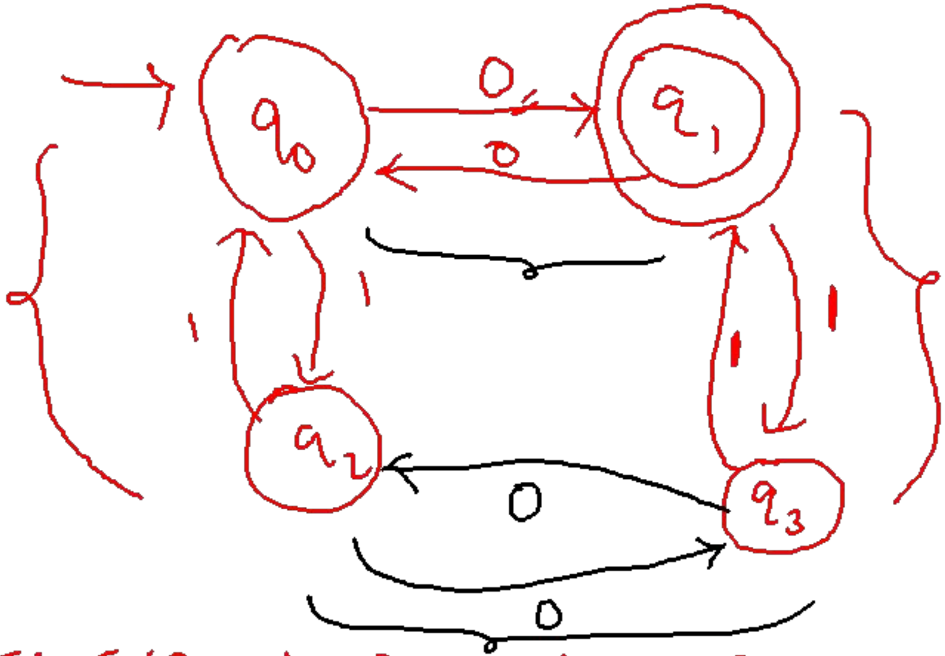
0011111000 → ODD $\#_0$ Even $\#_1$

001100011 } $\delta(q_0, x) = q_0$

q_0 ... q_0 } $\delta(q_0, x) = q_1$

00110 $\delta(q_0, x) = q_1$ → 0's # $\wedge$ Even #

q_0



$\delta(q_0, x) = q_1$

ODD #0's
Even #1's

01 ⊢ #1

$\delta(q_3, 0) = q_0$ 0100

$\delta(q_3, 0) \to q_1$ 010 ✗

$\delta(q_3, 0) \to q_2$

If $\delta(q_1, 1) = q_0$ Machine

010 Invalid

$\delta(q_1, 1) = q_2$ Machine

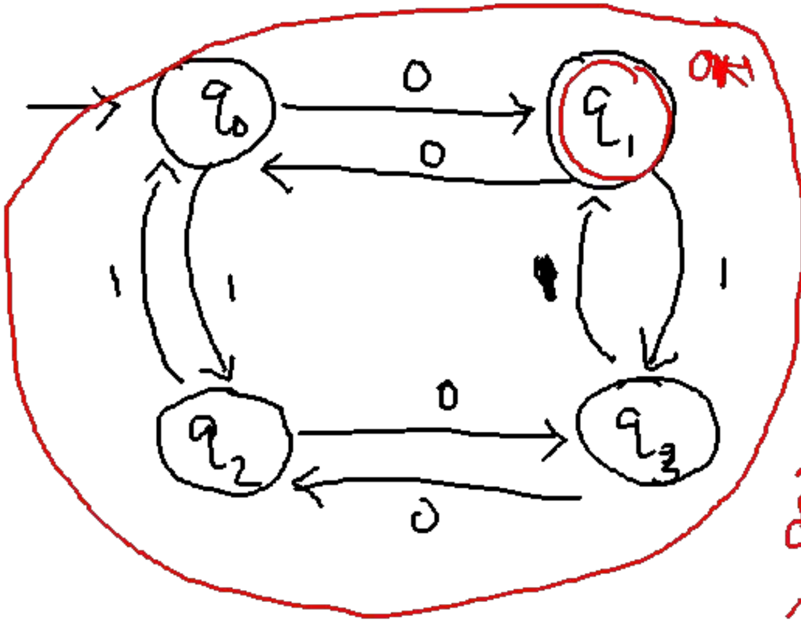
0110 Even #0's
Invalid

$\delta(q_0, 0)$ — q_1

$\delta(q_0, 1)$ — q_2

$\delta(q_1, 0)$ — q_0

$\delta(q_1, 1)$ — ?



0 OK
OK OP
ε

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

$\hat{\delta}(q_0, x) = q_1$

x begins with 'p'
ends with pattern 'p'
contains '101'

