Sheikh Hasina University, Netrokona
Department of Computer Science and Engineering
CSE-2205: Introduction to Mechatronics

Lec-24: Programmable Logic Controller (PLC)

Mechatronics: Electronic Control Systems in Mechanical Engineering by W. Bolton

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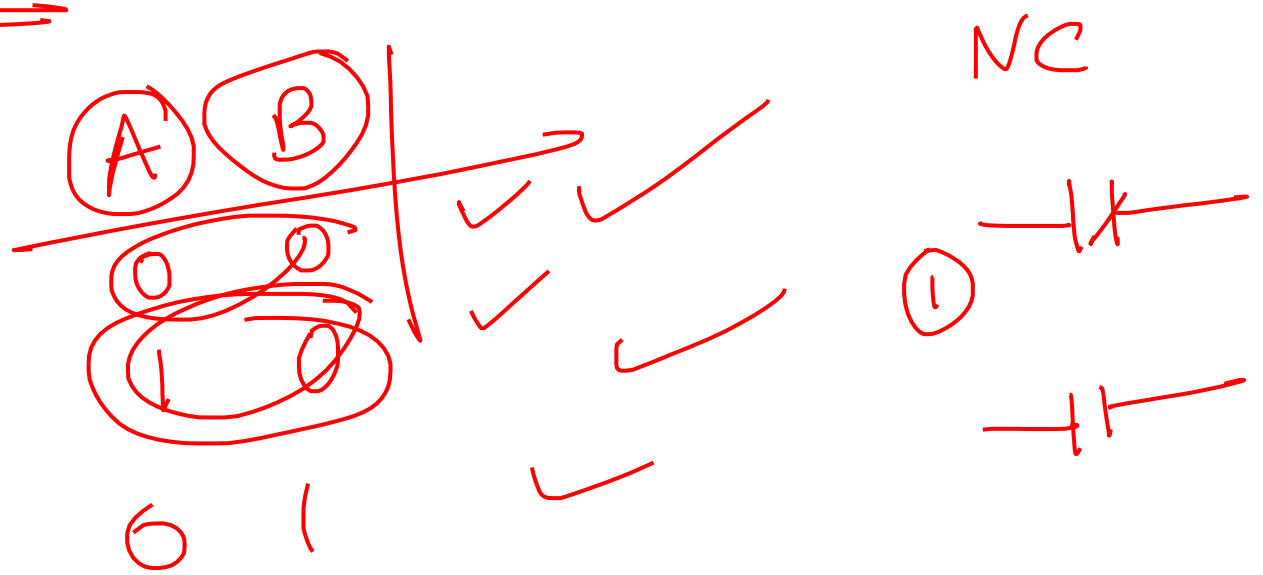
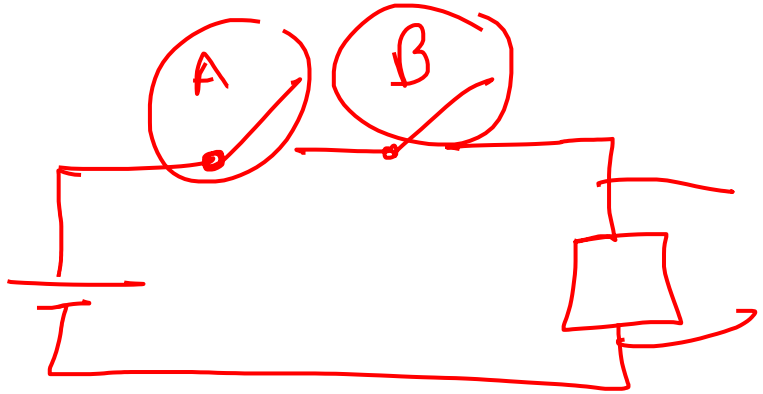
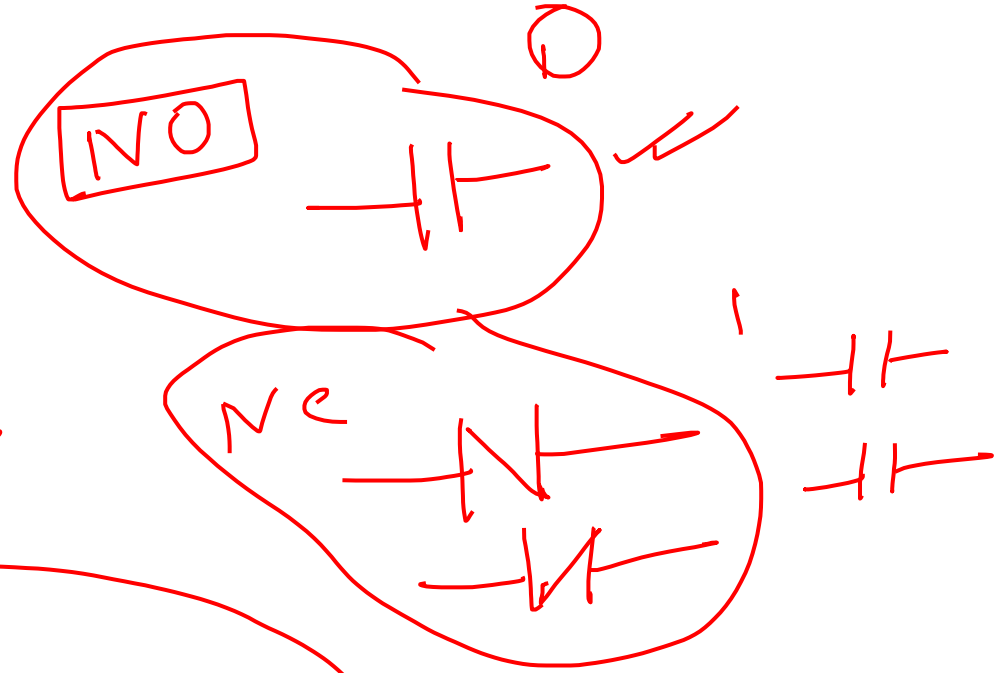
Logic functions



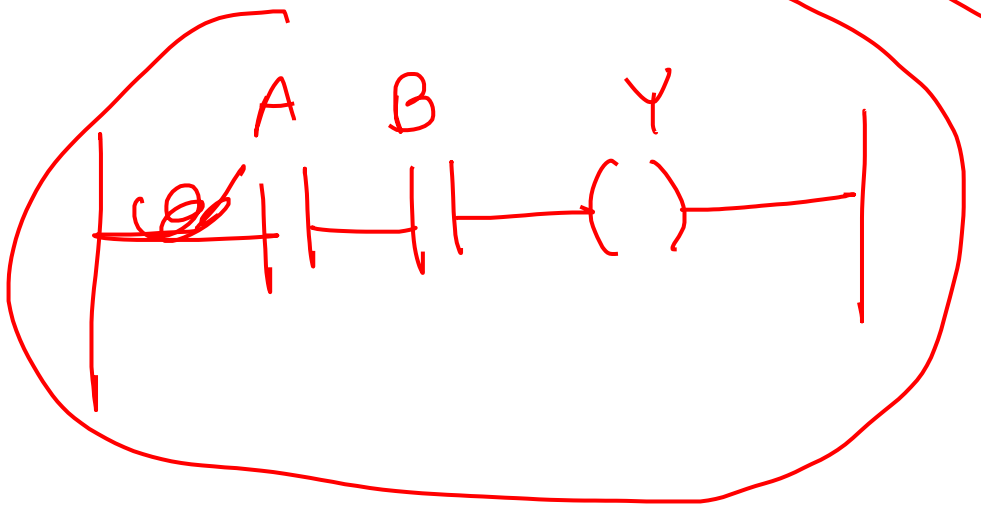
1) AND

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1



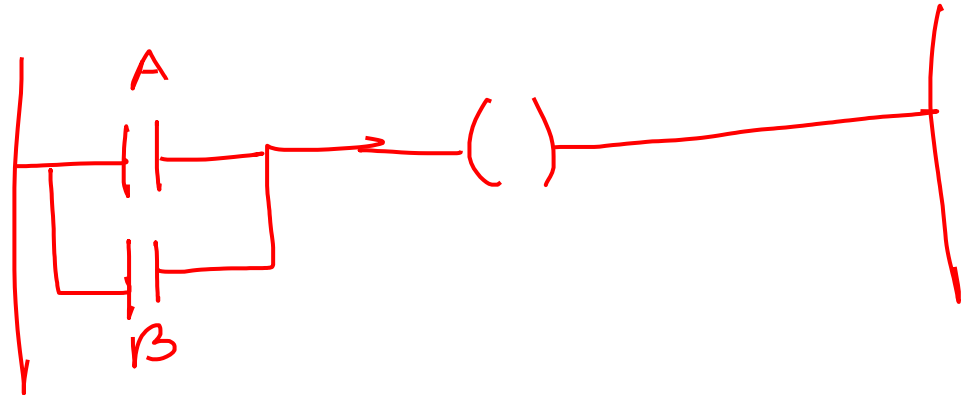


Ladder:



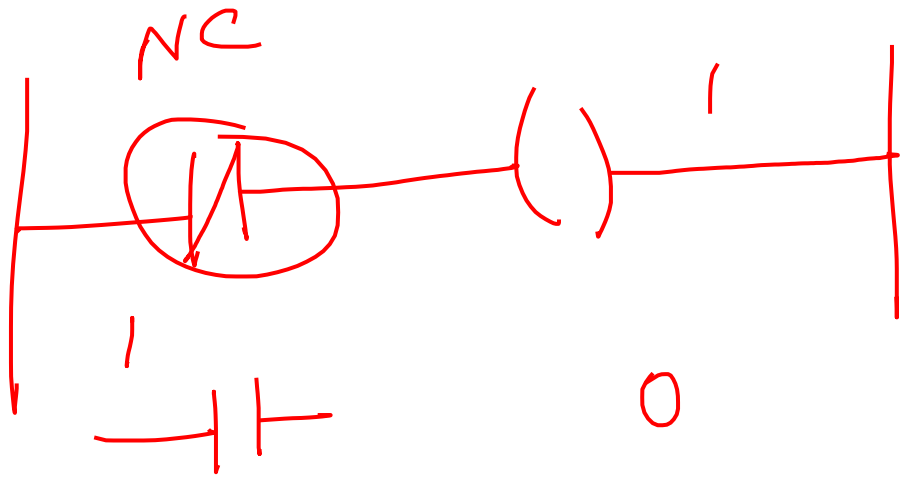
2) OR:

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

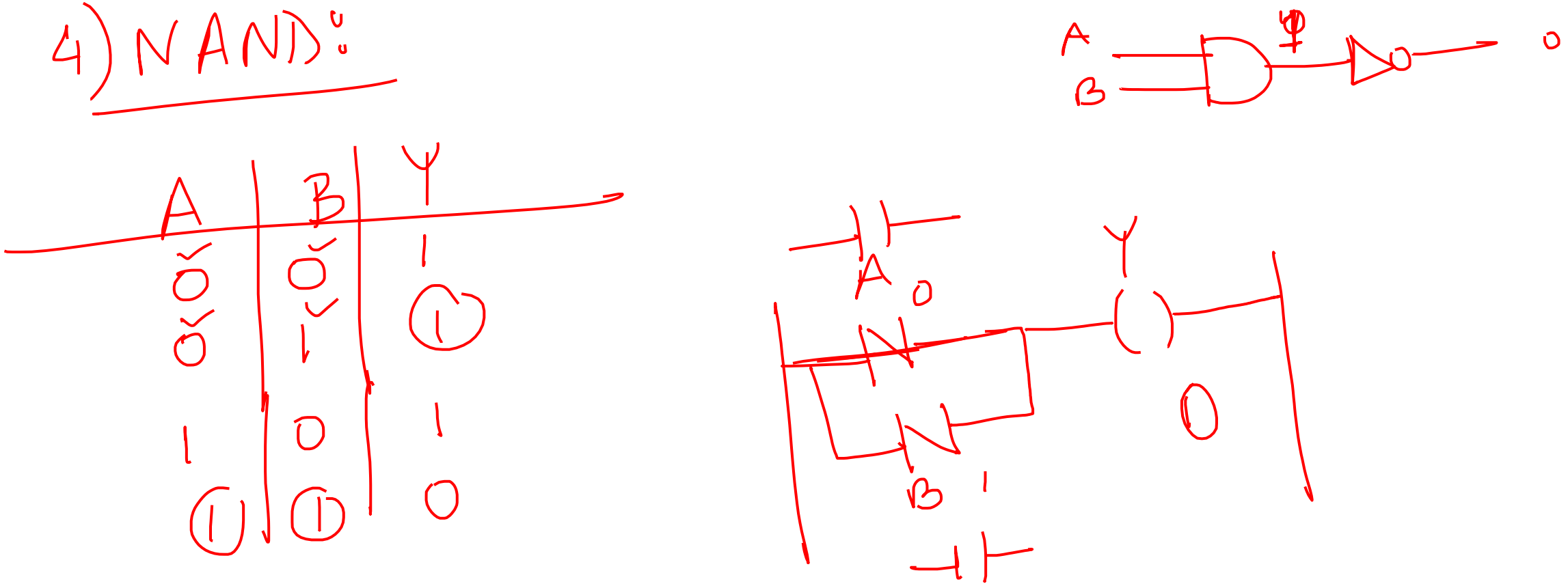


3) NOT Gate

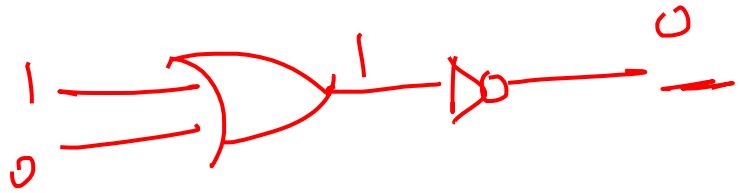
A	Y
0	1
1	0



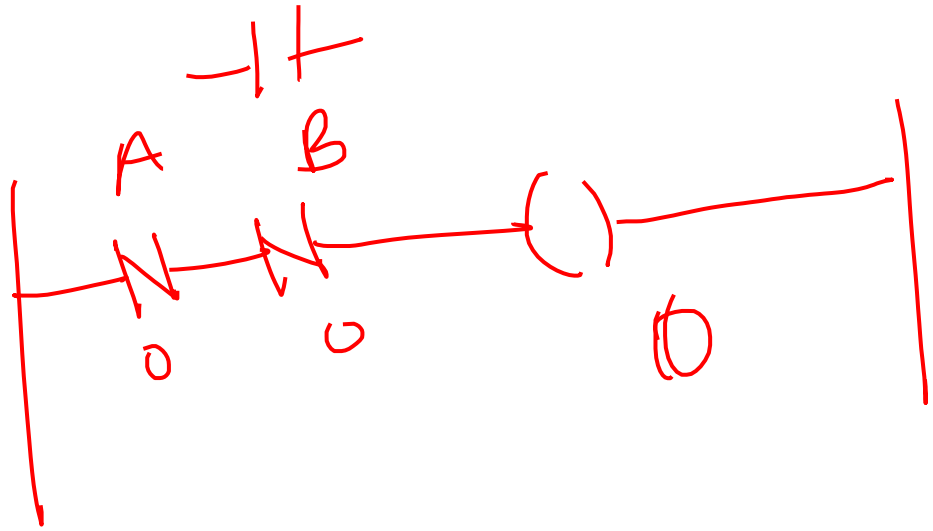
4) NAND:



5) NOR:



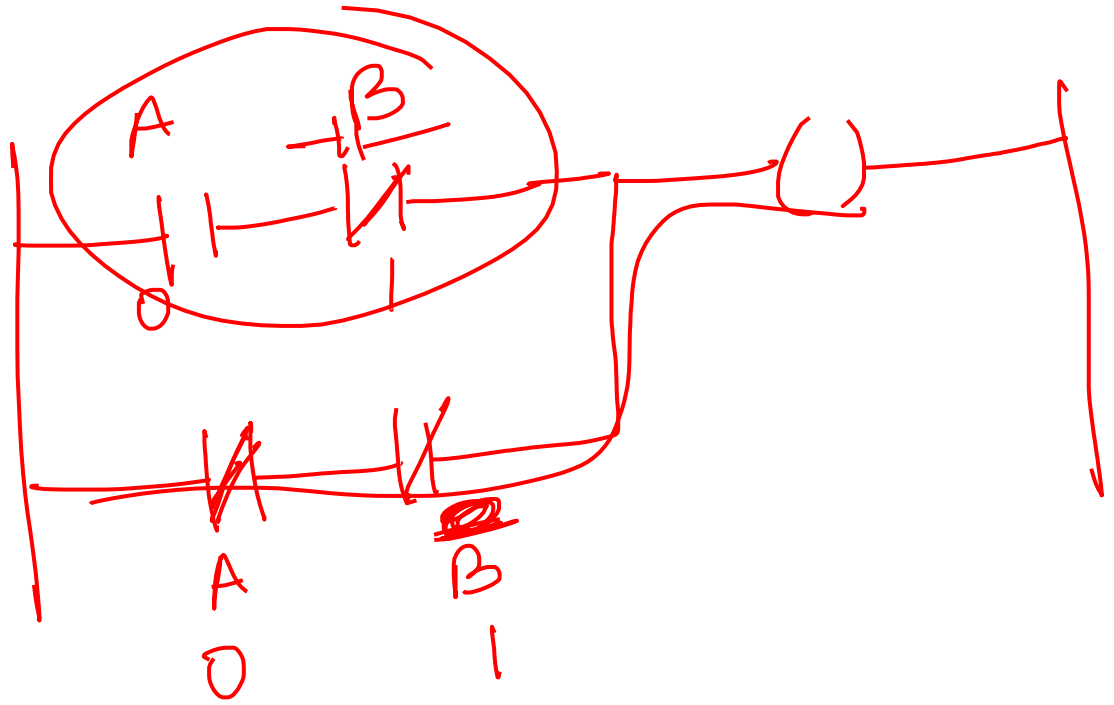
A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

