## Problem 1.1

**a.** $M_1 : q_1$ $M_2 : q_1$
**b.** $M_1 : \{q_2\}$ $M_2 : \{q_1, q_4\}$
**c.** $M_1 : q_1 \to q_2 \to q_3 \to q_1 \to q_1$ $M_2 : q_1 \to q_1 \to q_1 \to q_2 \to q_4$
**d.** $M_1$ : no $M_2$ : yes
**e.** $M_1$ : no $M_2$ : yes

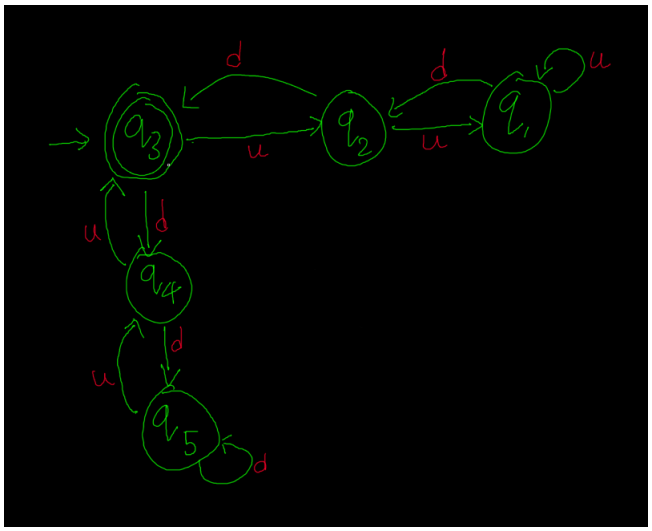
## Problem 1.2

$M_1$ definition:
$Q : \{q_1, q_2, q_3\}$
$\Sigma : \{a, b\}$
$\delta$ can be shown as:

| | $a$ | $b$ |
|---|---|---|
| $q_1$ | $q_2$ | $q_1$ |
| $q_2$ | $q_3$ | $q_3$ |
| $q_3$ | $q_2$ | $q_1$ |

