

Computer Science

Theory of Computation

Regular Languages and Non-regular Languages

Lecture No.- 11

A man with a beard and mustache, wearing a black polo shirt, stands with his arms crossed in front of a bookshelf. The background is slightly blurred, showing various books on the shelves.

Malleham Devasane Sir

Recap of Previous Lecture



Topic

Pumping Lemma



Topics to be Covered



Topic

Moore Machine

Topic

Mealy Machine

Moore M/c

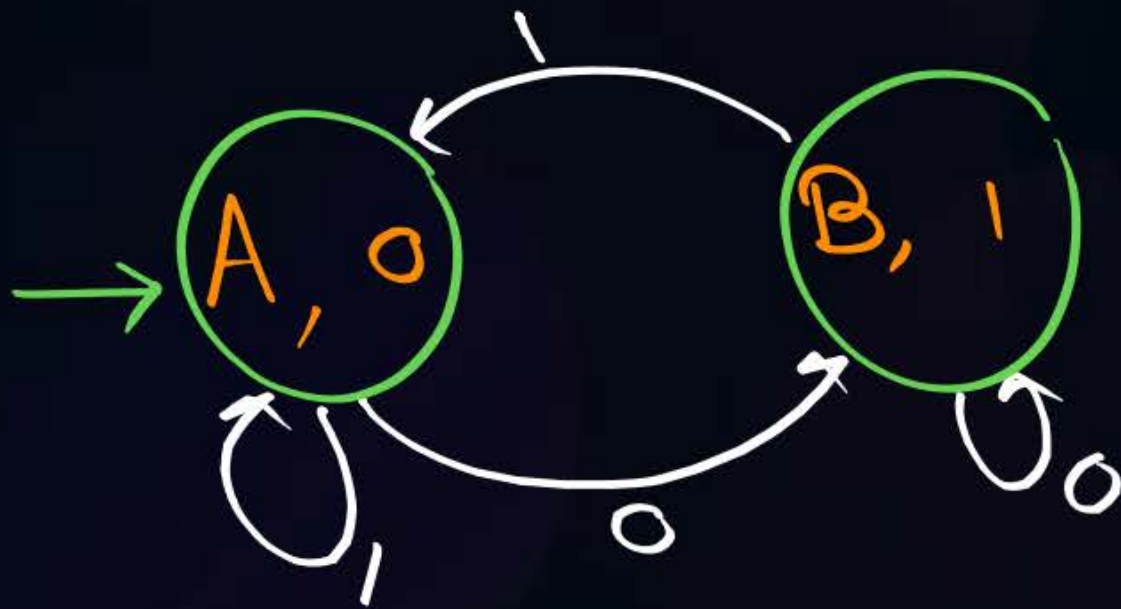
Mealy M/c

For n length input $\hookrightarrow n+1$ length o/pFor n length i/p $\hookrightarrow n$ length o/p