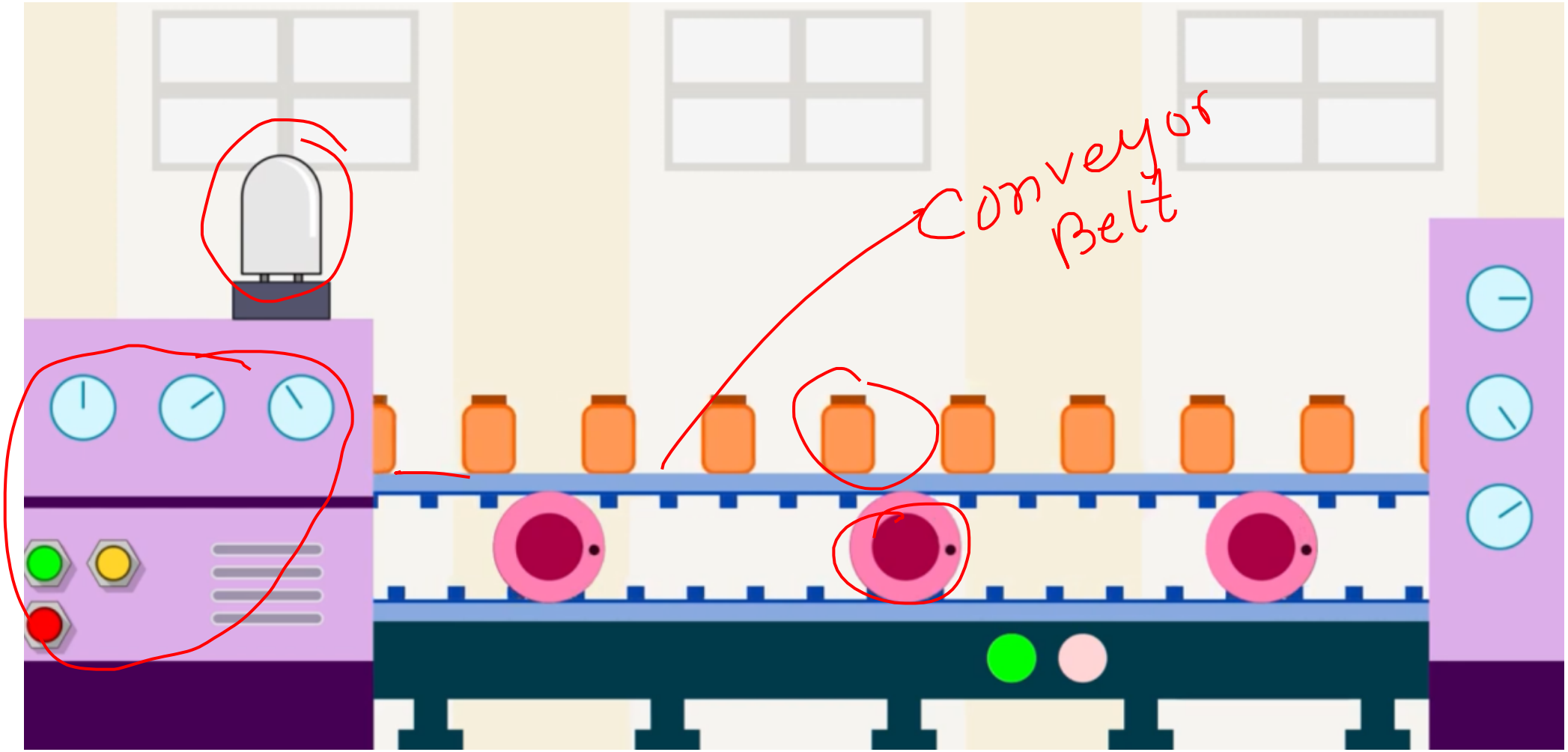


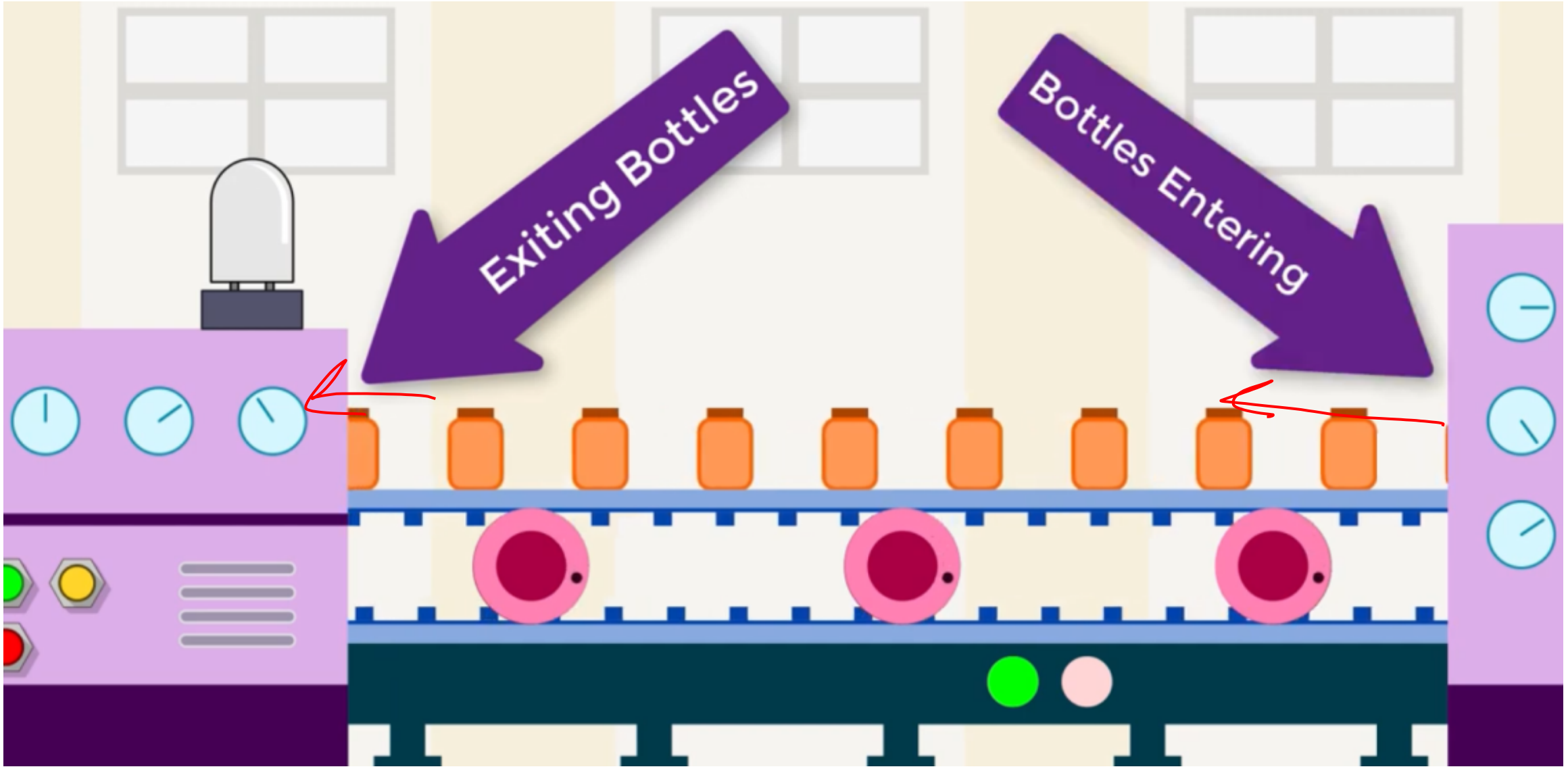
6) EX-OR:

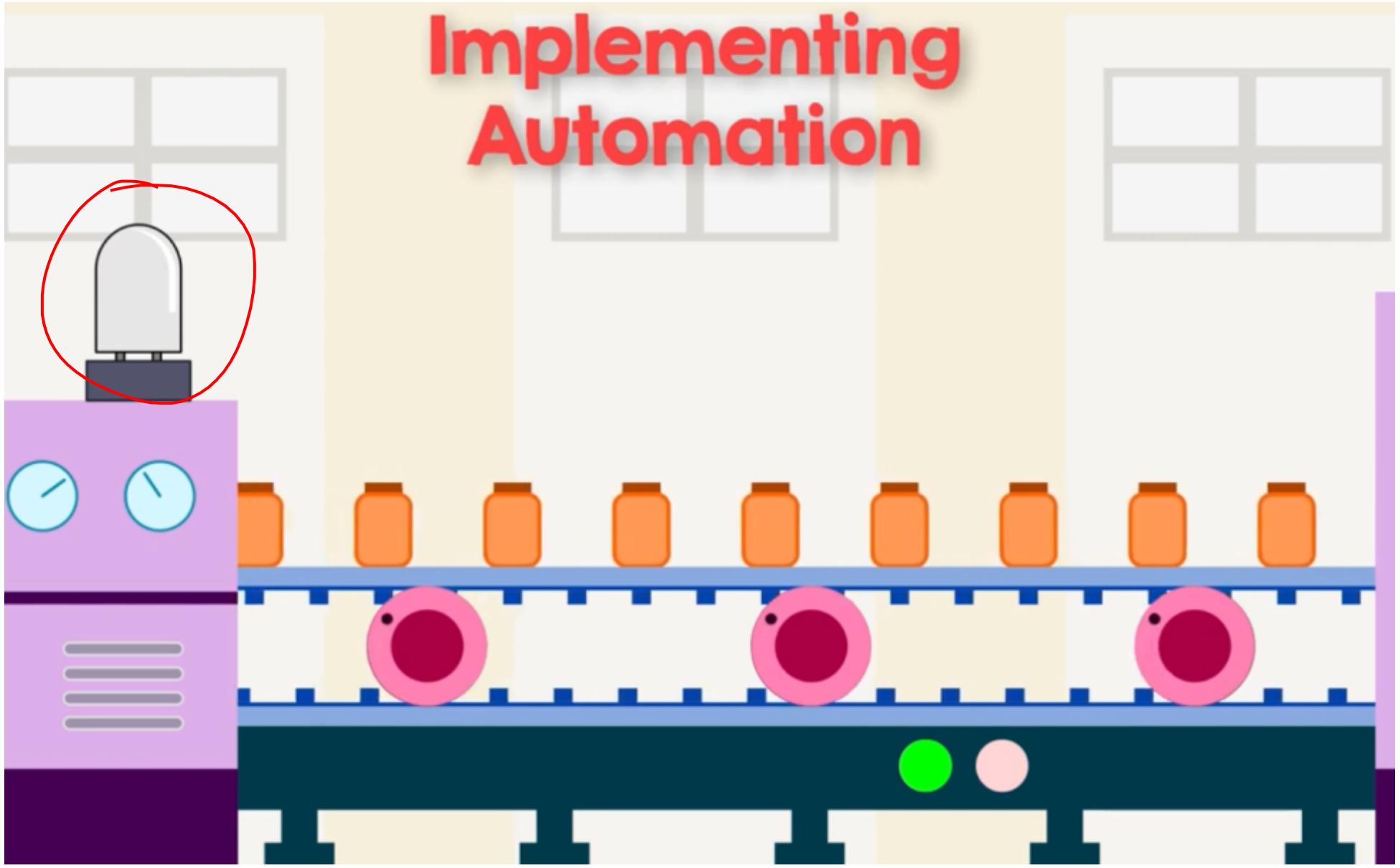
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