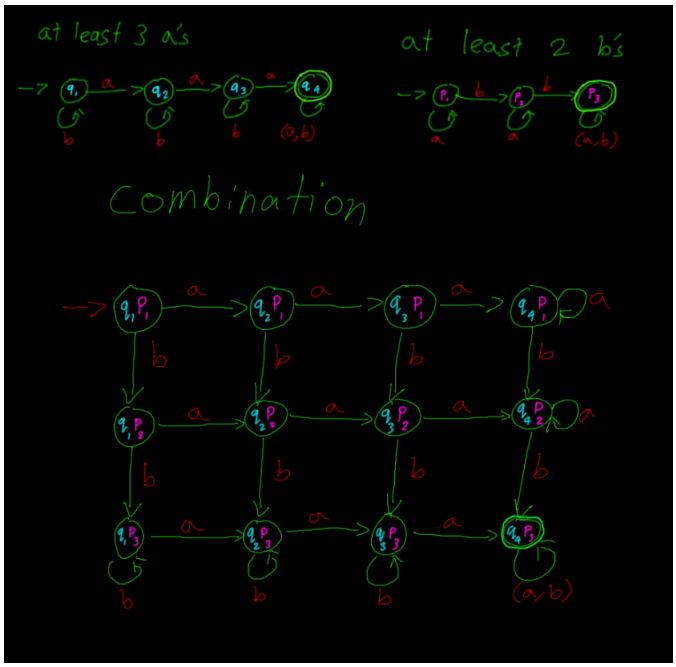
$q_1$ is the start state
$F : \{q_2\}$

## Problem 1.3

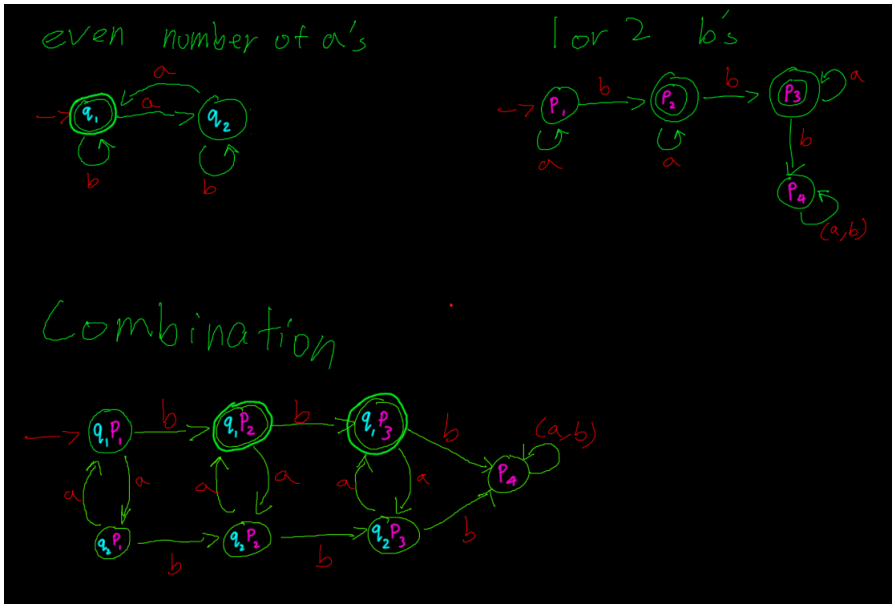


## Problem 1.4

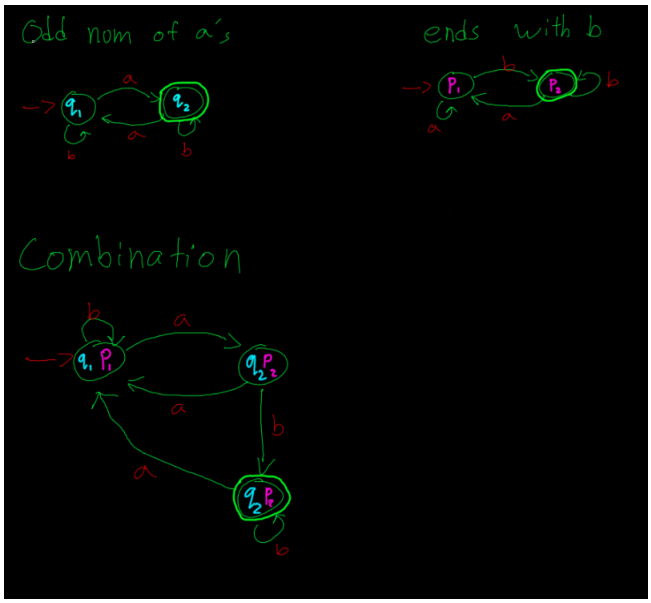
**a.**



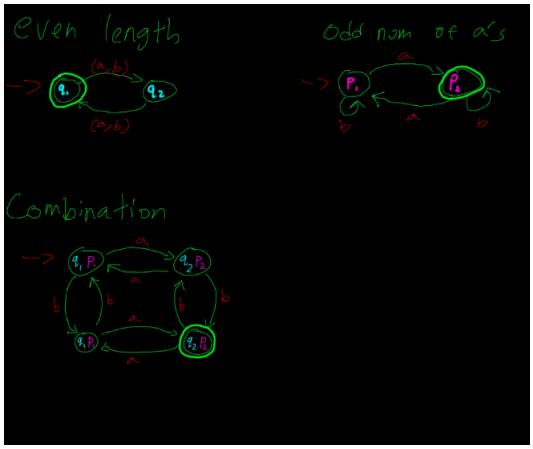

**c.**



**f.**

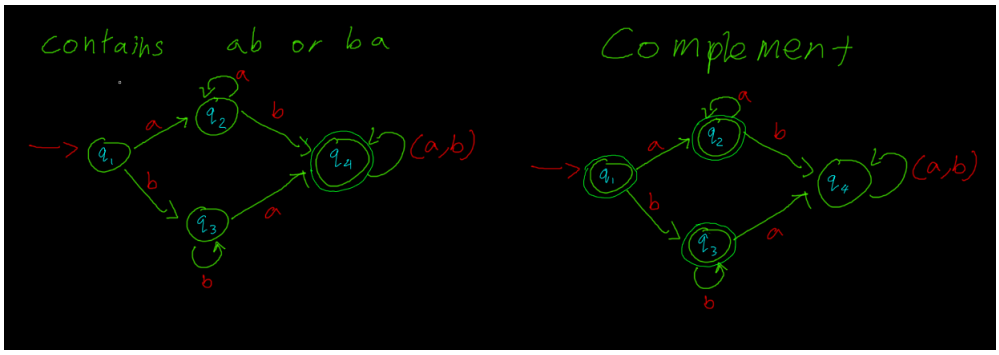

Odd num of a's
ends with b
Combination

