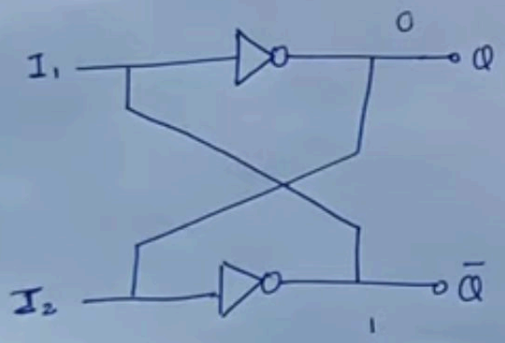
Latch v/s Flipflop

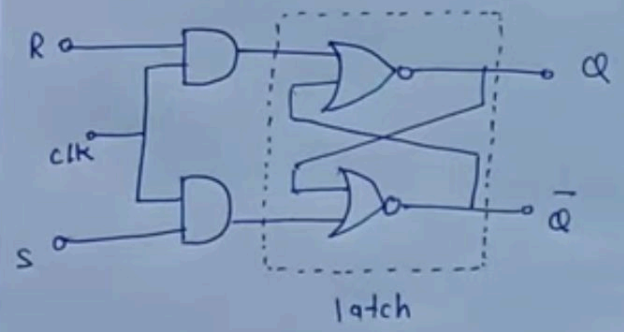
Latches

- Latches are building blocks of sq sequential circuits.
- Built from logic gates
- without clock



Flip Flops

- Also sequential circuits. used to store one bit binary no. (logic 1 and 0).
- Built from latches.
- with clock.
- (JK, SR, D, T)



Latches

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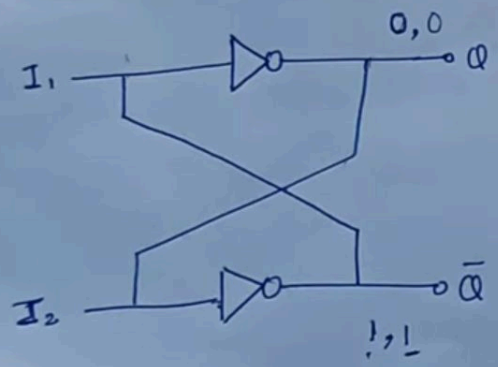

Flip Flops

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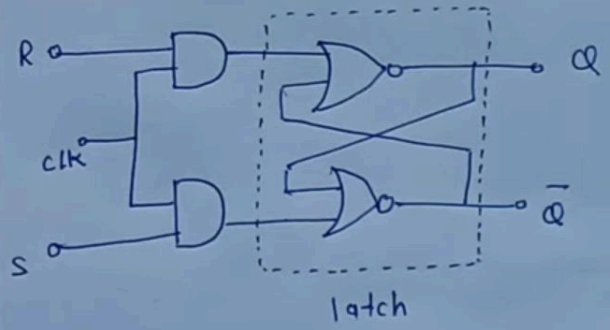

Latches

- Latches are building blocks of sq sequential circuits.
- Built from logic
- without

I₁

Flip Flops

- Also sequential circuits. Used to store one bit binary no. (logic 1 and 0).
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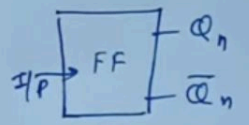
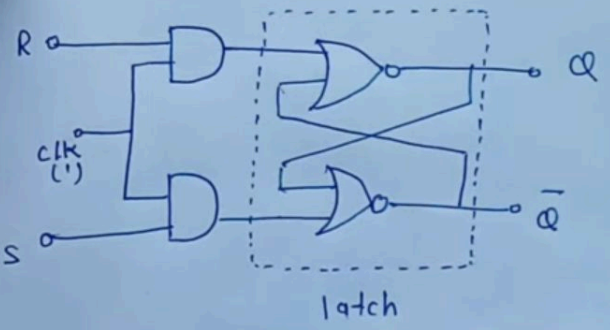
- with clock.
(JK, SR, D, T)