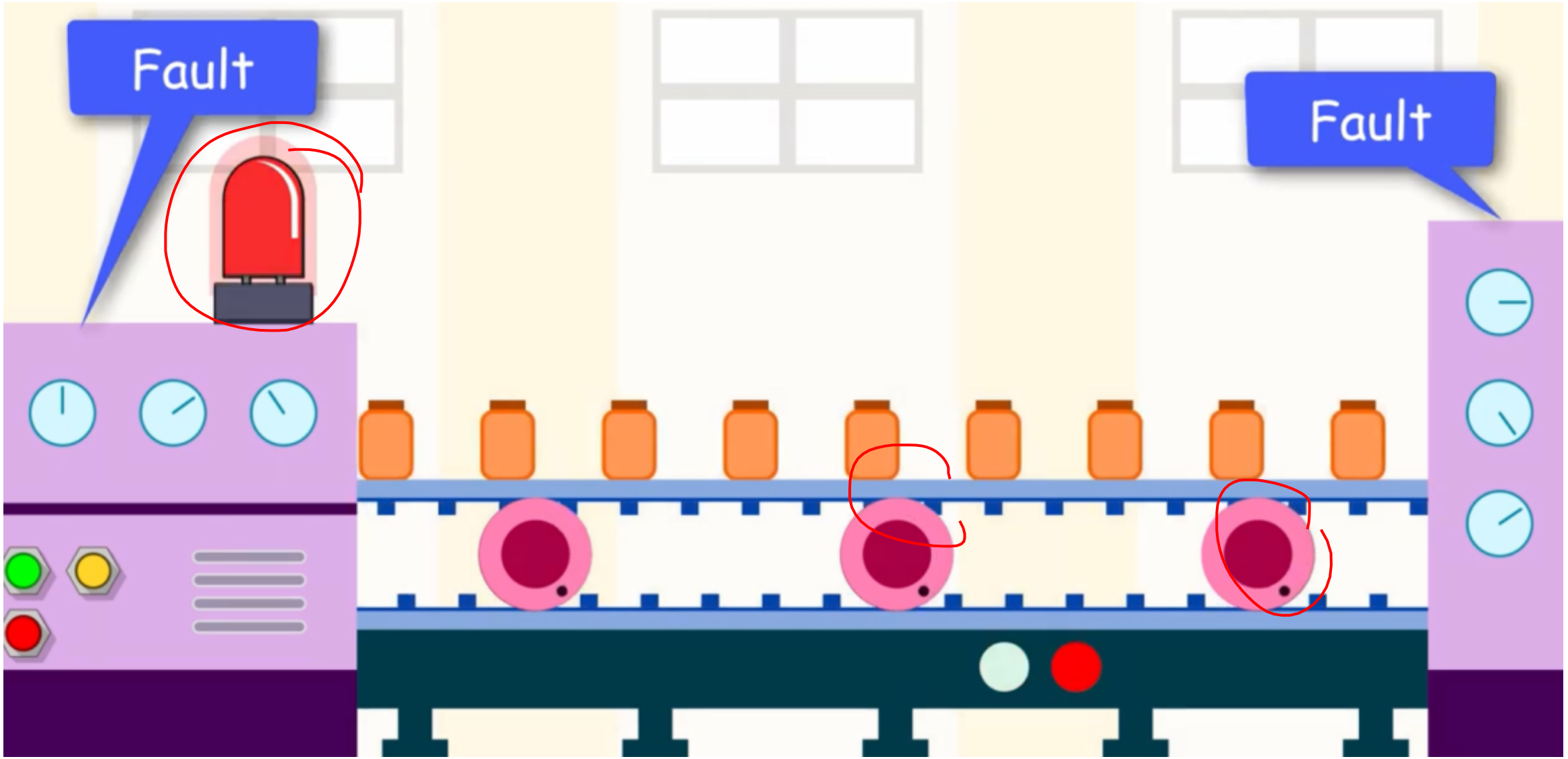
SOP = $\bar{A}B + A\bar{B}$

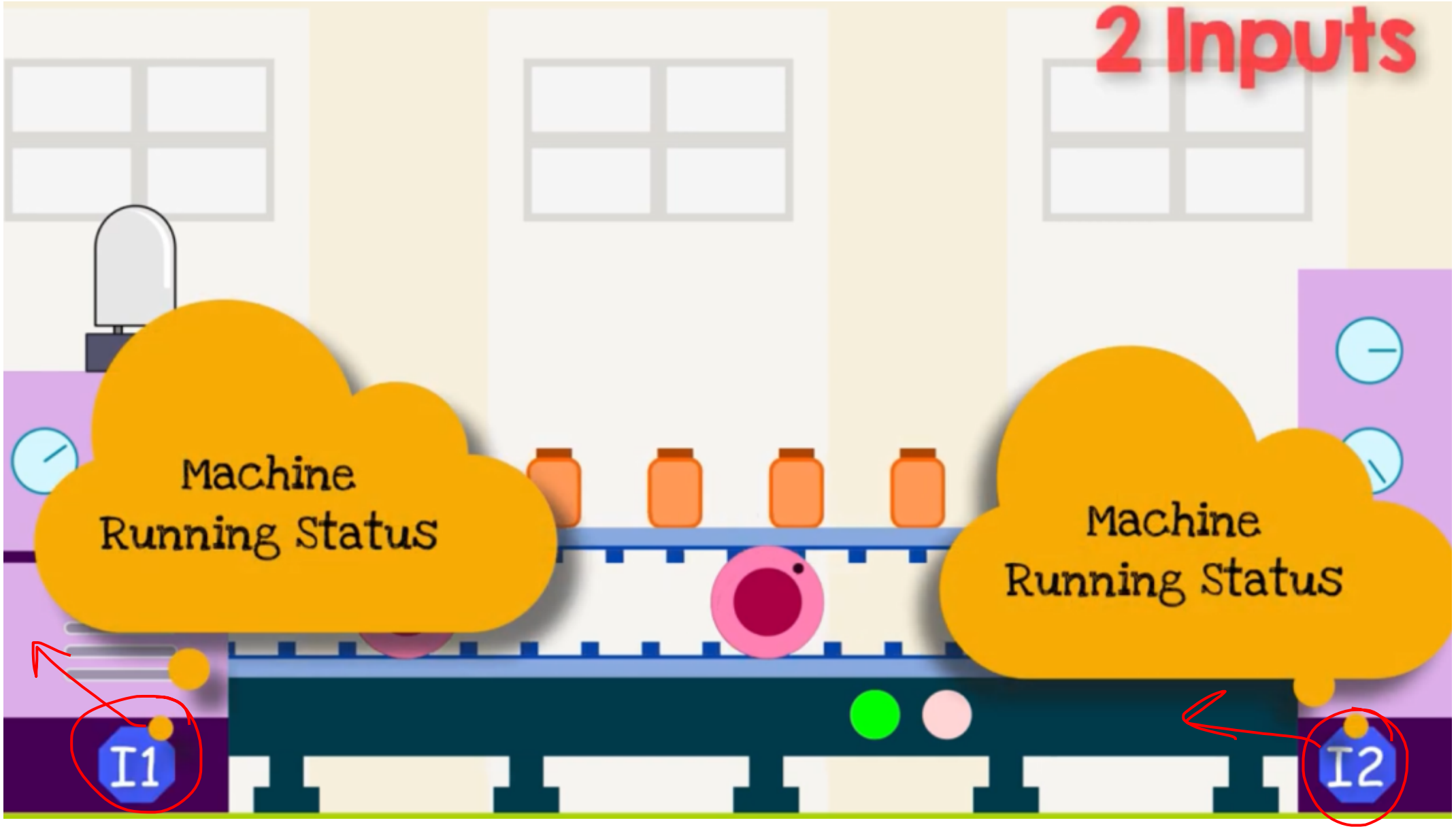


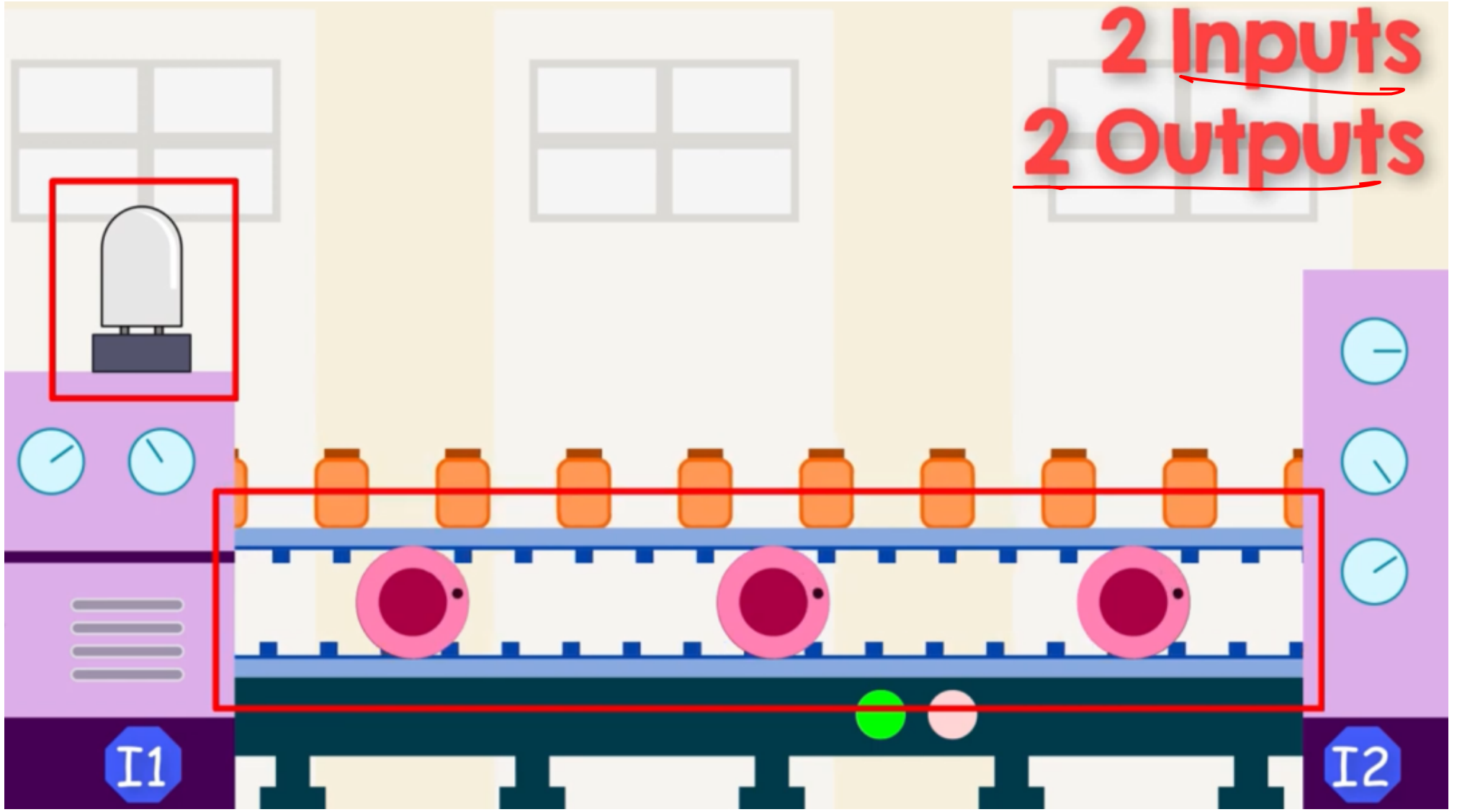

Conveyor
Belt

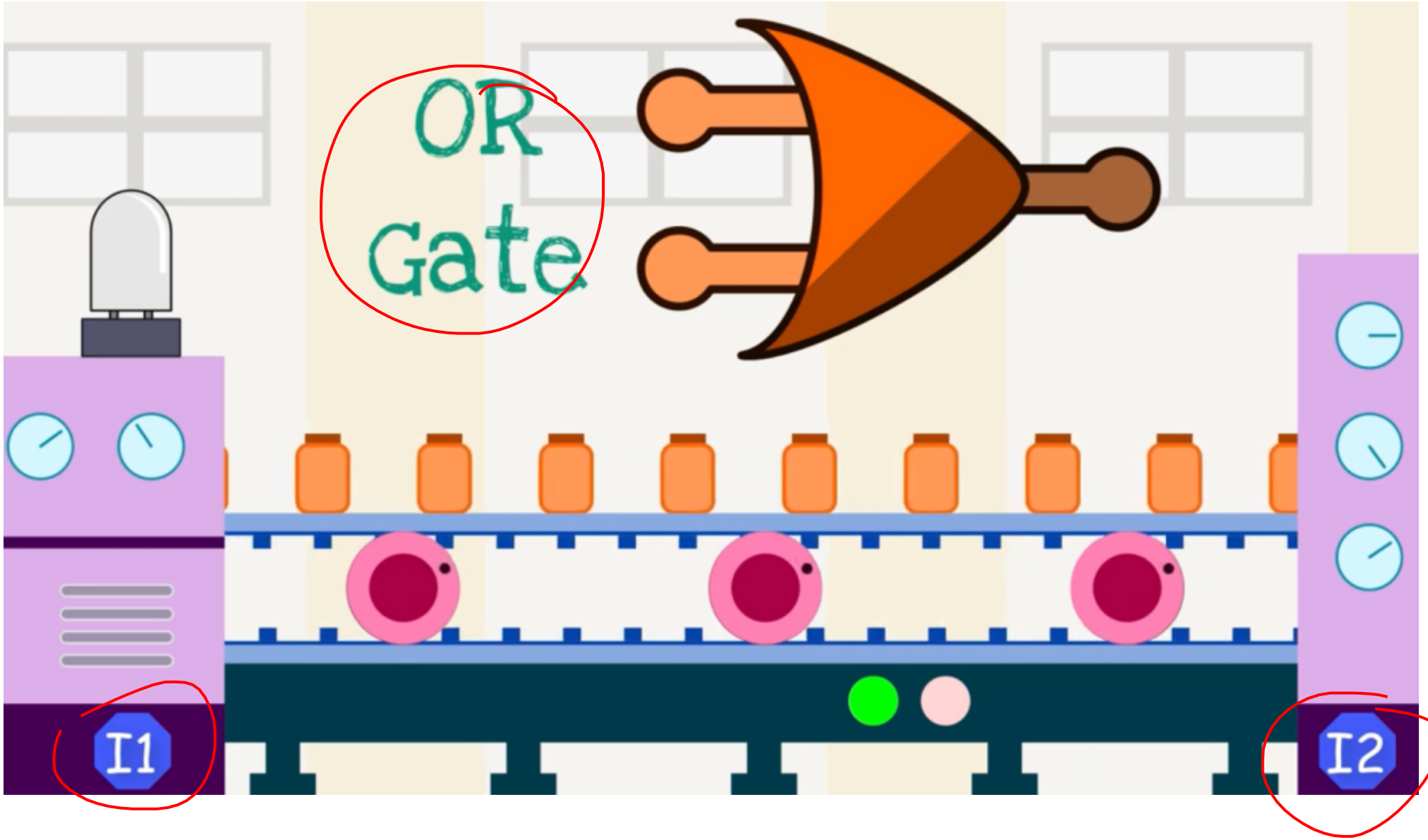

Exiting Bottles
Bottles Entering

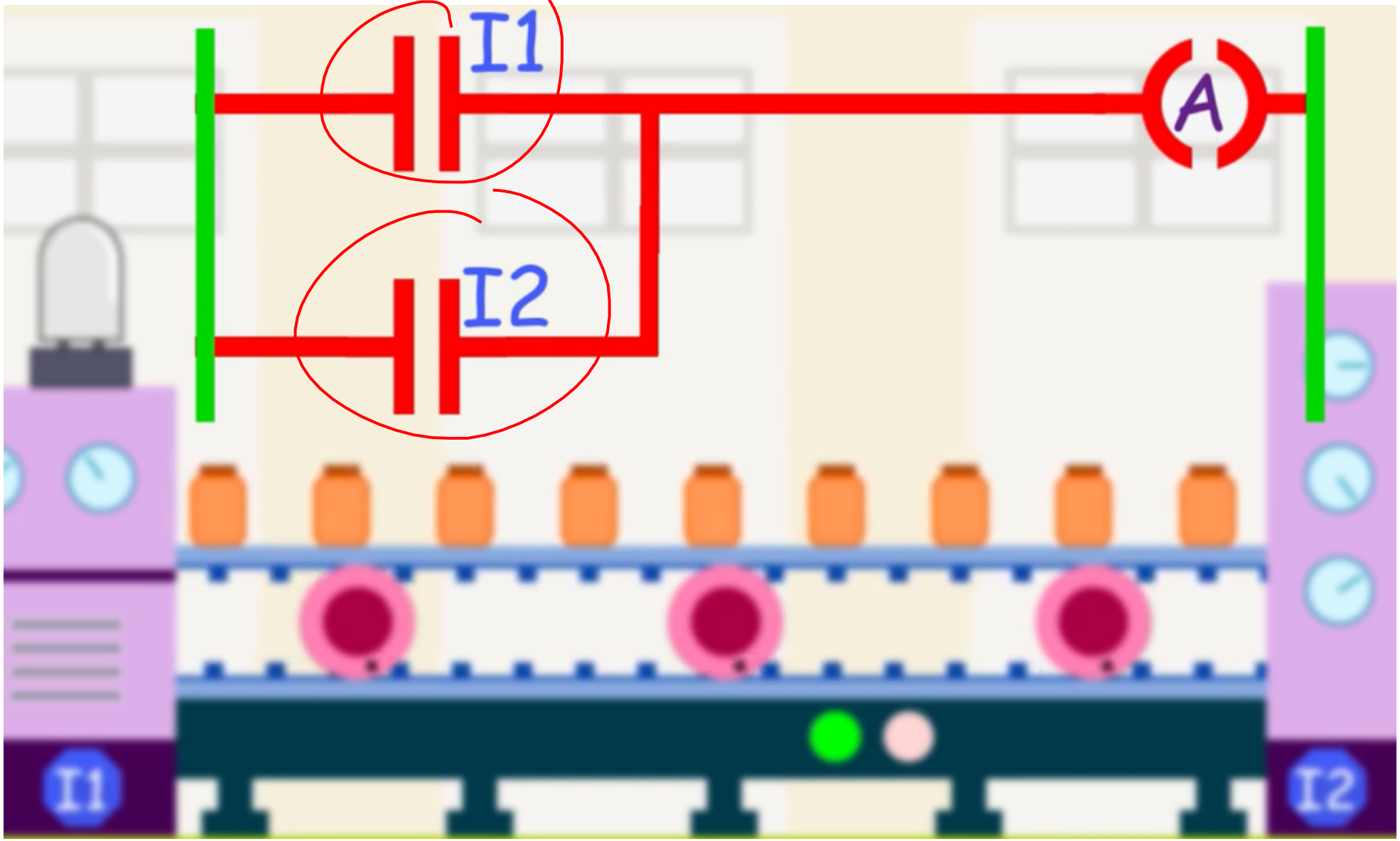

Implementing
Automation