**g.**

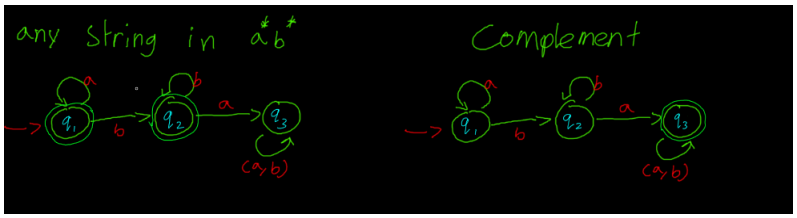

even length
Odd num of a's
Combination

## Problem 1.5

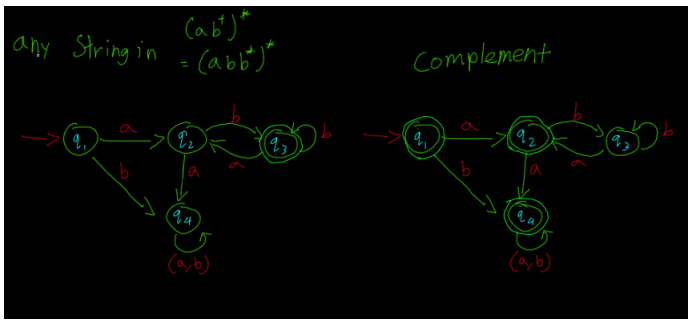
**c.**



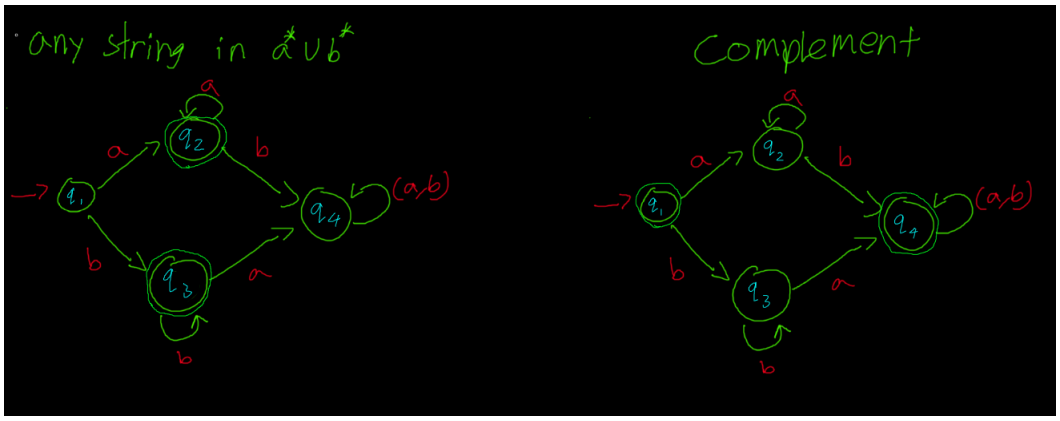

**d.**



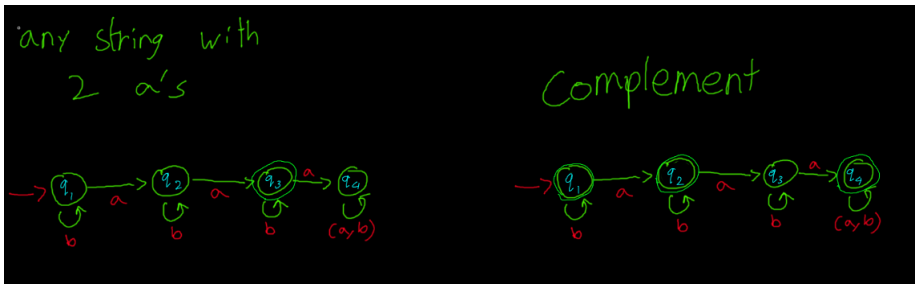

**e.**



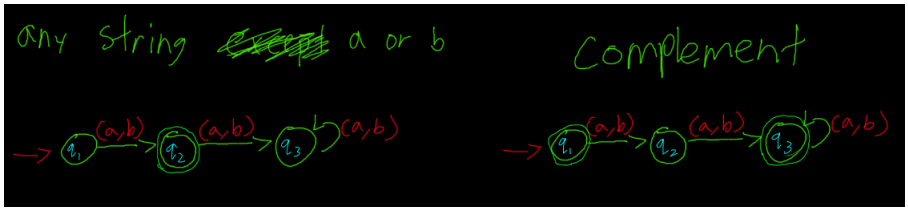
**f.**


any string in a*b*
Complement
a
b
(a,b)