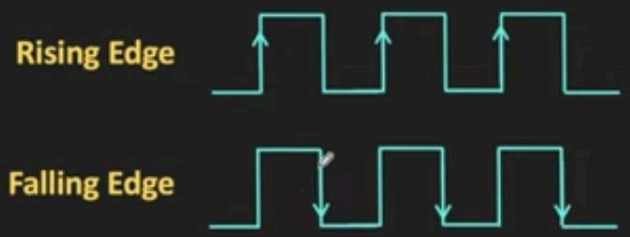


Q₁, Q₂,



Flip-Flop

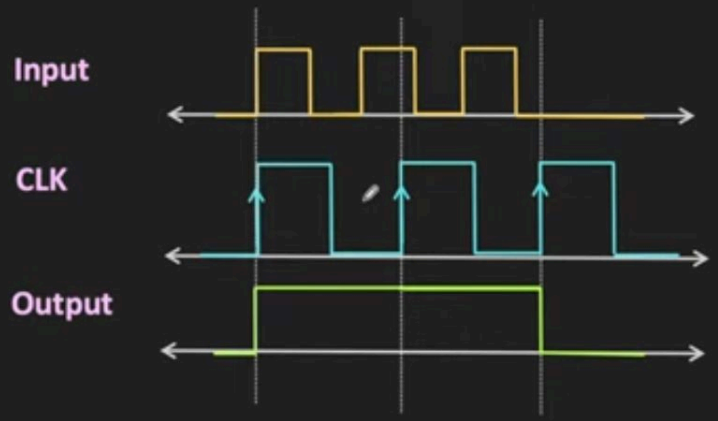
Clock Signal



ALL ABOUT ELECTRONICS

Flip-Flop

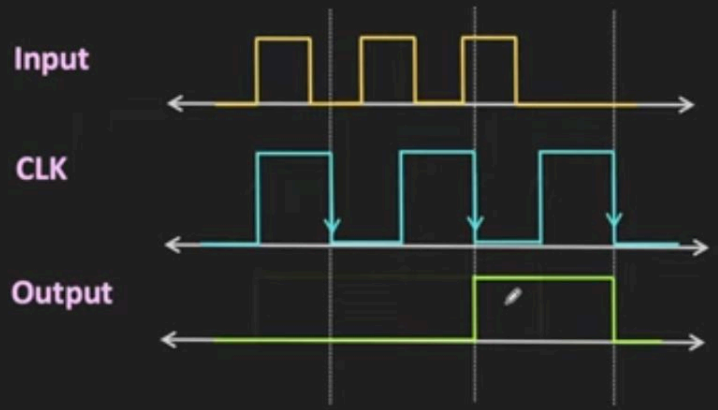
Positive Edge Triggered Flip-Flop



ALL ABOUT ELECTRONICS

Flip-Flop

Negative Edge Triggered Flip-Flop



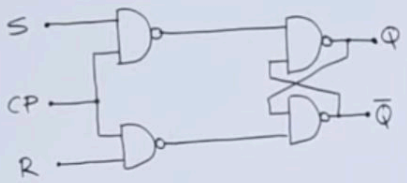
ALL ABOUT ELECTRONICS

Summary of All Flipflops

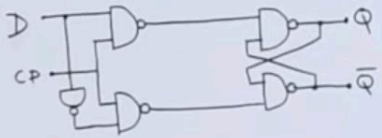
Summary of Flip-Flops

Logic diagram

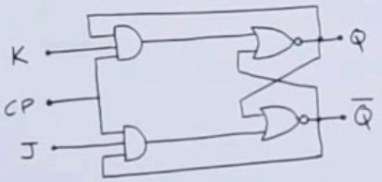
S-R F/F



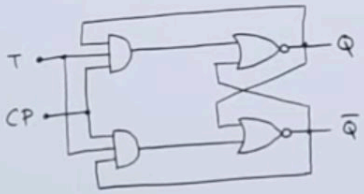
D F/F



J-K F/F



T F/F



Characteristic Table

S	R	Q(t+1)	
0	0	Q(t)	No Change
0	1	0	Reset
1	0	1	Set
1	1	?	Indeterminate

D	Q(t+1)
0	0
1	1

J	K	Q(t+1)
0	0	Q(t)
0	1	0
1	0	1
1	1	$\bar{Q}$(t)