i) one's complement of Binary number

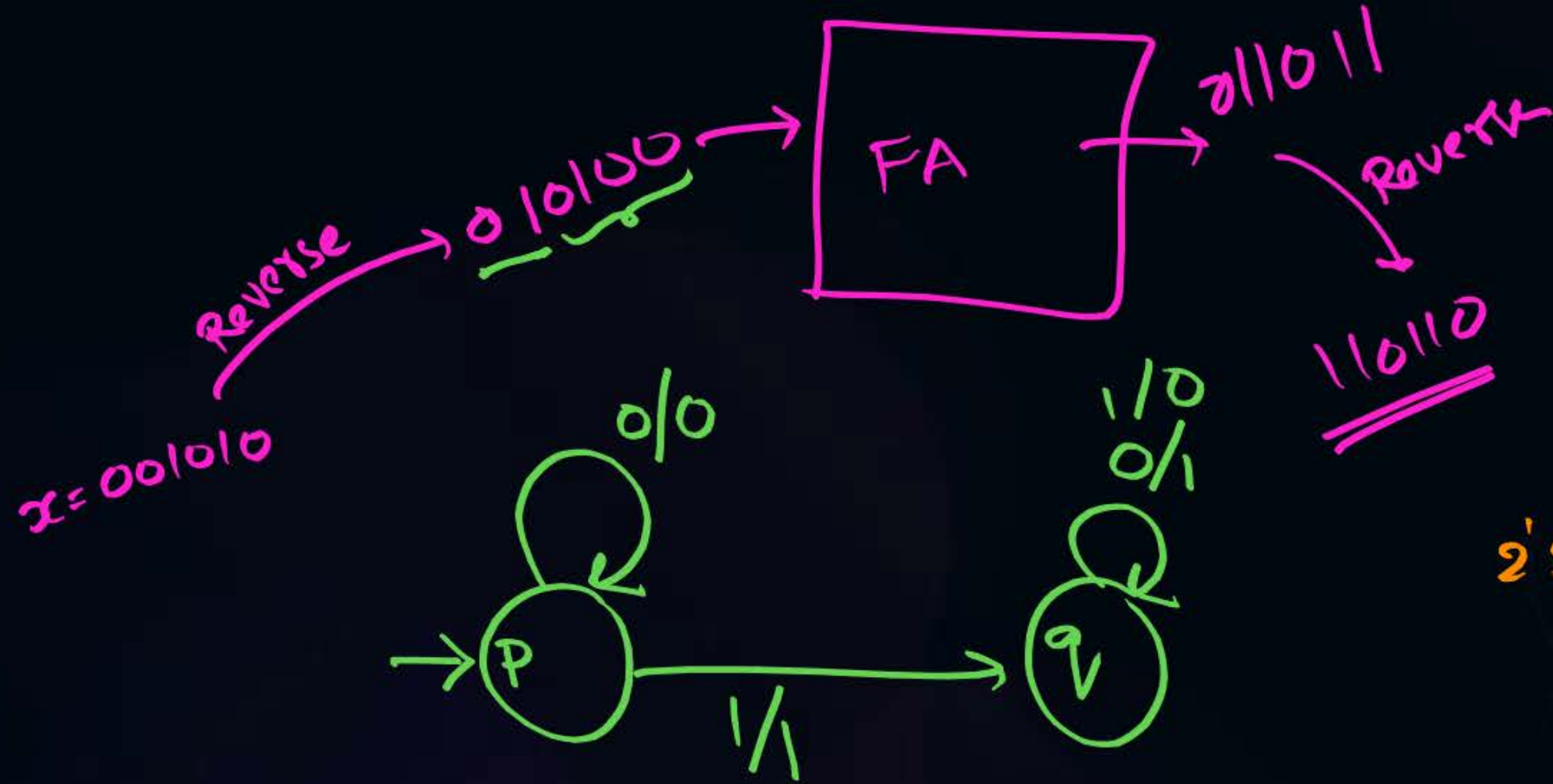


MOORE m/c

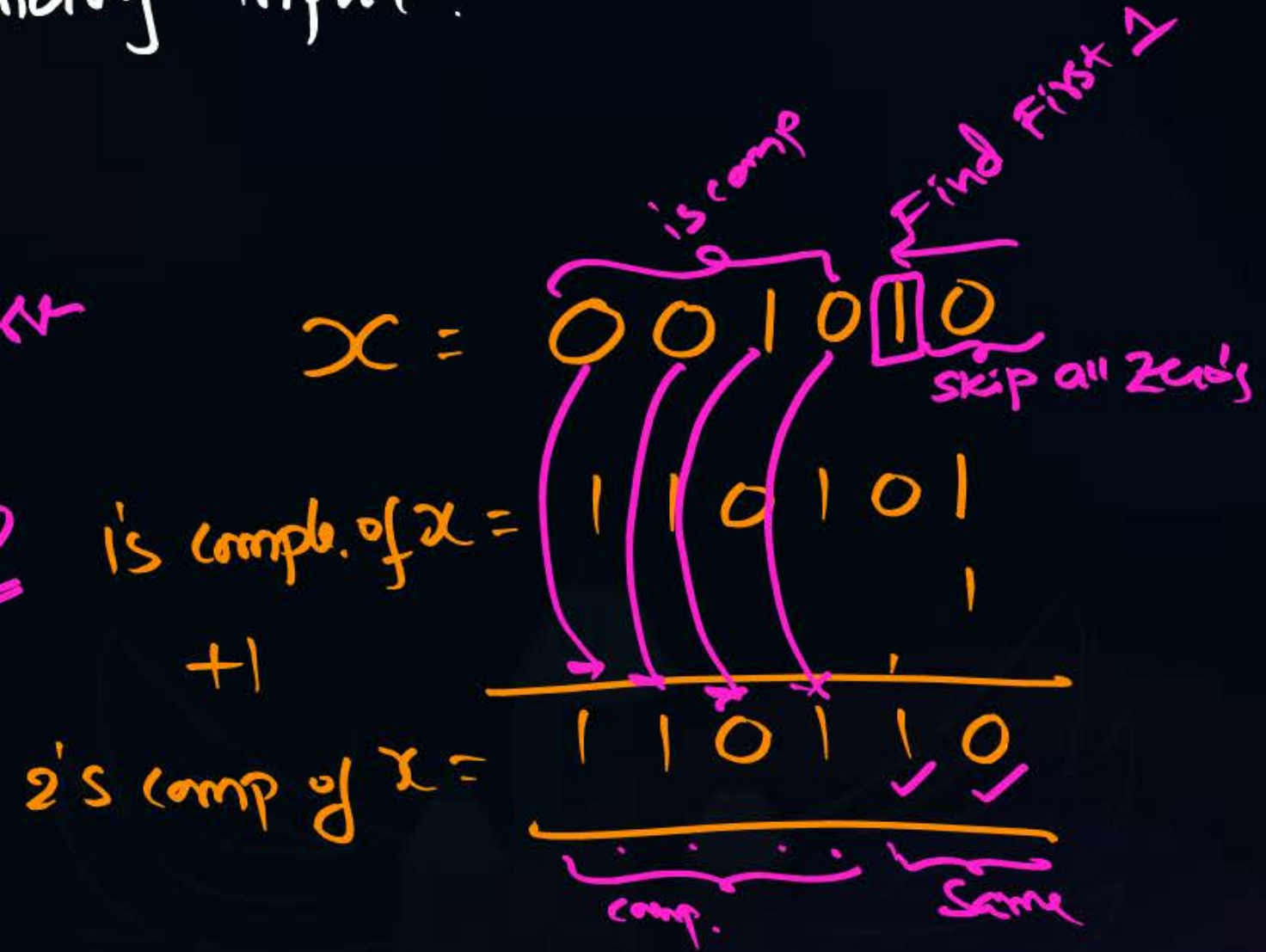


Note: If there are k o/p symbols then Moore machine
contain at least k states.
 $|\Delta| = k$

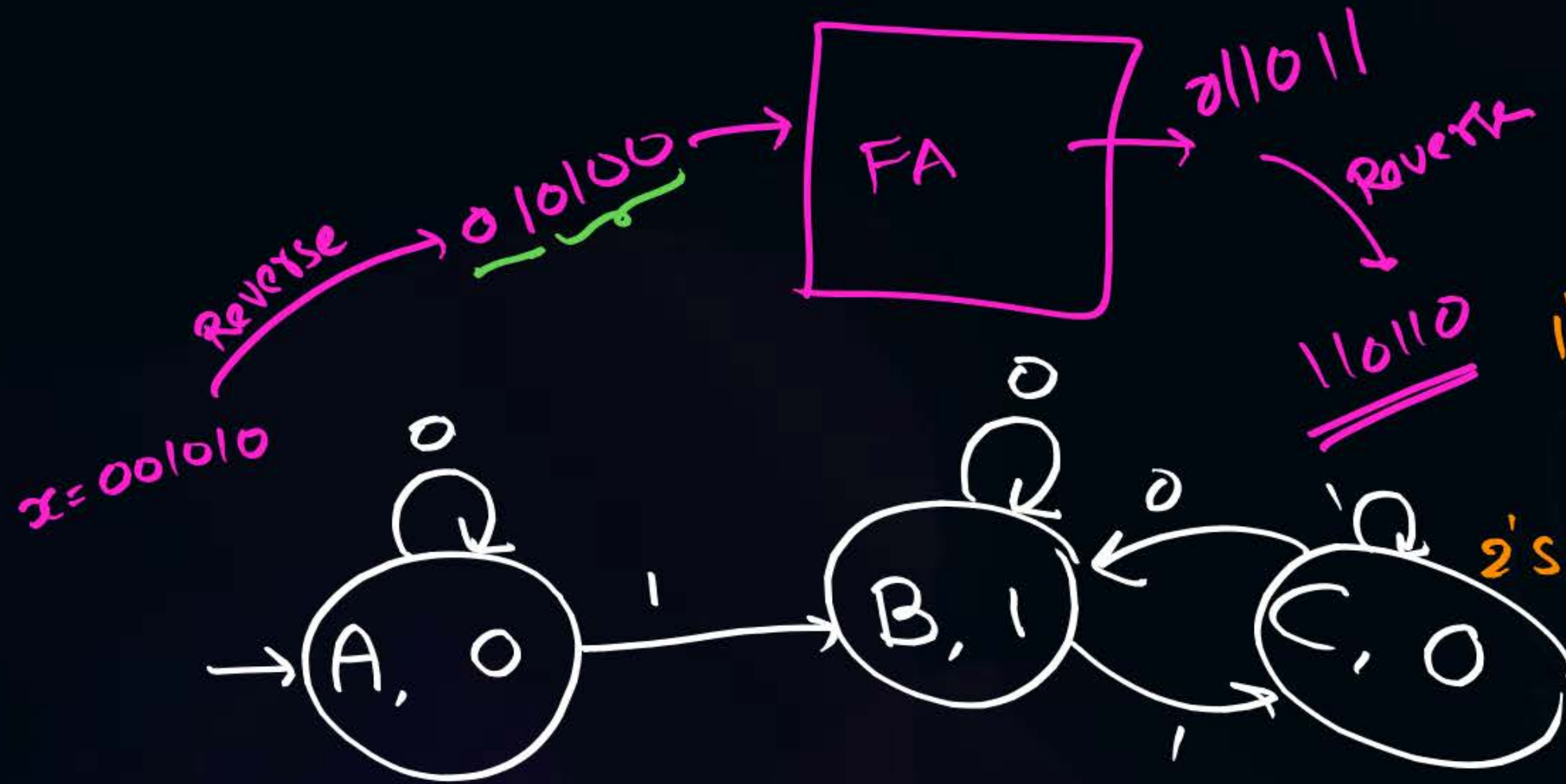
2) Two's complement of binary input.



Mealy Machine



2) Two's complement of binary input.



is comple. of $x =$
 $+1$
 2's comp of $x =$

$x = 001010$

is comp

Find First 1

skip all zeros

1's comp. of $x =$

110101

+1

2's comp of $x =$

110110

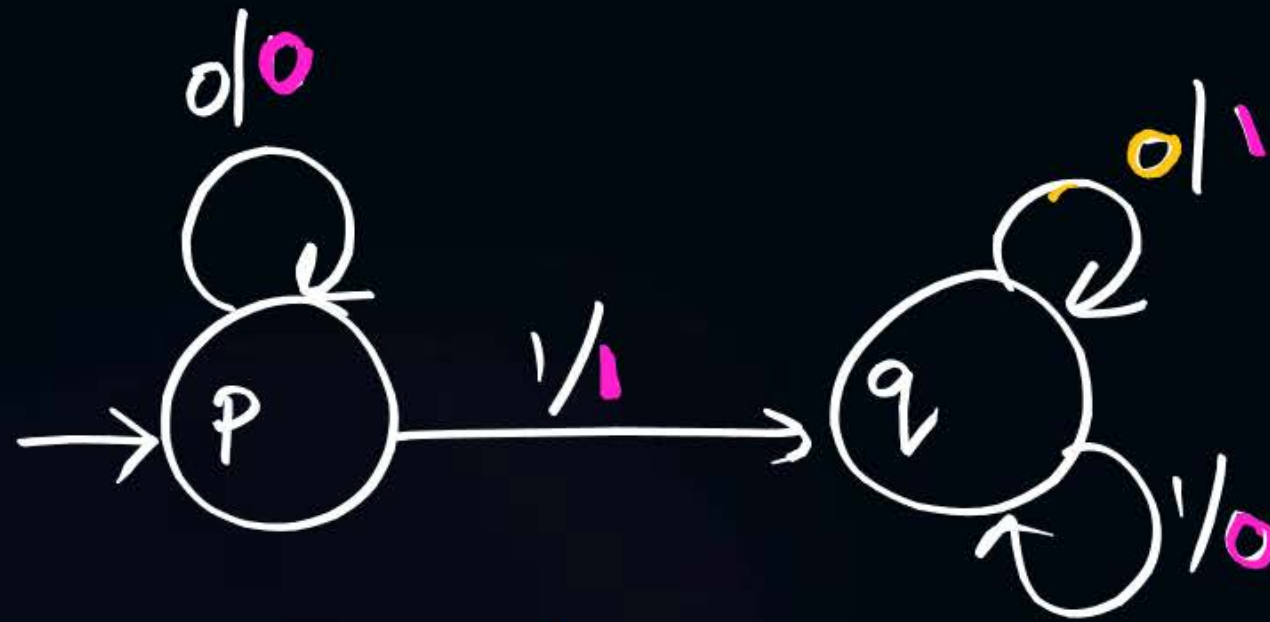
comp.