**g.**

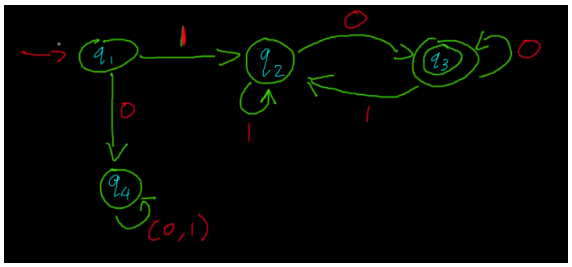

any string with
2 a's
Complement
a
b
(a,b)

**h.**

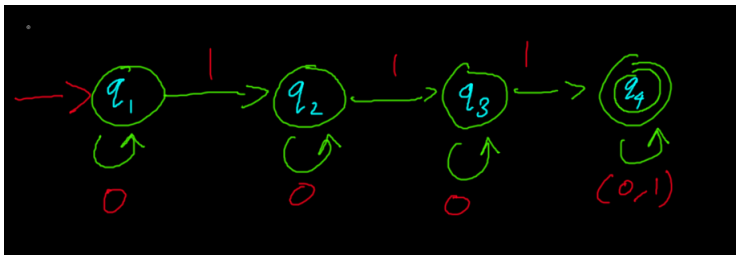

any string a or b
Complement
(a,b)