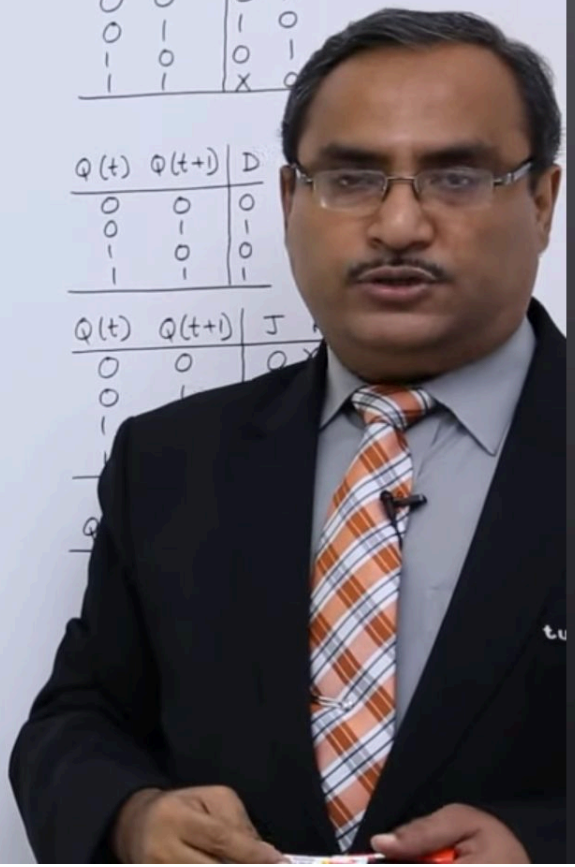
T	Q(t+1)
0	Q(t)
1	$\bar{Q}$(t)

Excitation Table

Q(t)	Q(t+1)	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

Q(t)	Q(t+1)	D
0	0	0
0	1	1
1	0	0
1	1	1

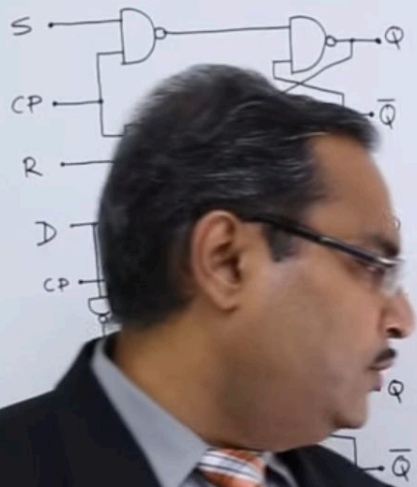
Q(t)	Q(t+1)	J
0	0	0
0	1	
1		



Summary of Flip-Flops

Logic diagram

S-R F/F



D F/F

J-K F/F

Characteristic Table

S	R	Q(t+1)	
0	0	Q(t)	No Change
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0	Q(t)
1	$\overline{Q}$(t)