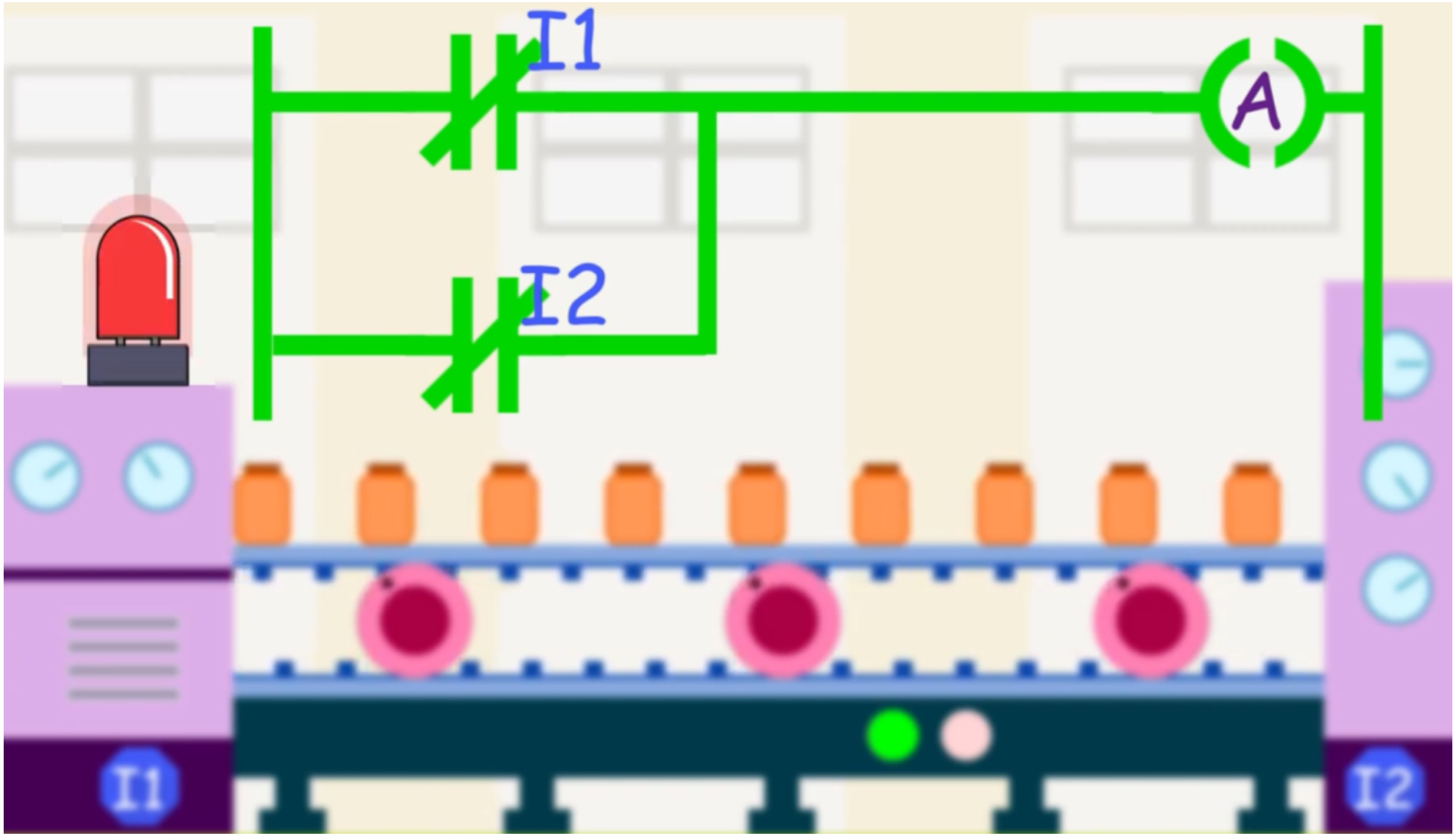

Fault
Fault


2 Inputs
Machine
Running Status
Machine
Running Status
I1
I2


2 Inputs
2 Outputs
I1
I2

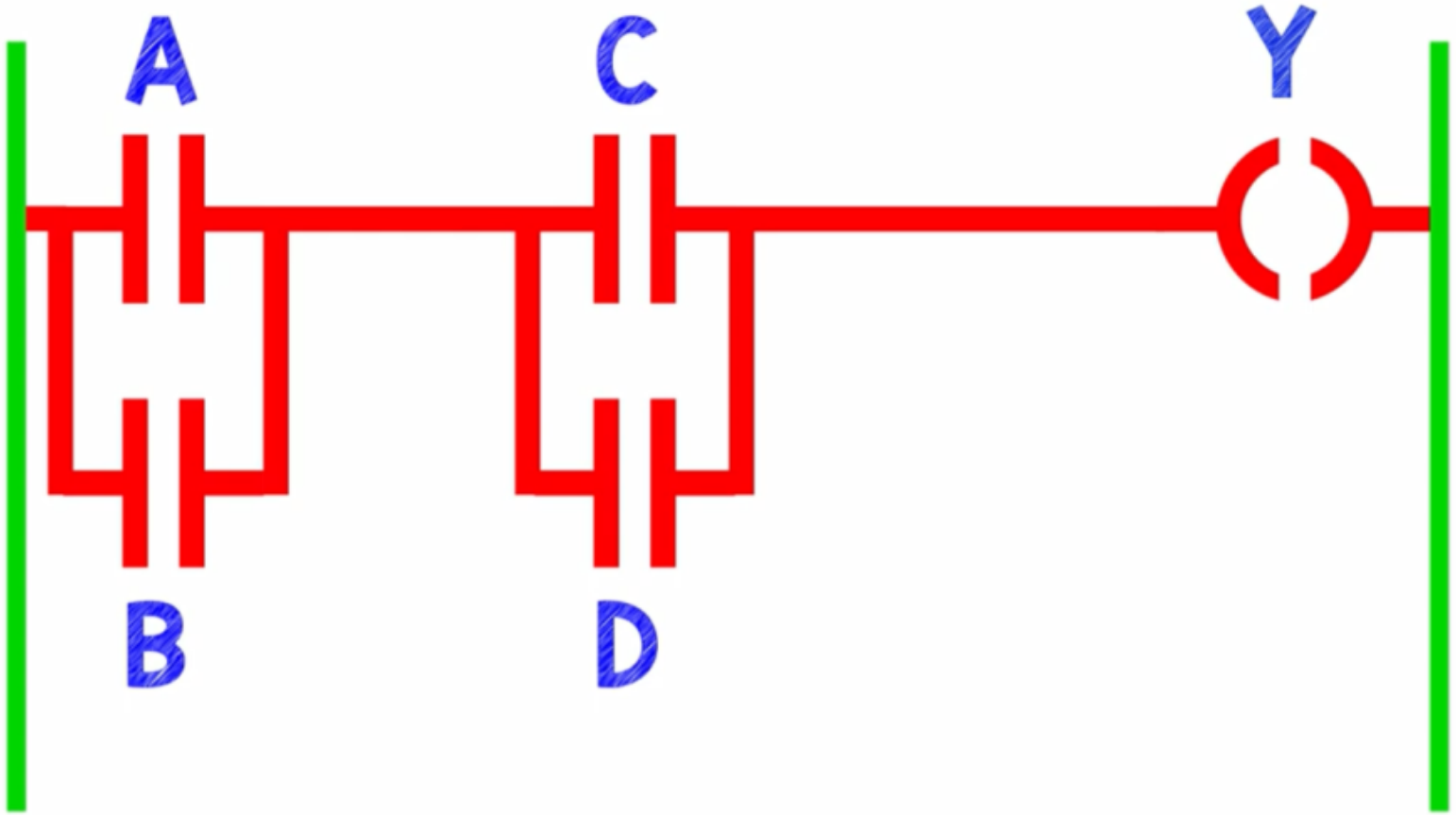

OR
Gate
I1
I2

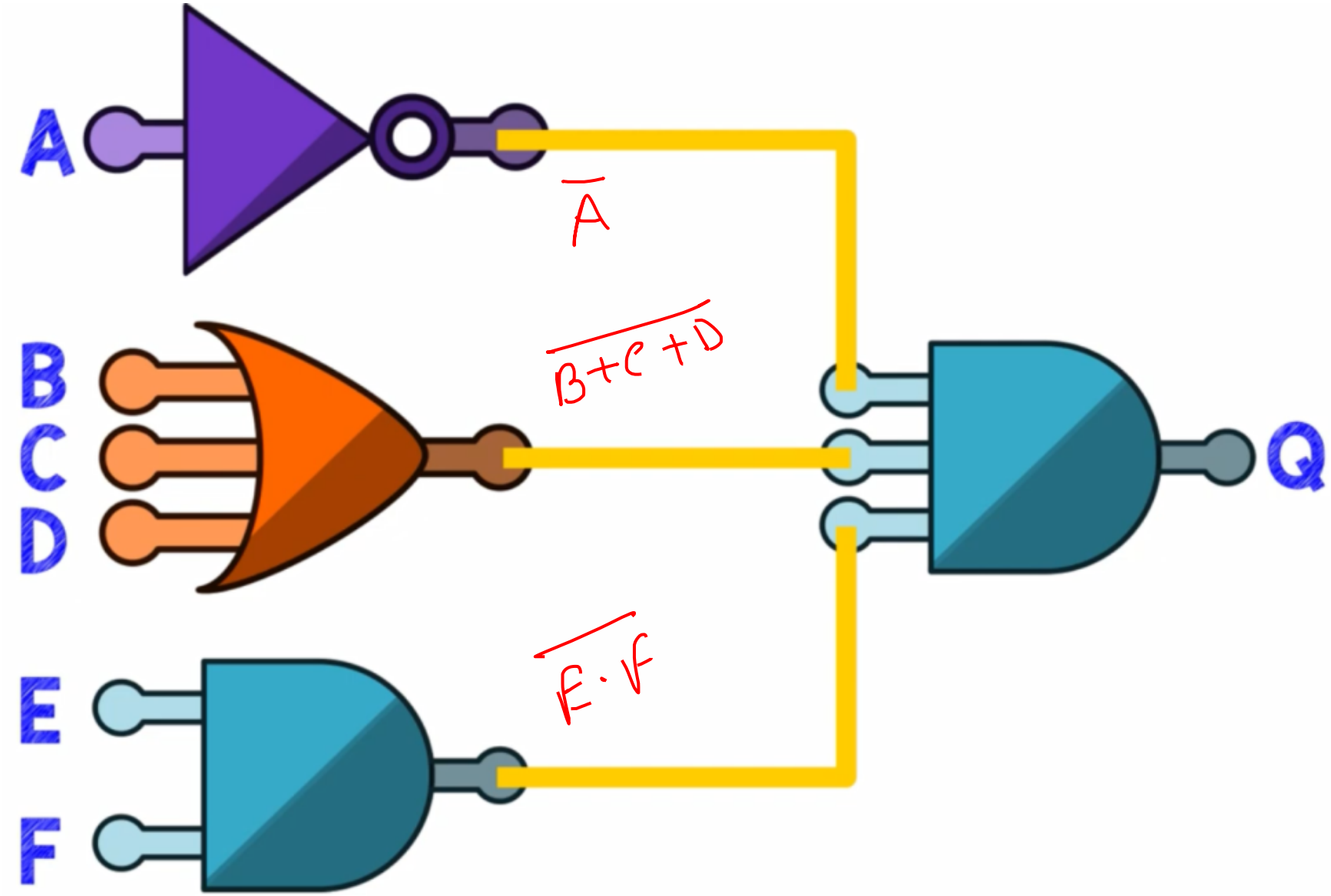

I1
I2
A
I1
I2


I1
A
I2
I1
I2

1) $Y = (A+B).(C+D)$