## Problem 1.6

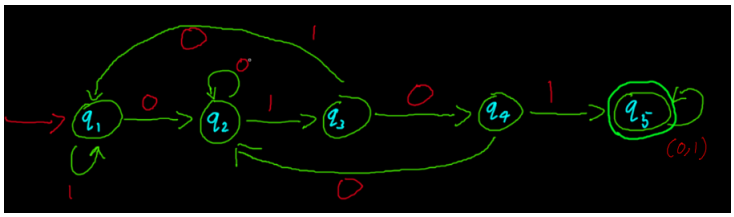
**a.**



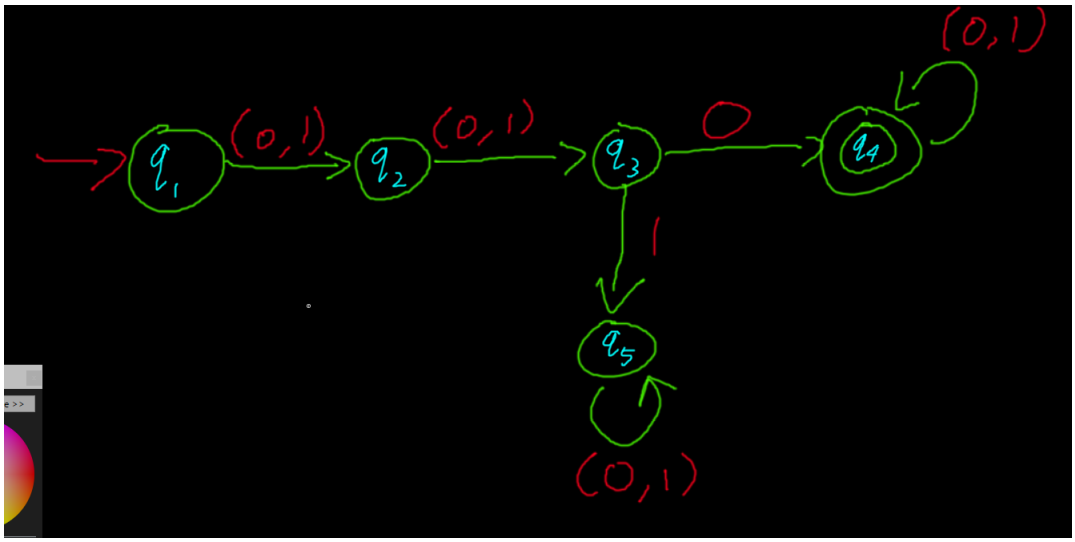

**b.**



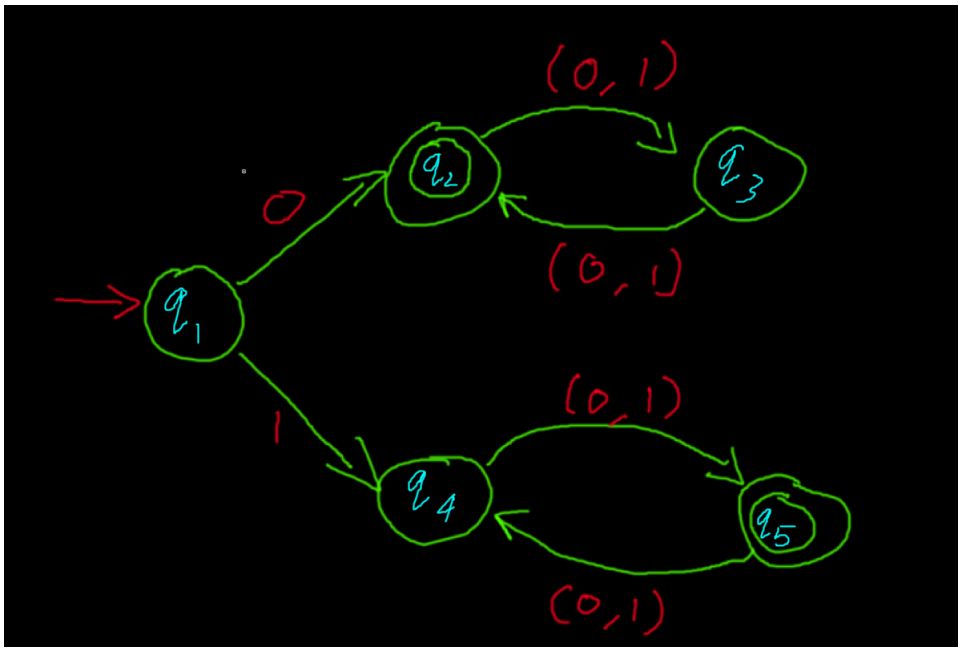

**c.**



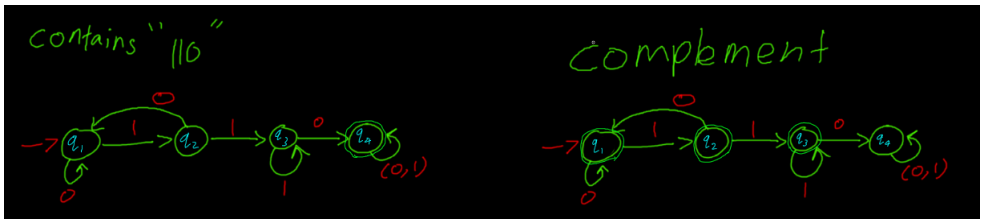
**d.**



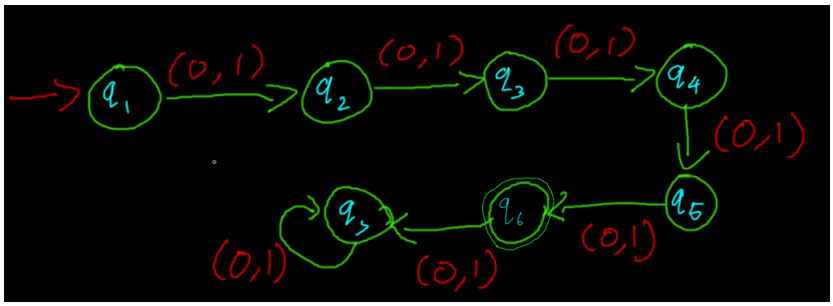

**e.**



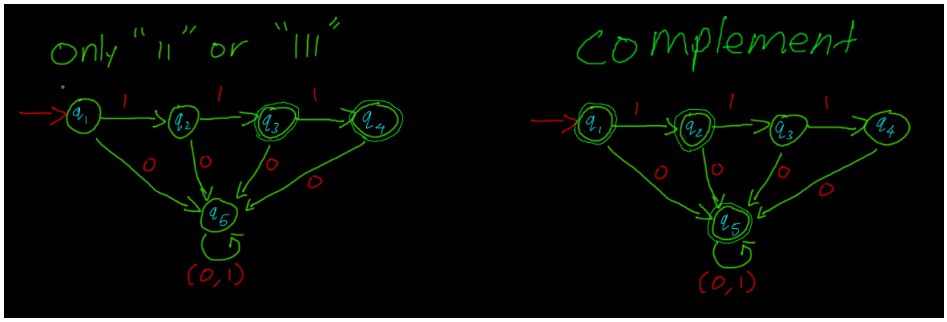