Excitation Table

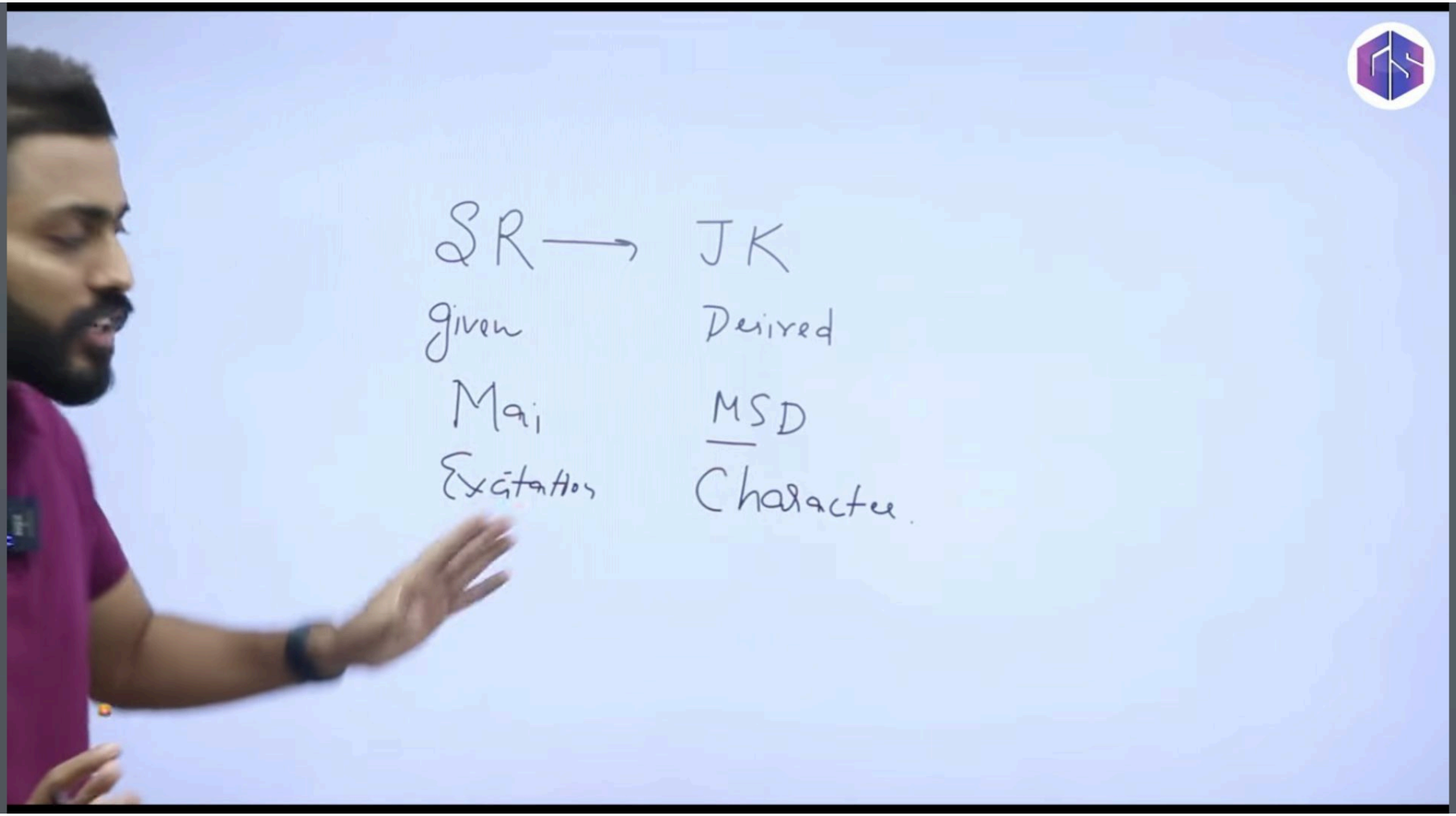
Q(t)	Q(t+1)	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

Q(t)	Q(t+1)	D
0	0	0
0	1	1
1	0	0
1	1	1

Q(t)	Q(t+1)	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

Q(t)	Q(t+1)	T
0	0	0
0	1	1
1	0	1
1	1	0

SR to JK flipflop


SR ⟶ JK
given Desired
Mai MSD
Excitation Character.
SUBSCRIBE

J	K	Q_n	Q_{n+1}	S	R
0	0	0	0		
0	0	1	1		
0	1	0	0		
0	1	1	0		
1	0	0	1		
1	0	1	1		
1	1	0	1		
1	1	1	0		

SUBSCRIBE

J	K	Q_n	Q_{n+1}	S	R
0	0	0	0		
0	0	1	1		
0	1	0	0		
0	1	1	0		
1	0	0	1		
1	0	1	1		
1	1	0	1		
1	1	1	0		

Excitation

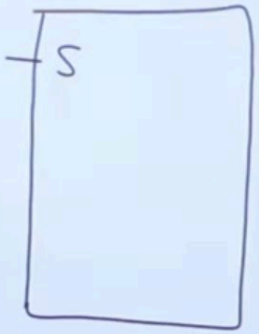
Q_n	Q_{n+1}	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