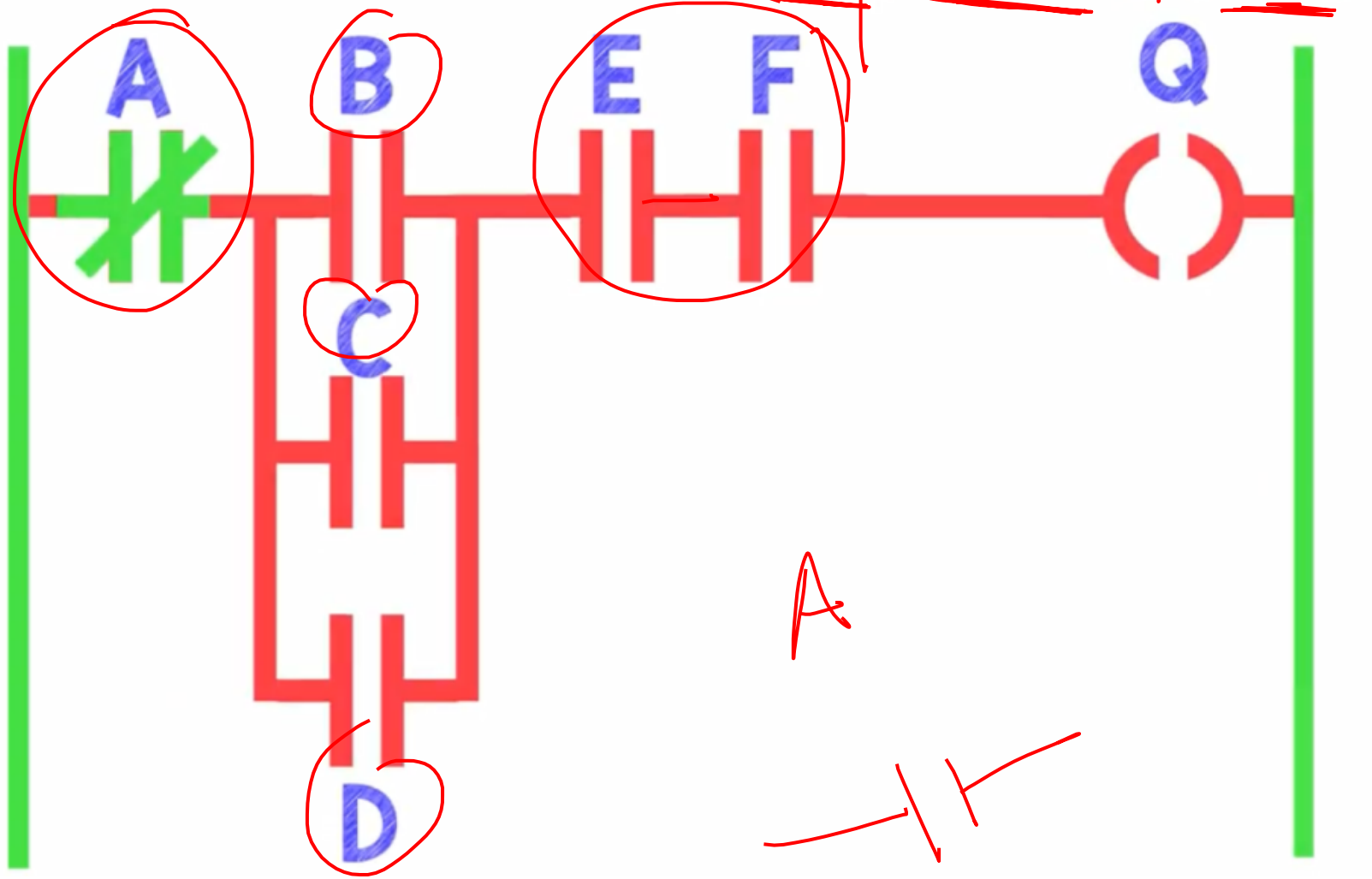
1) $Y = (A+B).(C+D)$




A
B
C
D
E
F
Q
$\overline{A}$
$\overline{B+C+D}$
$\overline{E \cdot F}$

$$Q = \overline{A}.(B+C+D).(E.F)$$

$$Q = \overline{A}.(B+C+D).(E.F)$$



A

$\overline{A}$

$$Q = A \cdot (B \circledast C)$$

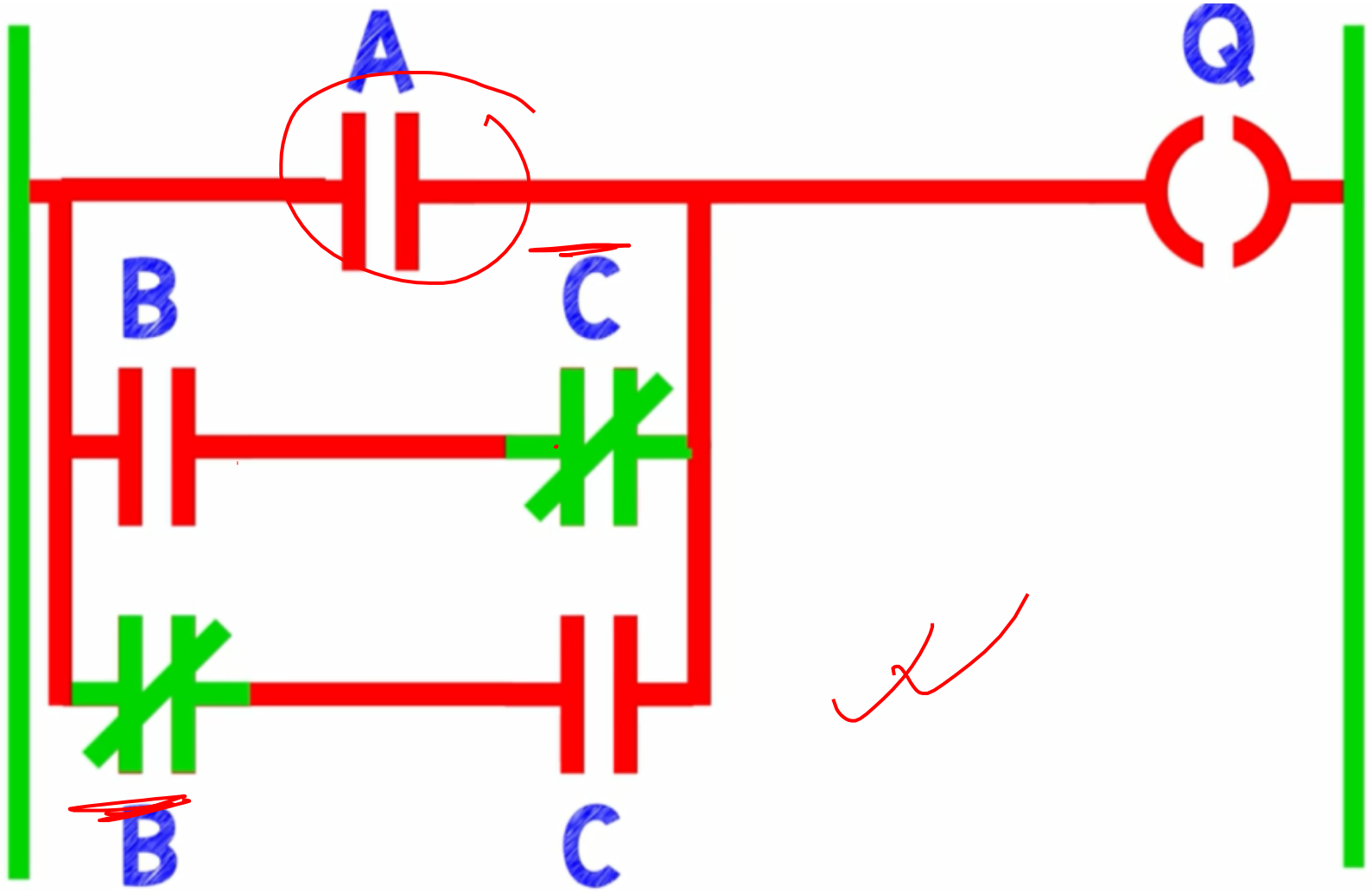
XOR

$$Q = A + (B \oplus C)$$