Same

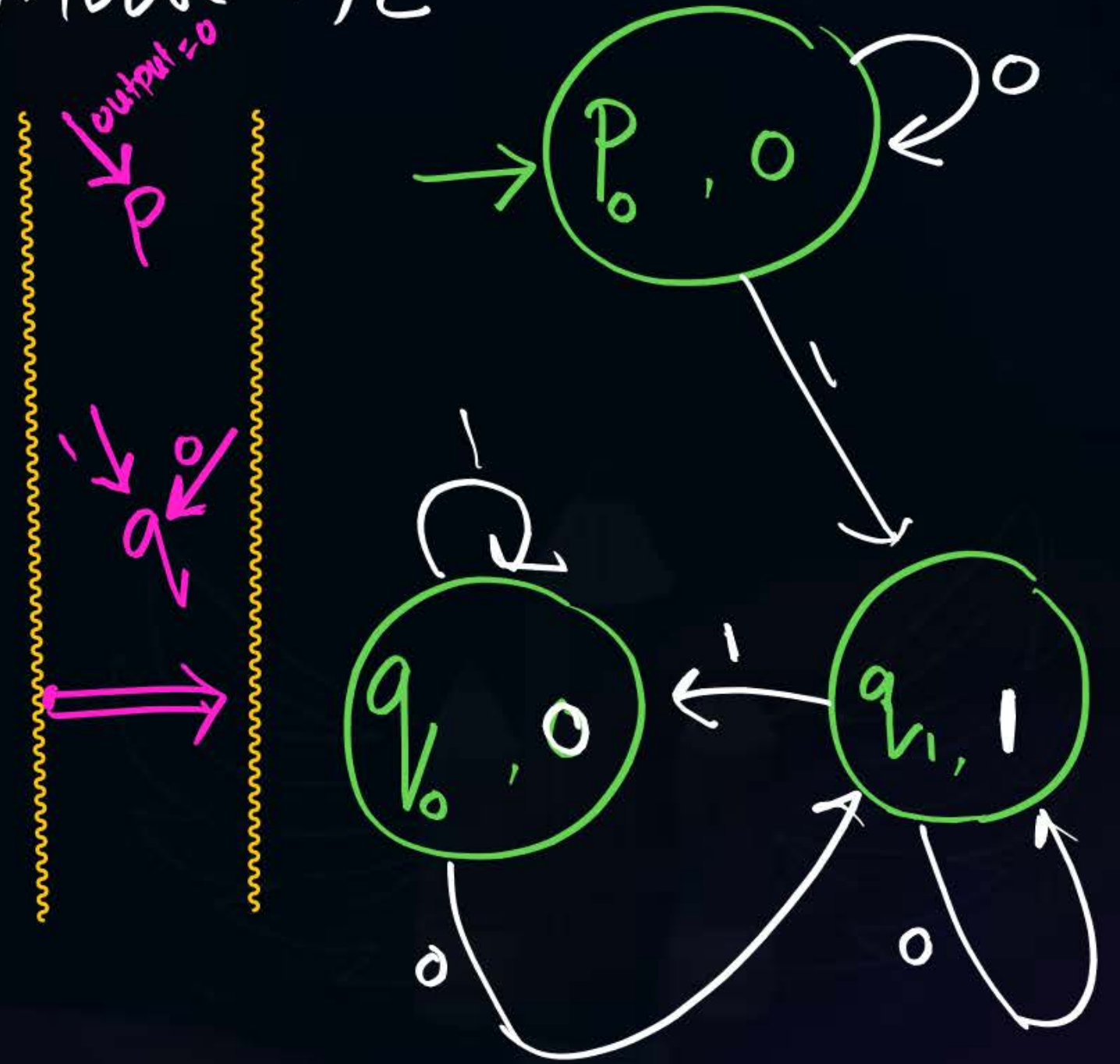
FA with output



Note: Every Mealy M/c is convertible to Moore machine
Mealy M/c \Rightarrow Moore M/c