?? 'p' is some string over {0,1}

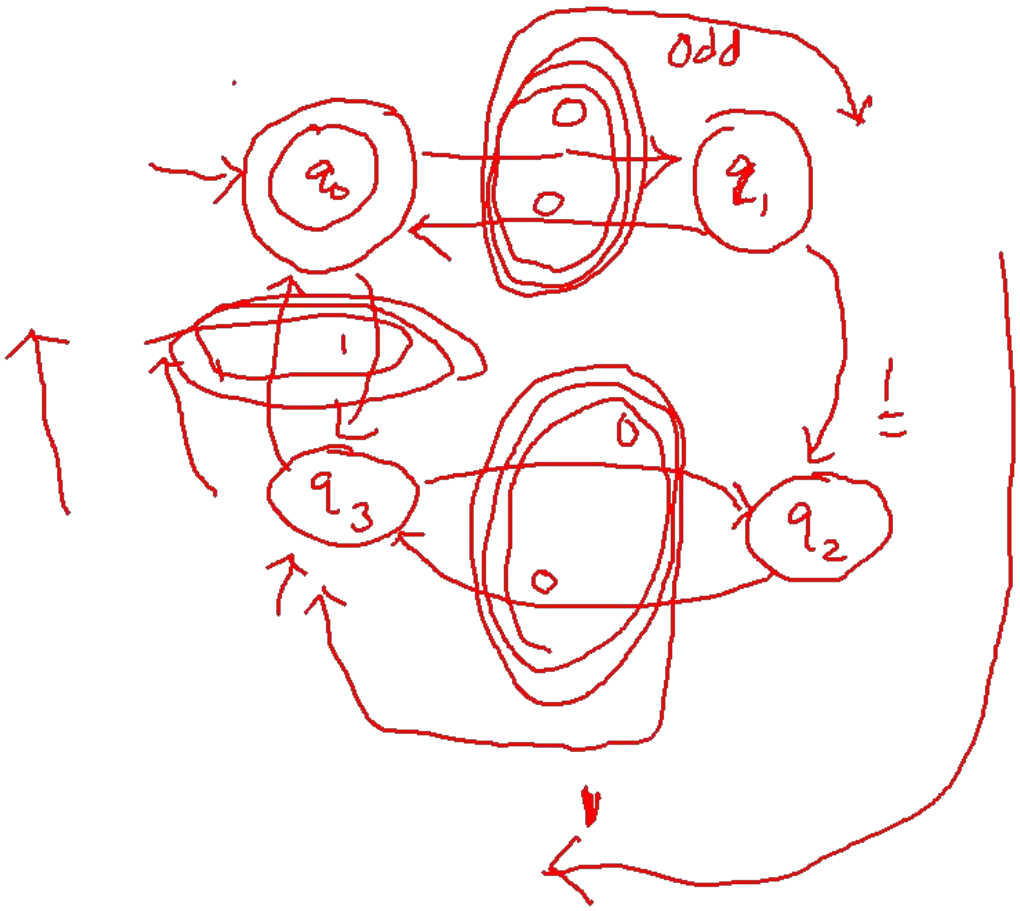
Q1: Can we design FSA for any 'p' s.t. begins with p, ends " , contains p

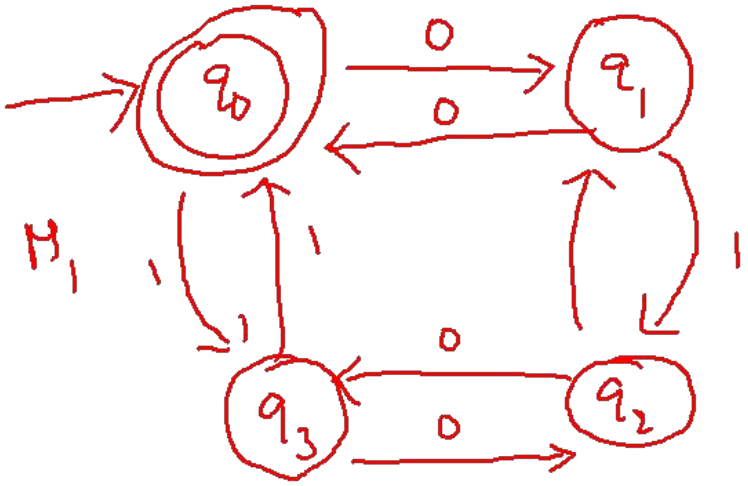
$L = \{ x \mid x \in \{0,1\}^*$
#1's in x is div by 5 $\}$

000, 0101010 ✗, 1111100 ✓, 1010111 ✓

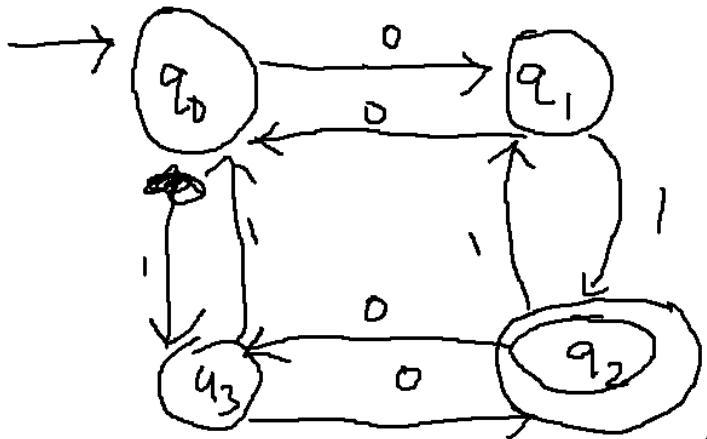
1110011400...

Q2 Counting





$L(M_1) = \{ x \mid x$ has Even #0 Even #1 $\}$



M_2

$L(M_2) = \{ x \mid x \text{ has ODD \#}_1 \text{ ODD \#}_0 \}$

M_3 $\delta(q_0, x) = q_3$

$L_3 = \{ x \mid \delta(q_0, x) = q_3 \}$

$L_3 = \{ x \mid x \text{ has ODD \#}_1 \text{ Even \#}_0 \}$

00111 0

$= q_2$

$L = \{ x \mid x \in \{0,1\}^* \text{ s.t } x \text{ contains } 101 \text{ or } 010 \text{ as a substring} \}$

Count Σ?

$L = \{ 101, 010, \overline{1010}, \overline{0101}, 01010, 11010, 0101, 1101, \ldots \}$

$\delta(q_2, 0) = \{q_0, q_4\}$ X

Either A or B

- Exclusive OR

(Both A & B cannot happen)

A or B - Inclusive OR

(Both A & B)