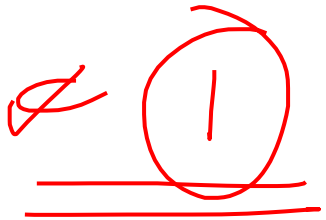
$$= \bar{A} + X$$

$$Q = A \cdot X$$

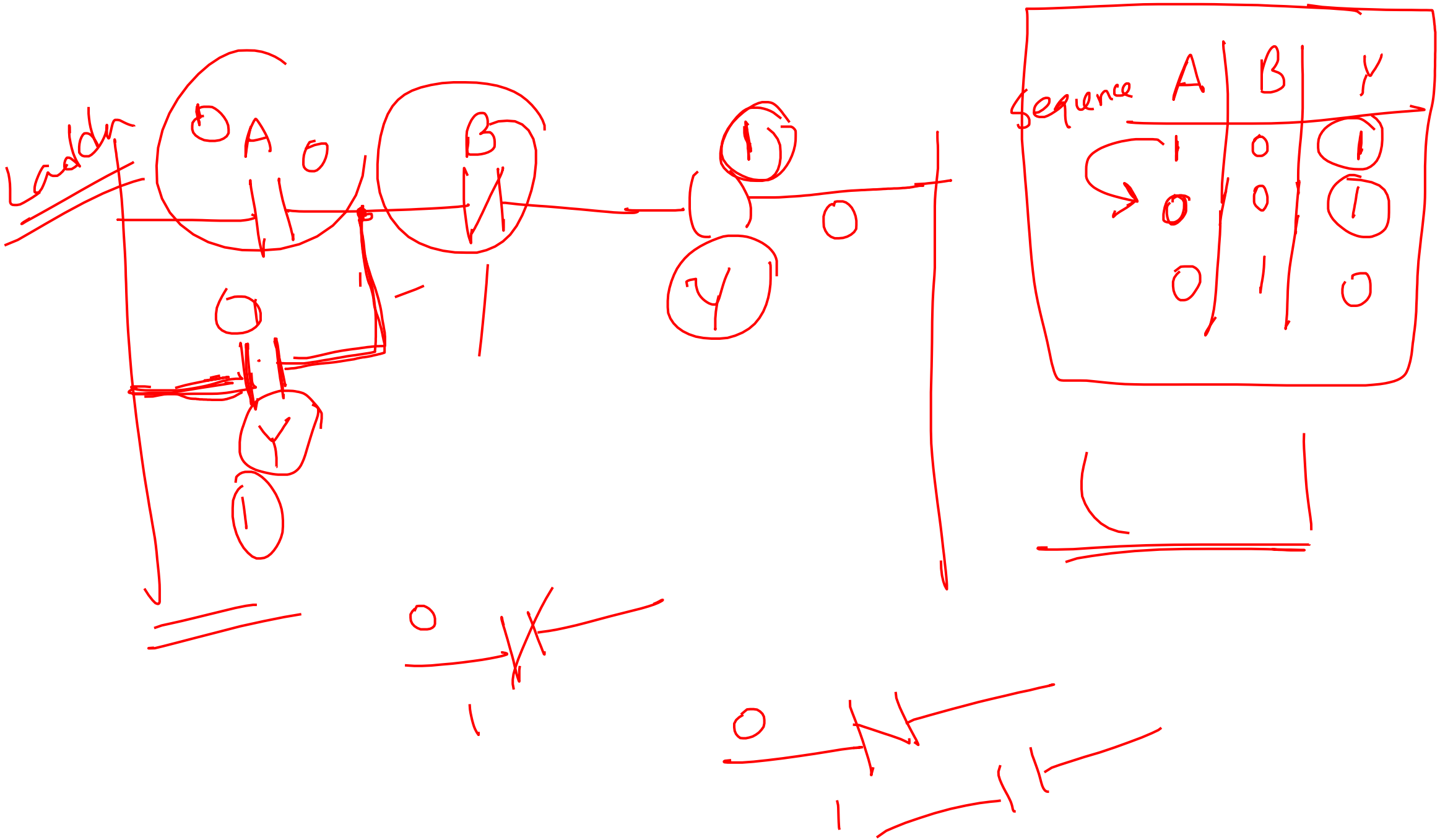
$$X = B\bar{C} \cdot \bar{B}C$$

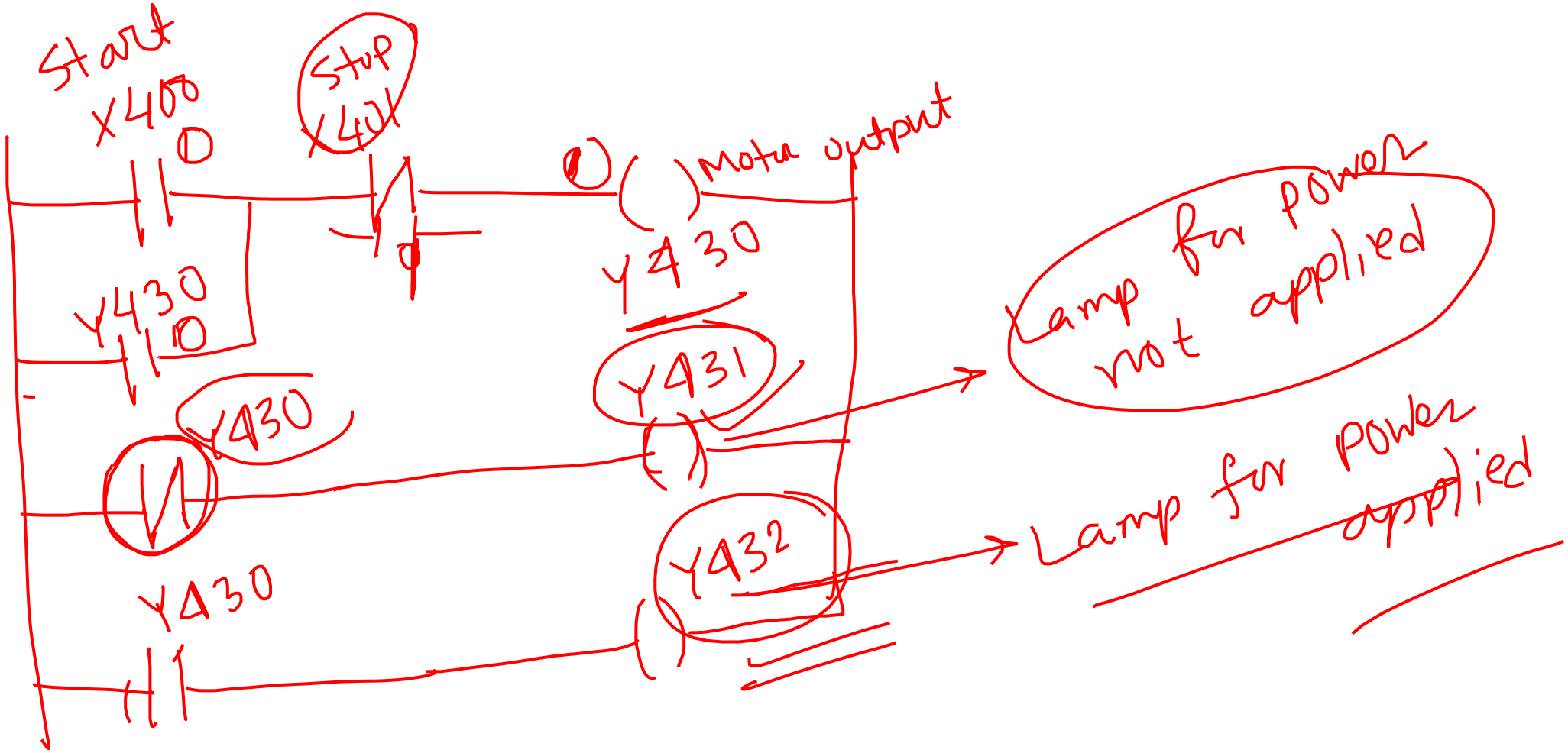

A
Q
B
C
B
C

Latching :

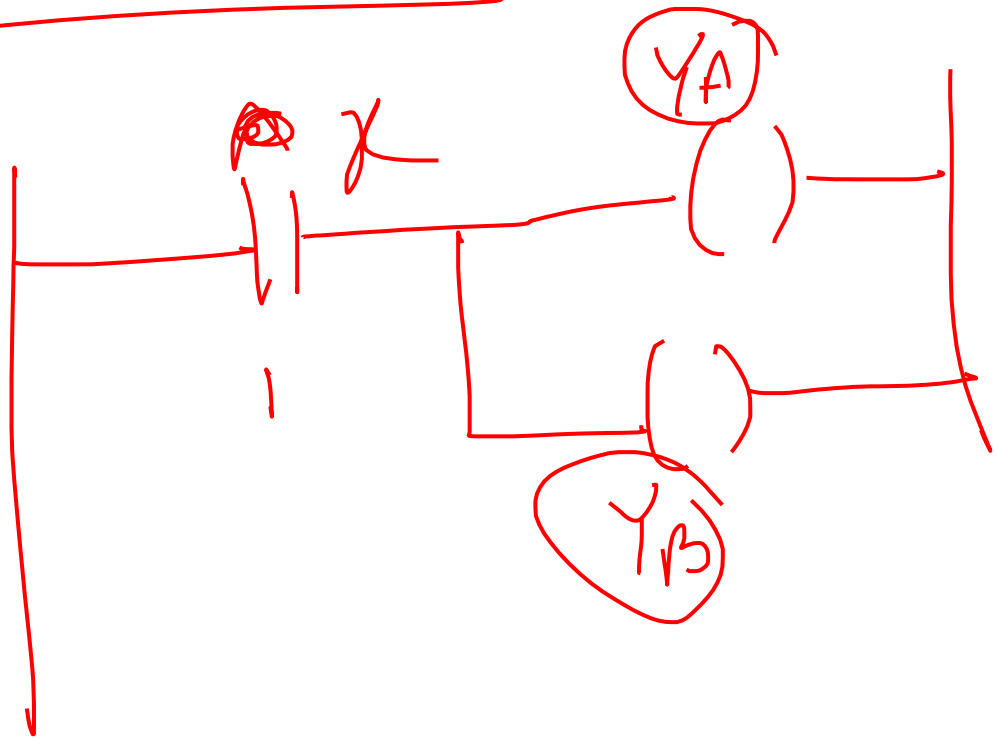


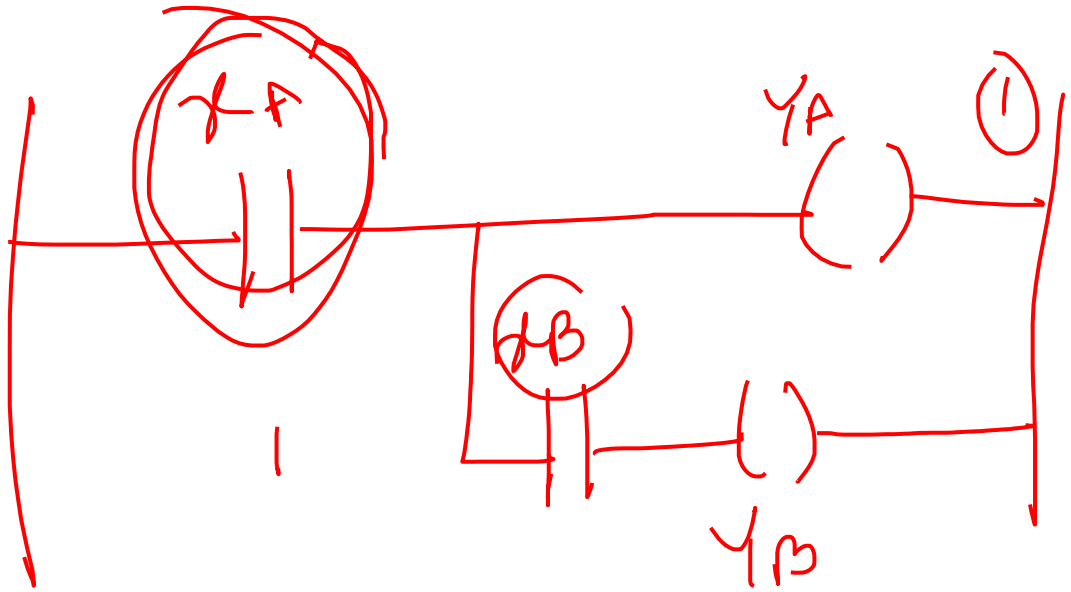