Mealy



3) Find no. of occurrences of ab 's

aababababa

0 0 1 0 1 0 0 1 0

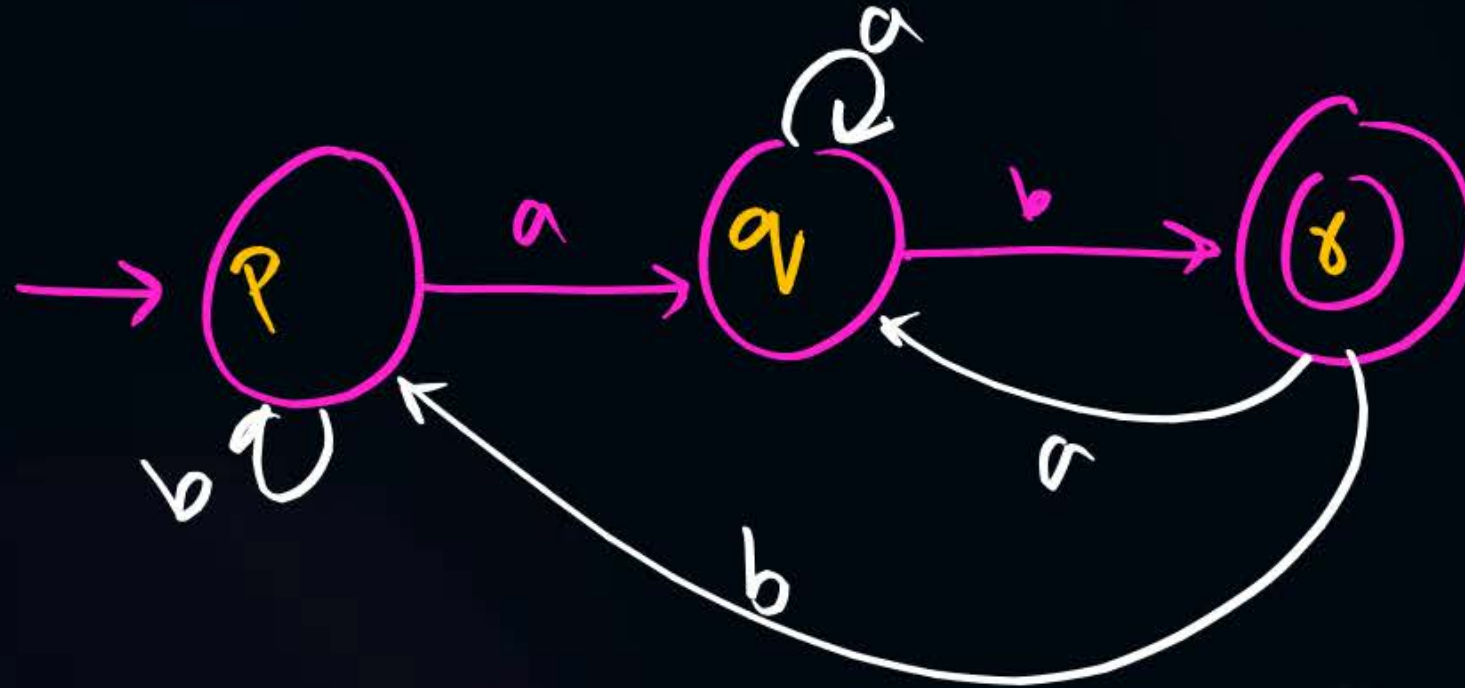
= 3 occurrences



001010010
 $\Delta = 4012$

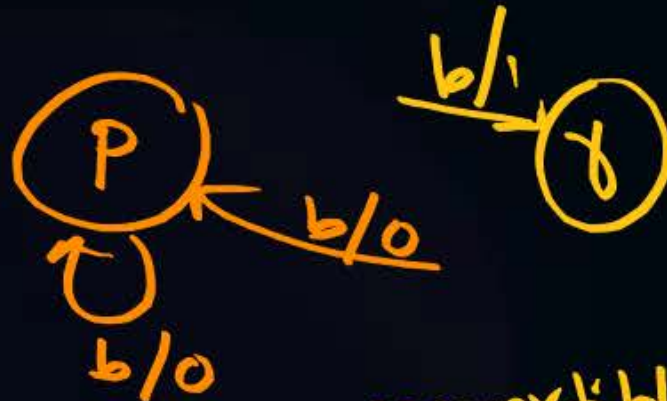
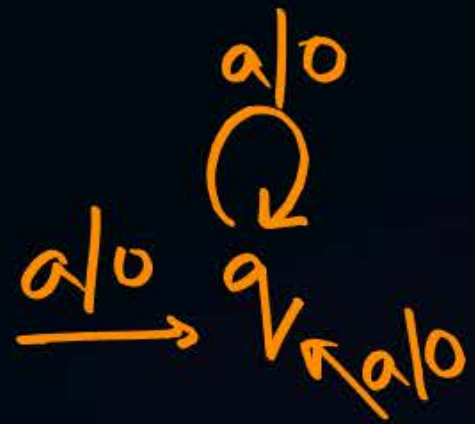
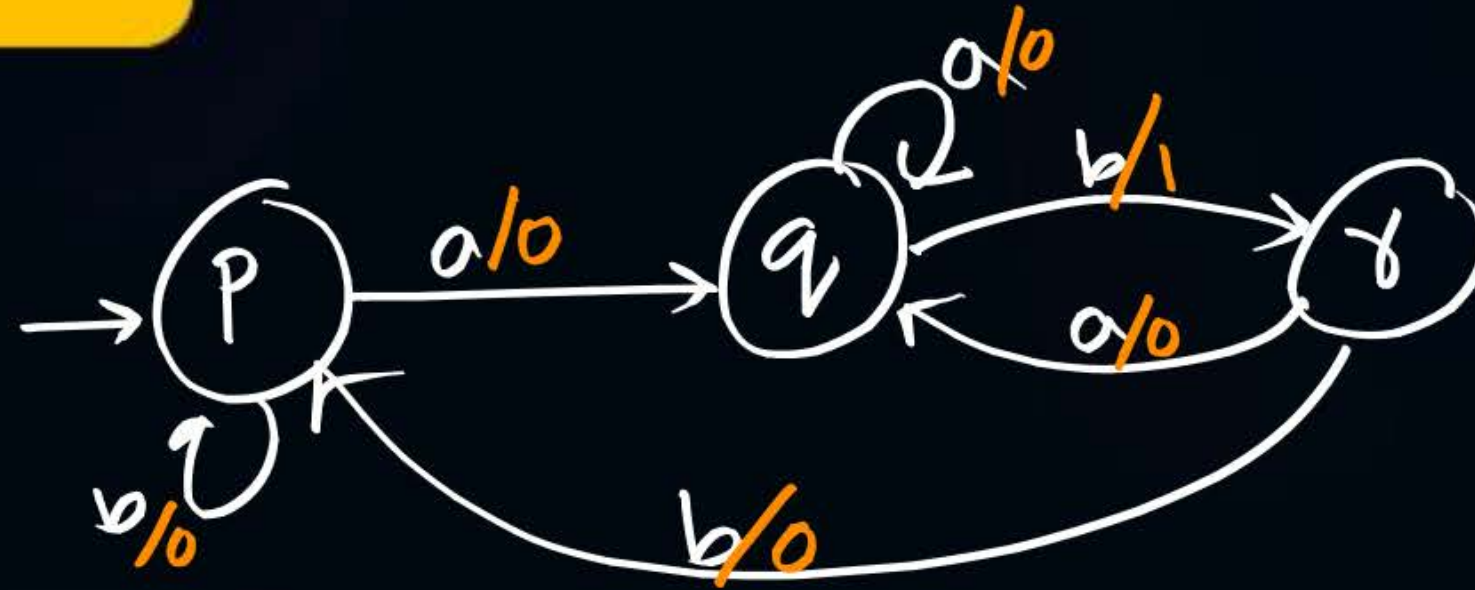
"Ends with ab"