**f.**



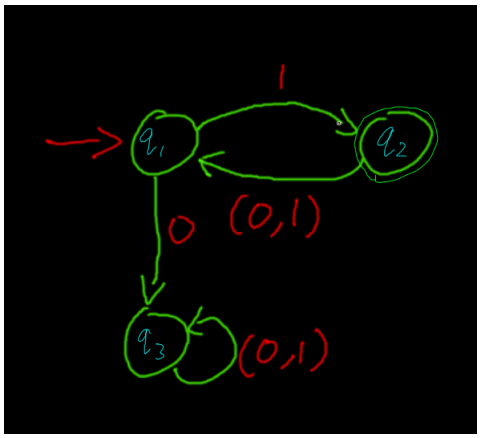

**g.**



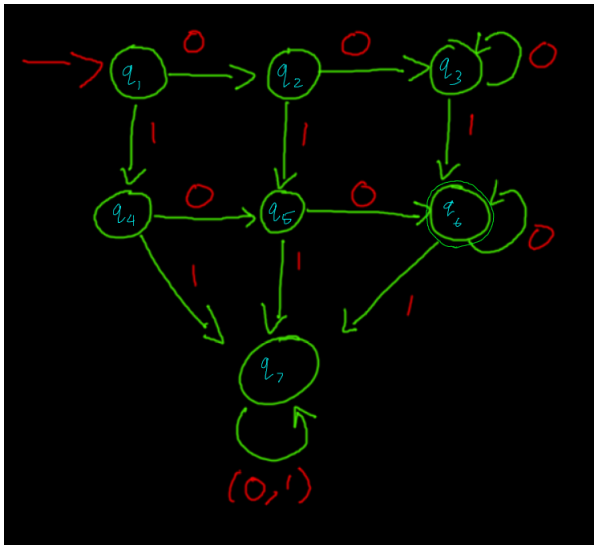
**h.**



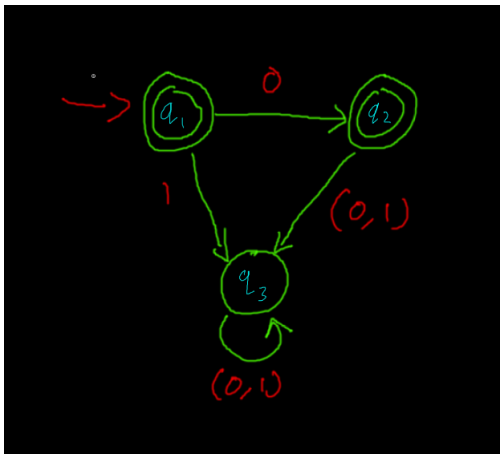
**i.**



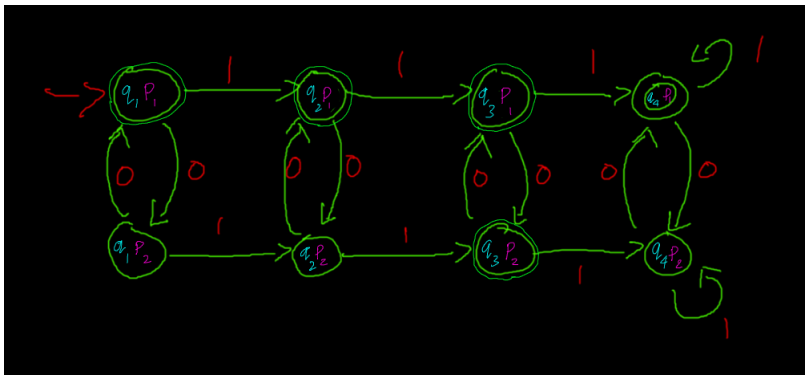

**j.**



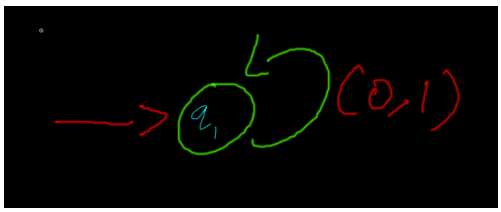
**k.**




**l.**




**m.**



**n.**