self-maintaining ckt:


Ladder
A
B
Y
Sequence
A
B
Y

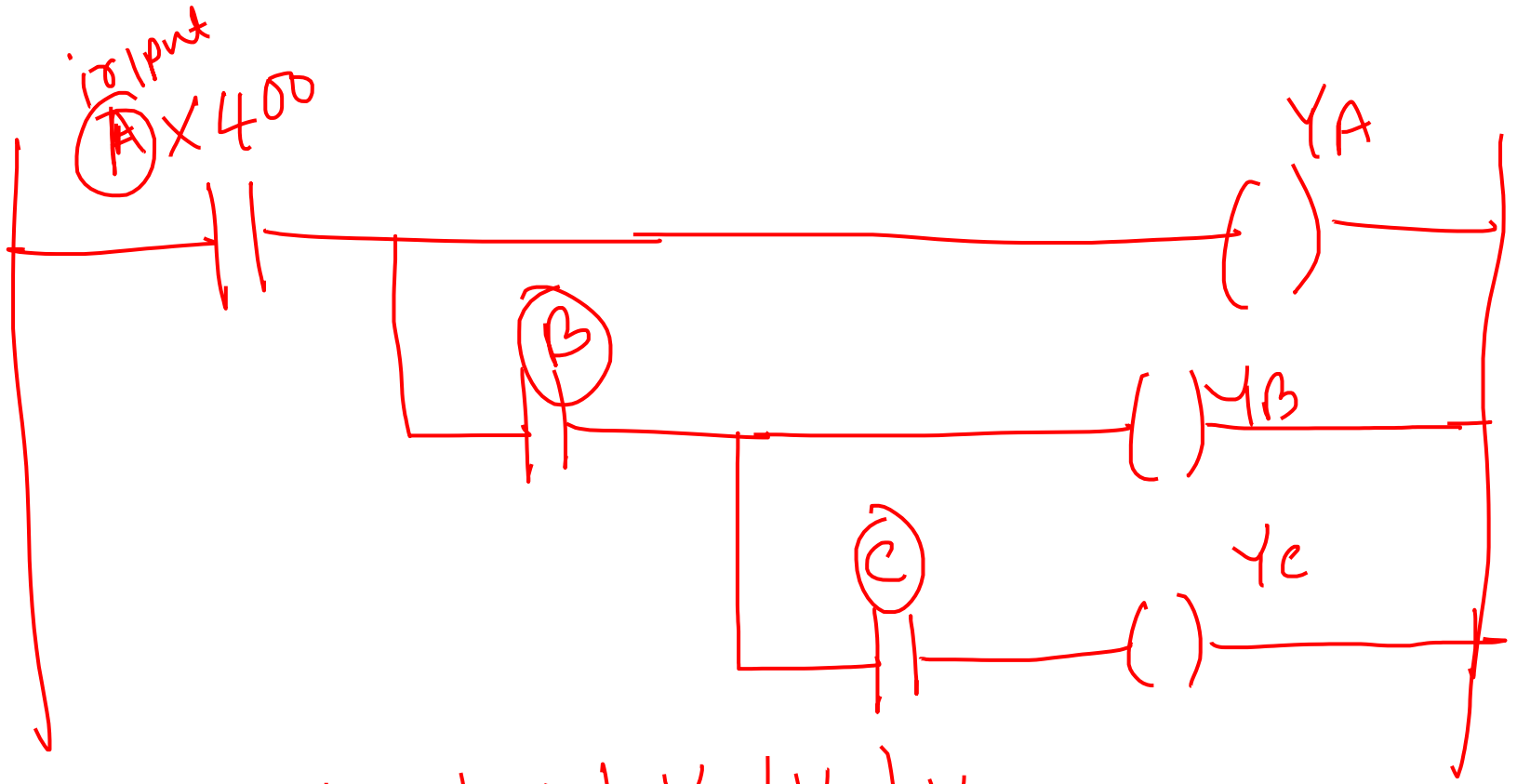

Start
X400
Stop
X401
Y430
Y430
Y430
Y431
Y432
Y430
Mota output
Lamp for power not applied
Lamp for power applied

Multiple outputs:





x_A	x_B	Y_A	Y_B
1	0	1	0
0	1	0	0



X_A	X_B	X_C	Y_A	Y_B	Y_C
1	0	0	1	0	0
1	1	0	1	1	0