DFA



Moore m/c



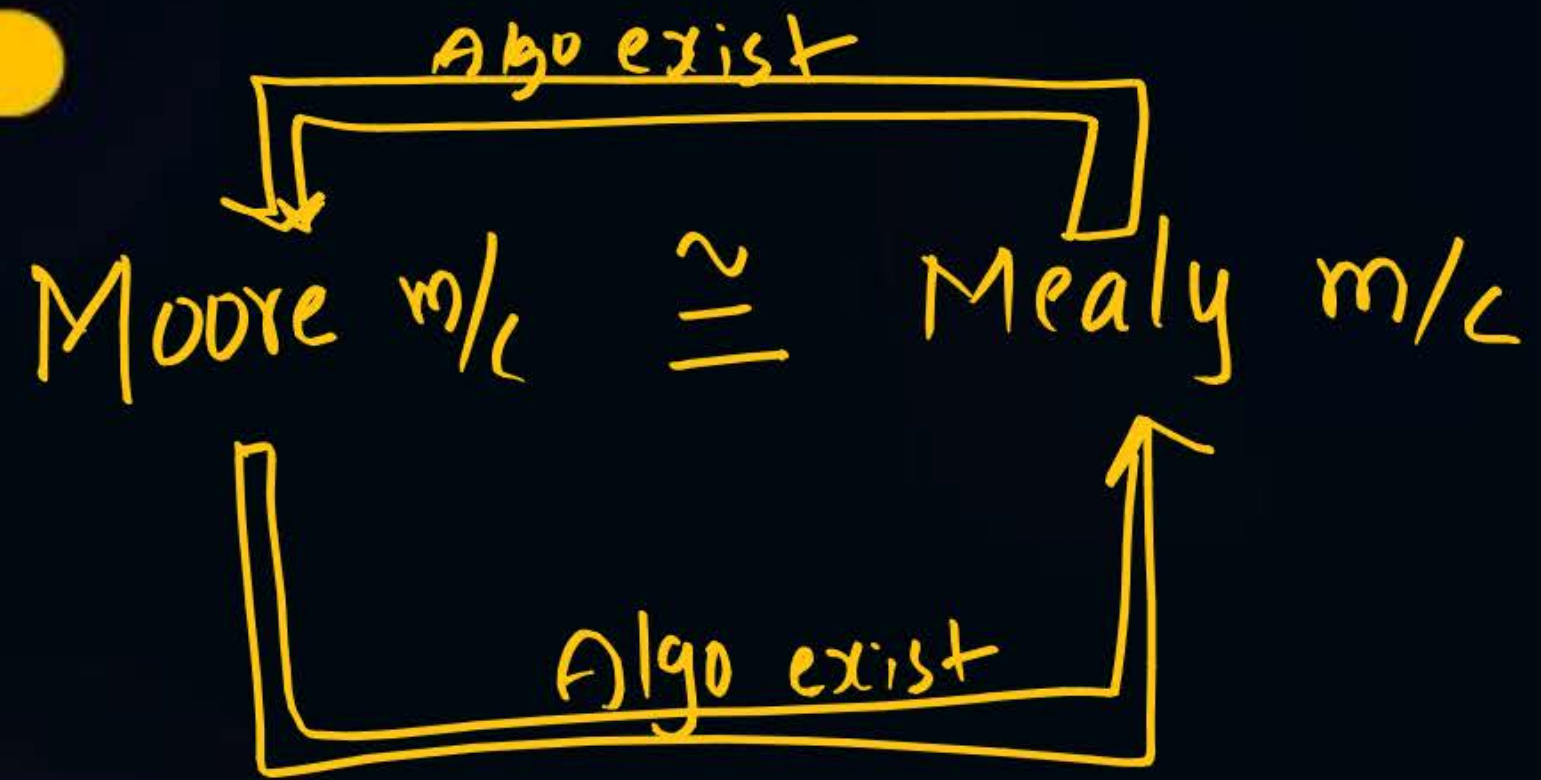


copy o/p to all incoming inputs.
Convert to mealy machine

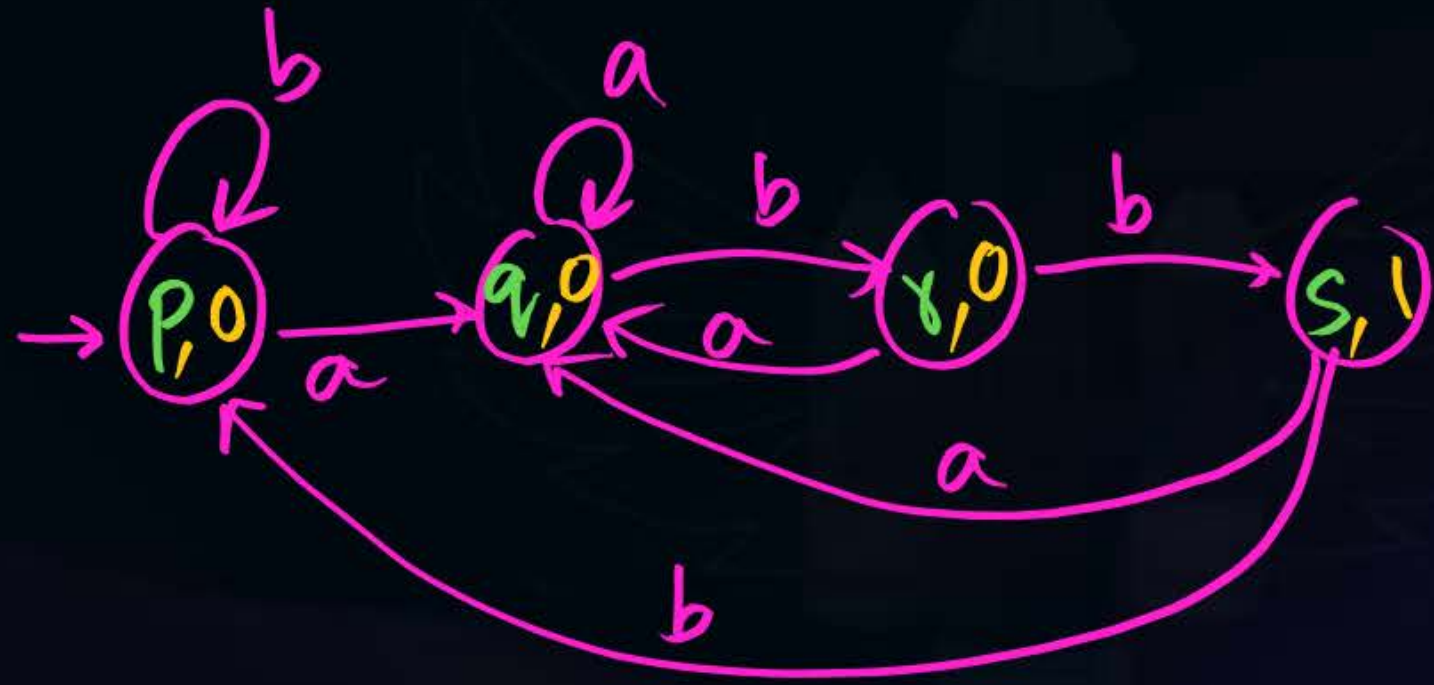
Note: Every Moore m/c is convertible to mealy machine.
Moore m/c

Given





Sequence Detector

[illegible]

5) produce sum of previous and present bit.

Input:

Output:

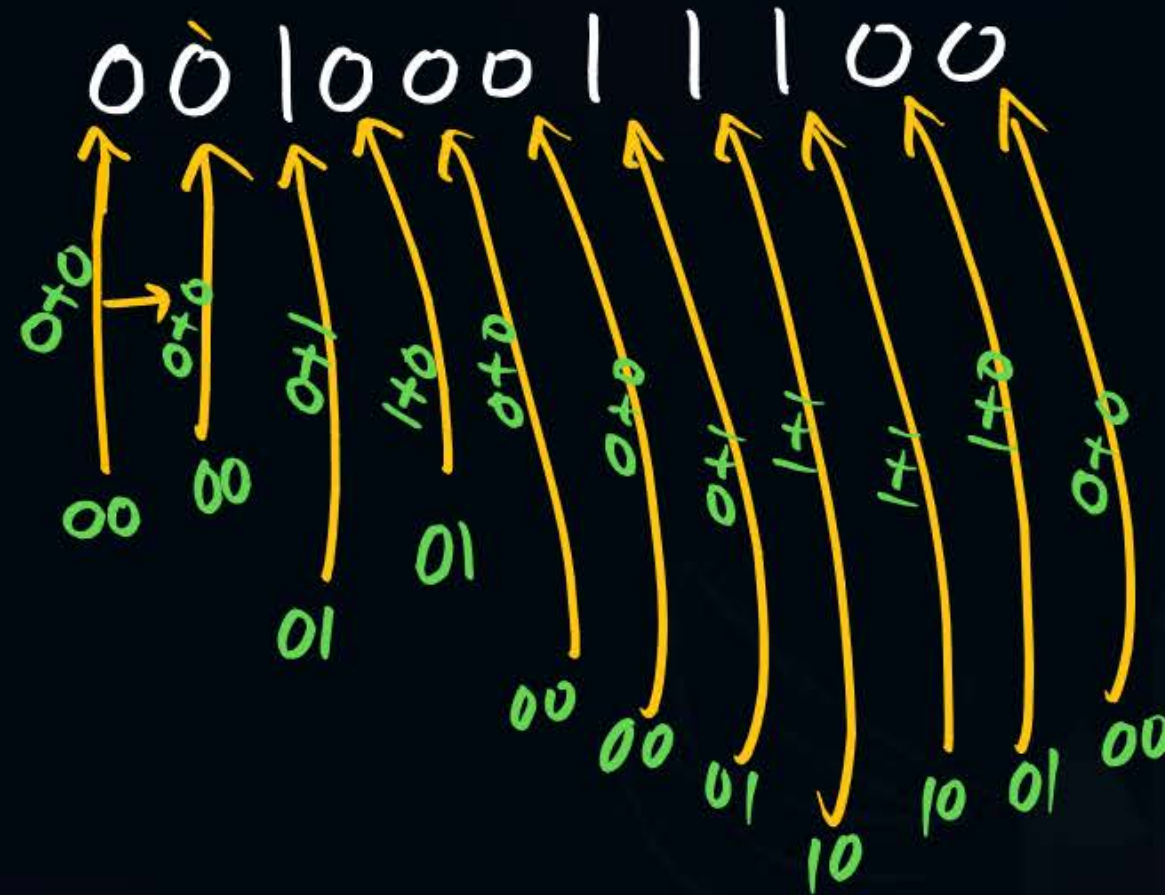
Previous + Present = O/p

$$0 + 0 = 00$$

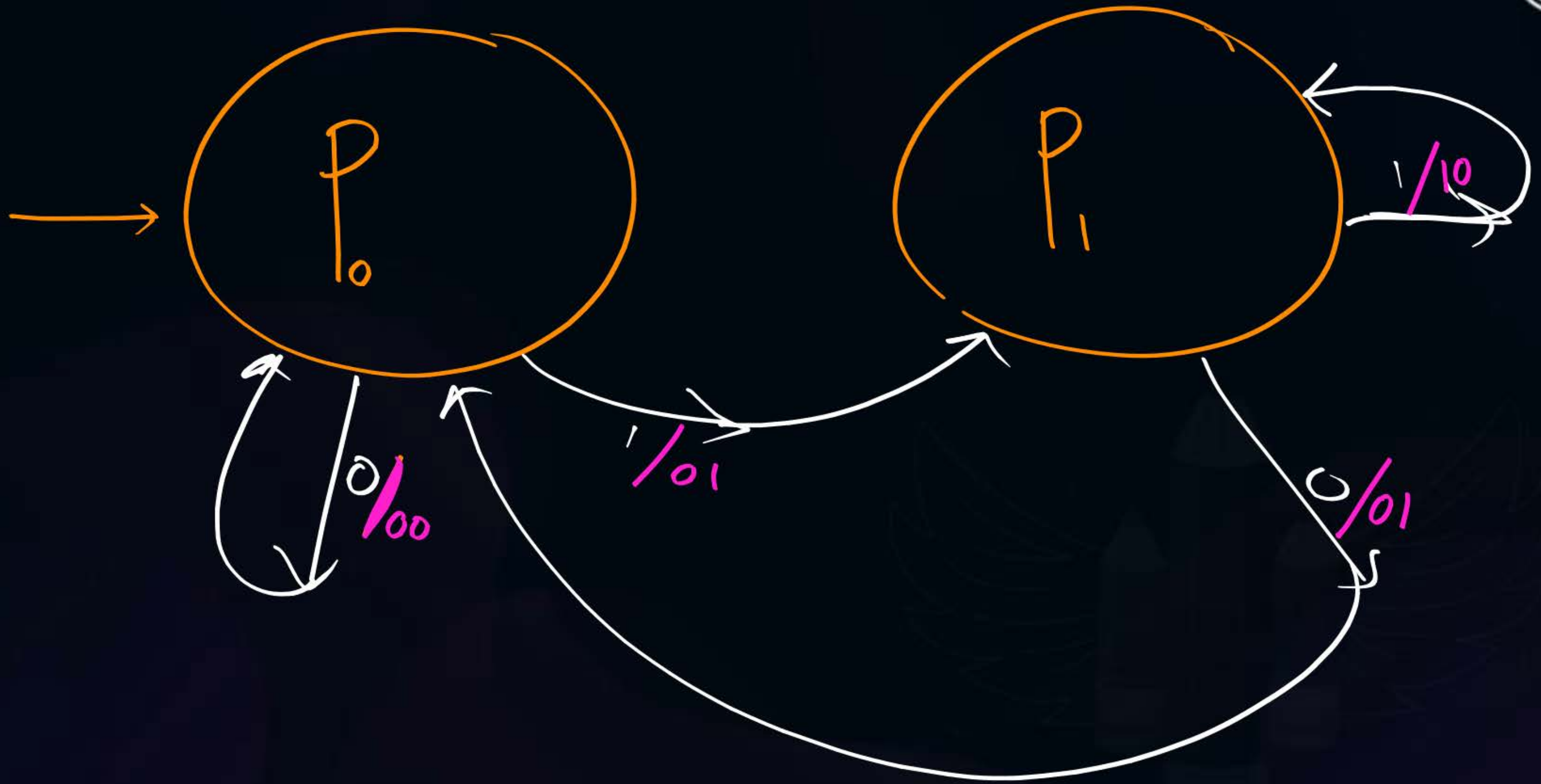
$$0 + 1 = 01$$

$$1 + 0 = 01$$

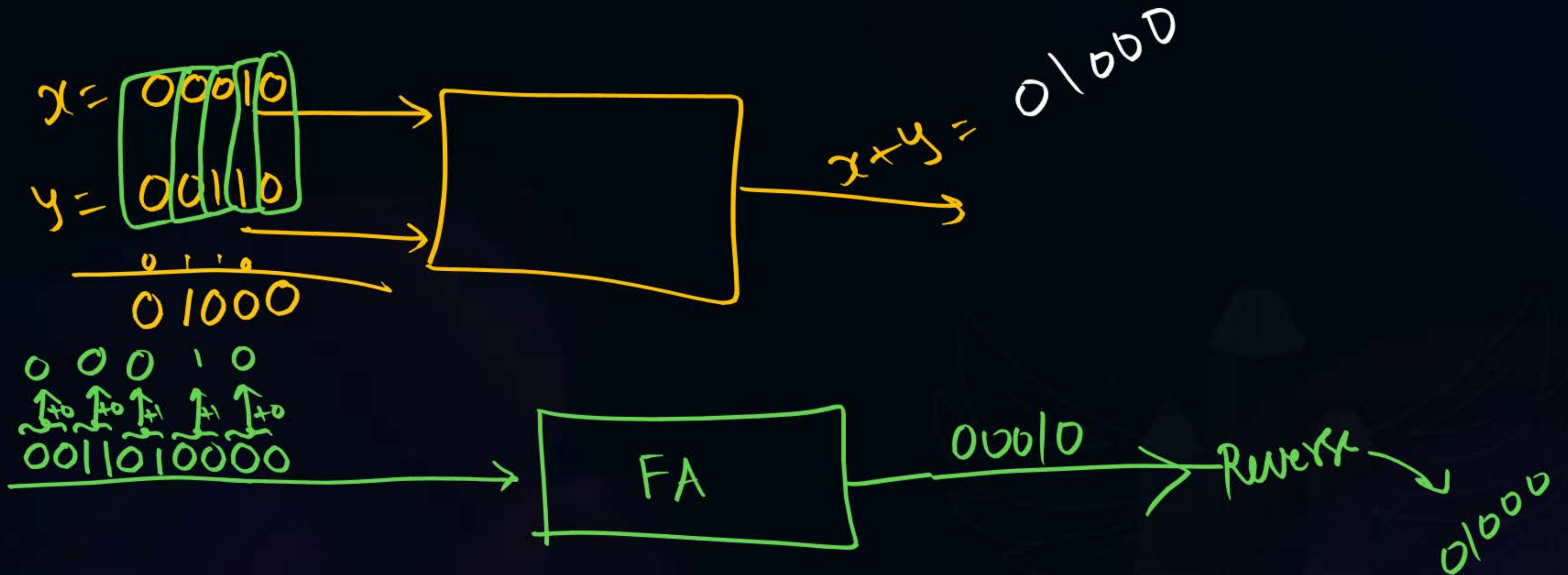
$$1 + 1 = \underbrace{10}_{2 \text{ length}}$$

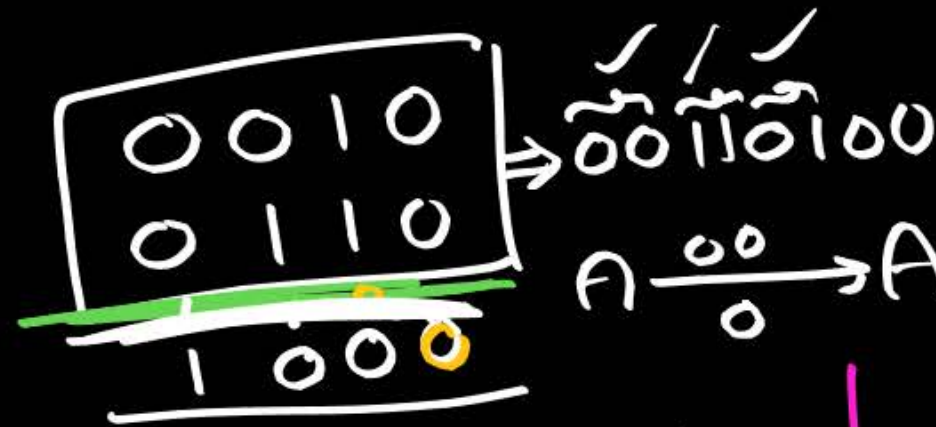
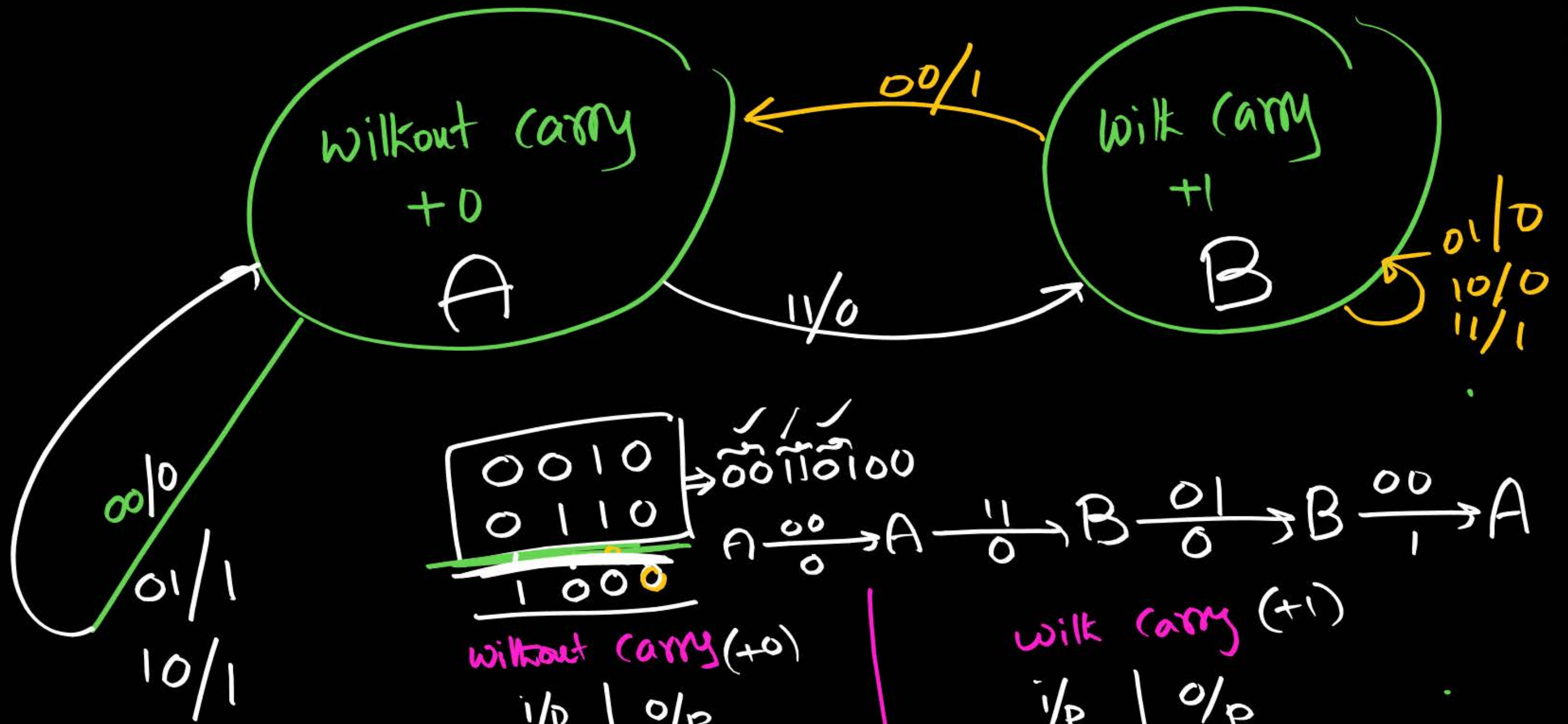


O/p: 0000100001000010000100



6) Sum of two binary inputs.





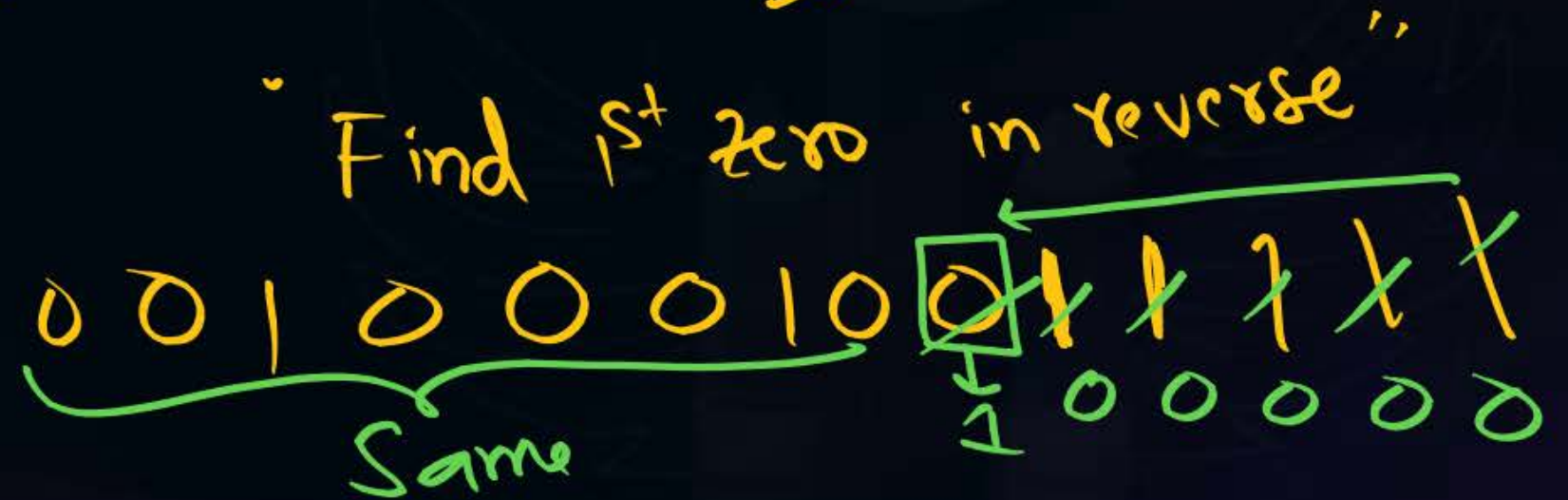
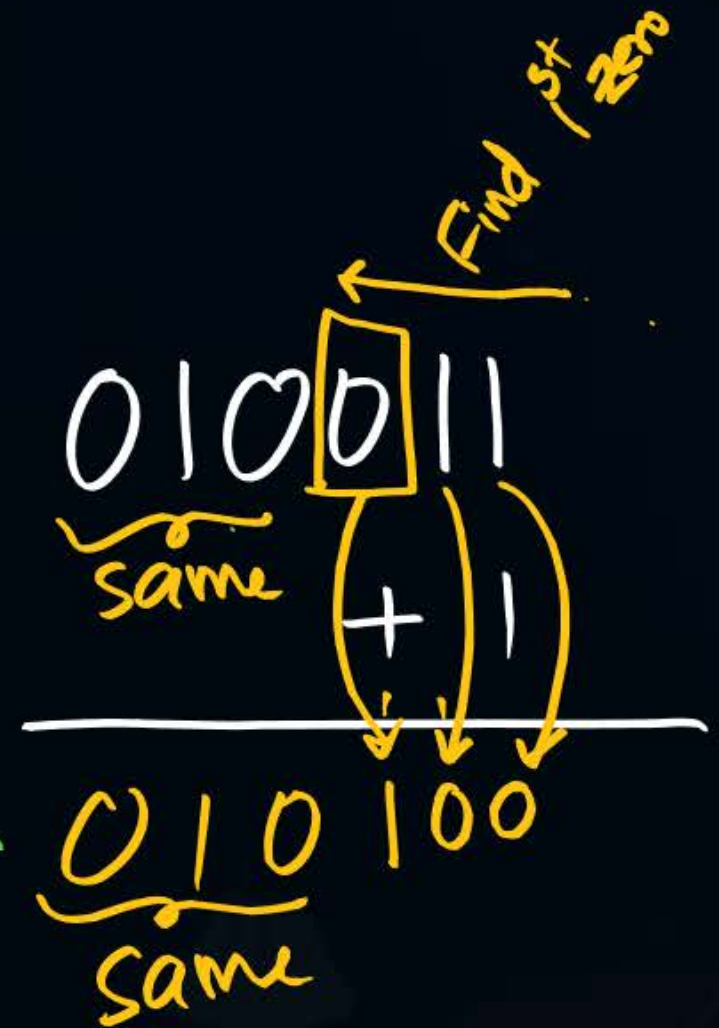
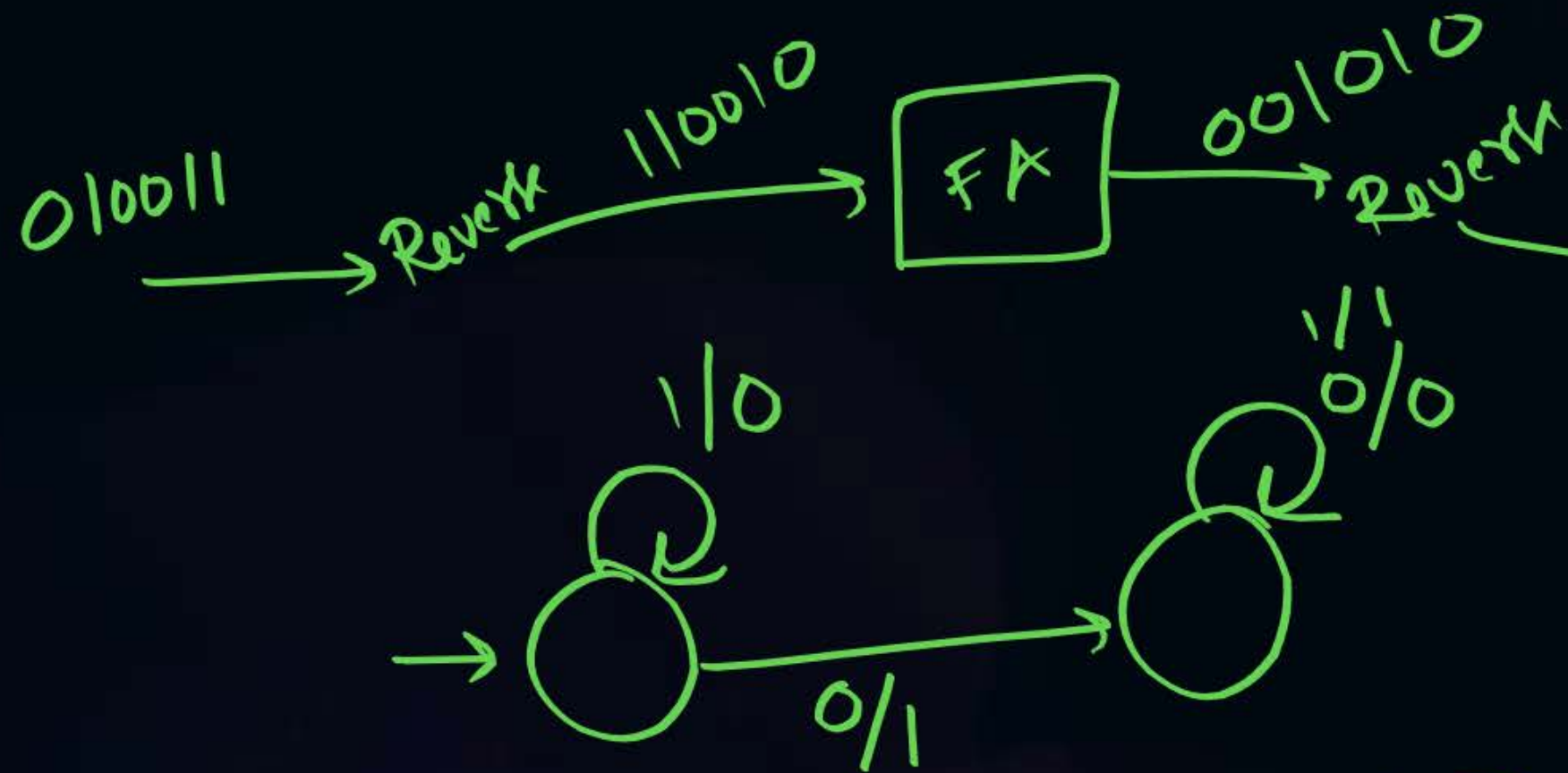
without carry (+0)

i/p	o/p
00	0 (without carry)
01	1 (without carry)
10	1 (without carry)
11	0 (with carry)

with carry (+1)

i/p	o/p
00	1 (without carry)
01	0 (with carry)
10	0 (with carry)
11	1 (with carry)

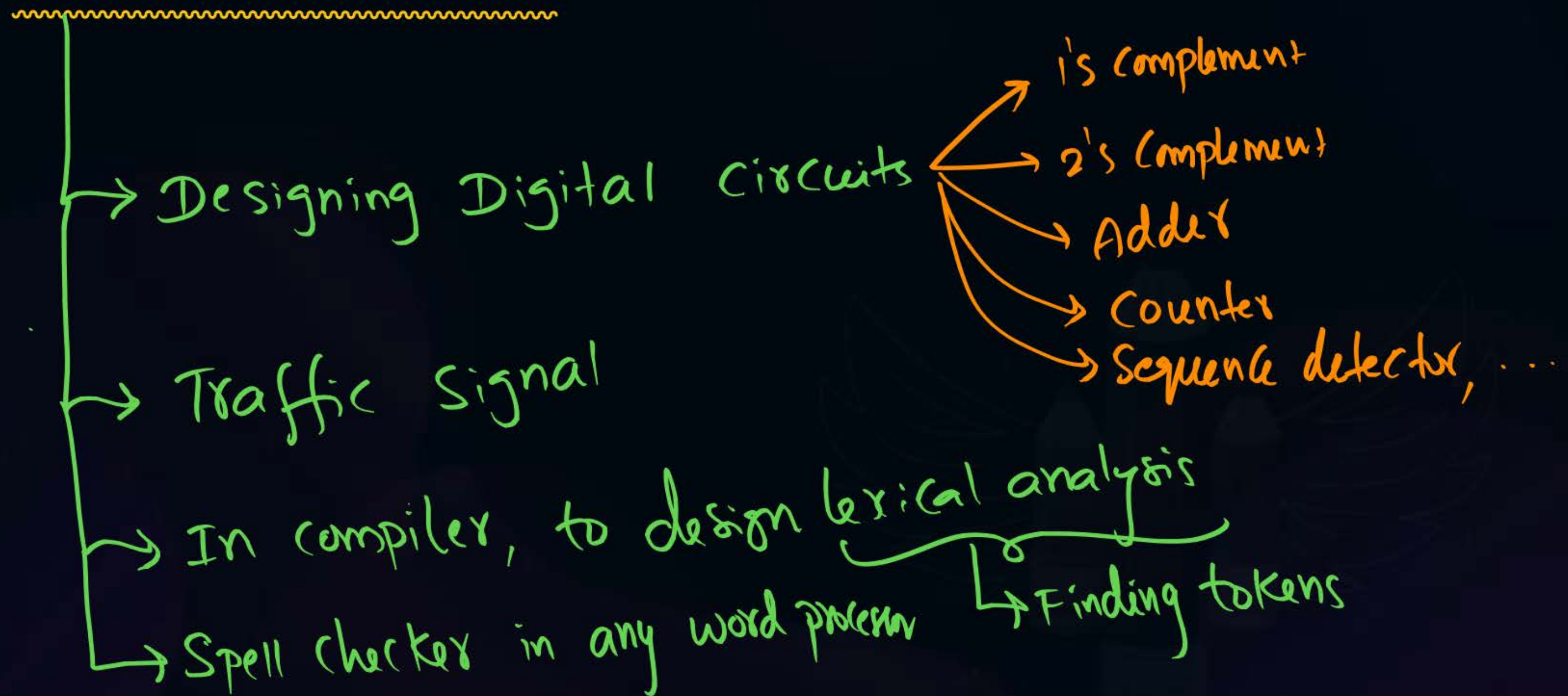
7) Increment of Binary i/p



- H.W. {
- 8) Decrement of Binary i/p
 - 9) Subtraction of two Binary inputs

Mooxe m/c \cong Mealy m/c

Applications of FA (Regular languages) (Regular exps)



Regular languages

- Can be computed without using additional memory.
- FA exist

Regular Languages



GATE PYQs

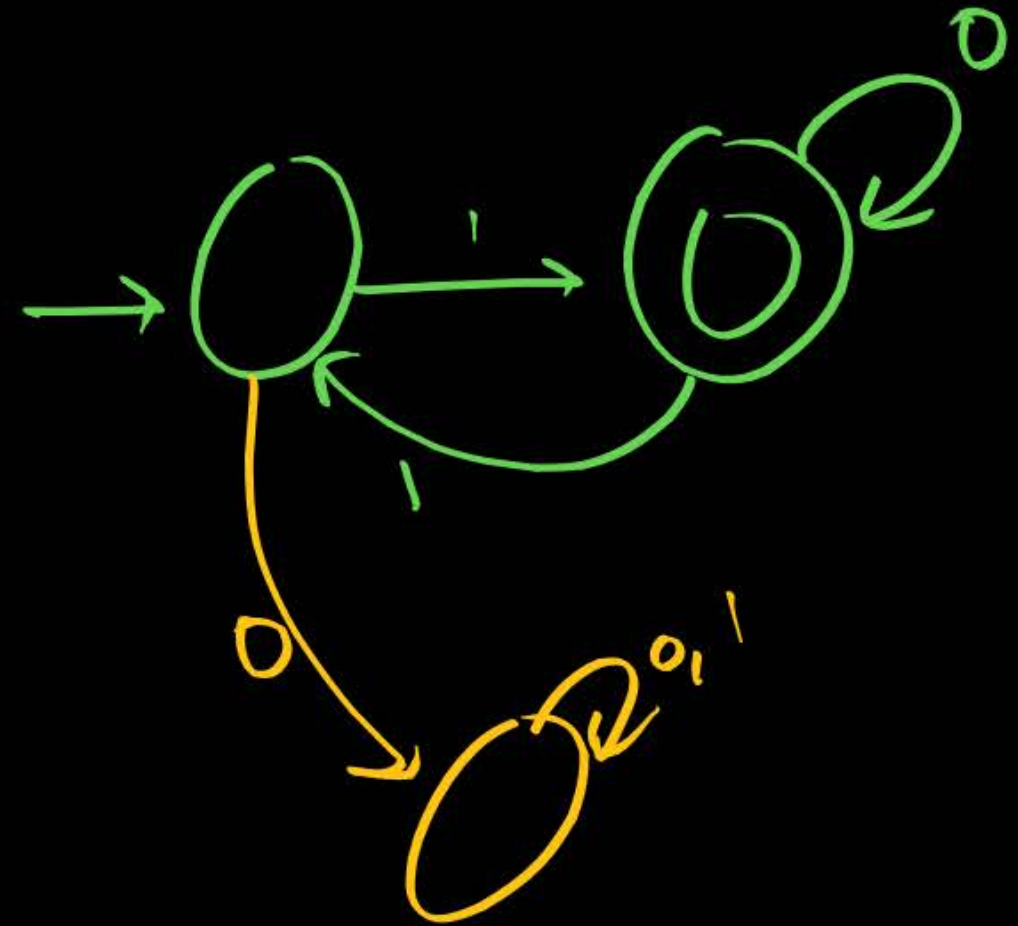
H.W.



$$1(0+11)^* = \{1, 10, 100, 111, \dots\}$$

\Downarrow
 NFA

\Downarrow
 DFA





2 mins Summary



Topic

Moose & Mealy ✓

Next: Context Free Languages: CFG

THANK - YOU