SUBSCRIBE

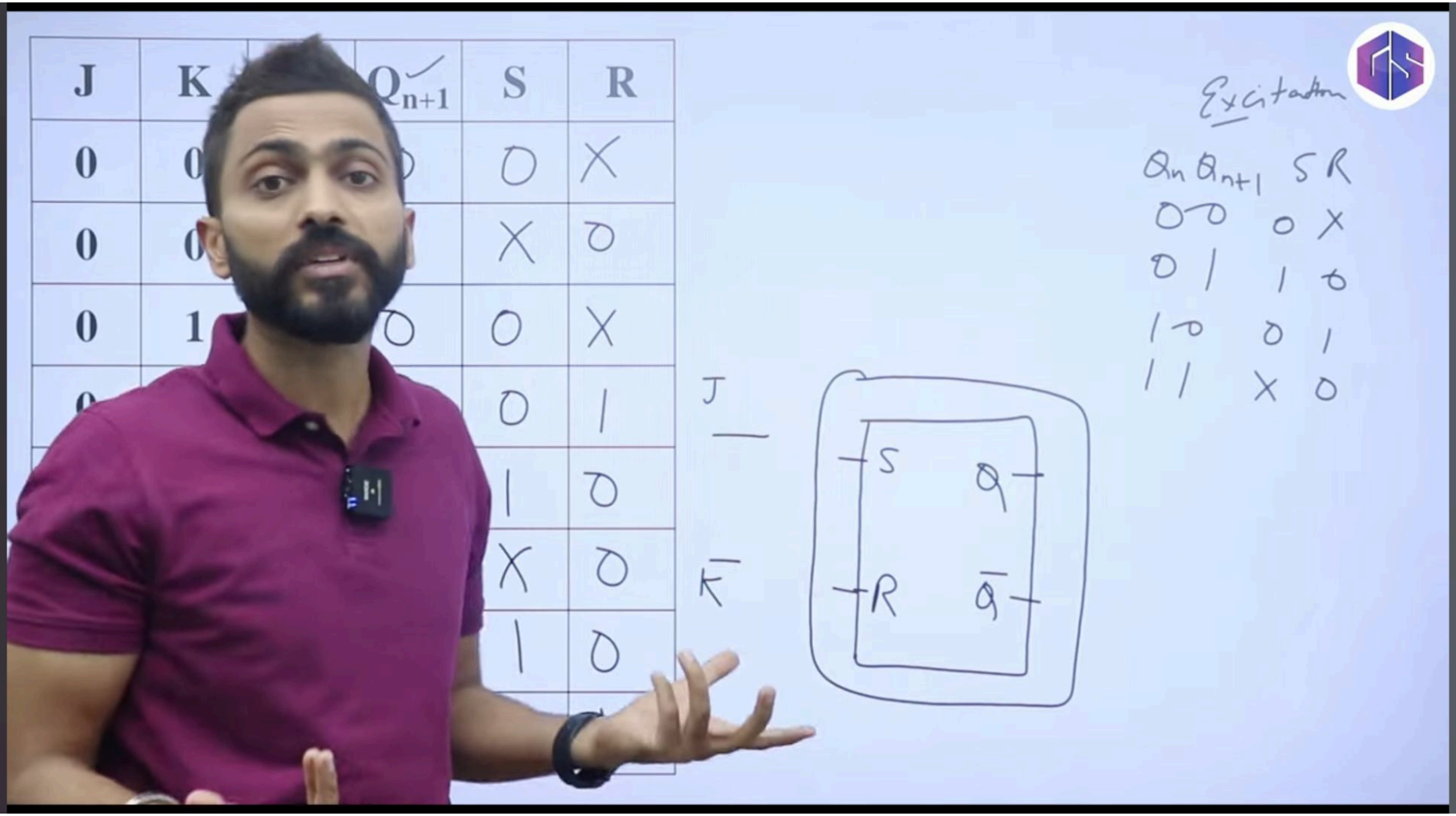
J	K	Q_n	Q_{n+1}	S	R
0	0	0	0	0	X
0	0	1	1	X	0
0	1	0	0	0	X
0	1	1	0	0	1
1	0	0	1	1	0
1	0	1	1	X	0
1	1	0	1	1	0
1	1	1	0	0	1

Excitation

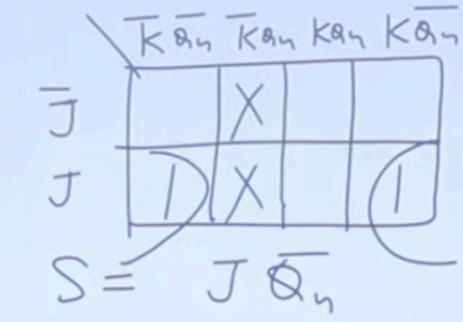
Q_n	Q_{n+1}	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0



SUBSCRIBE

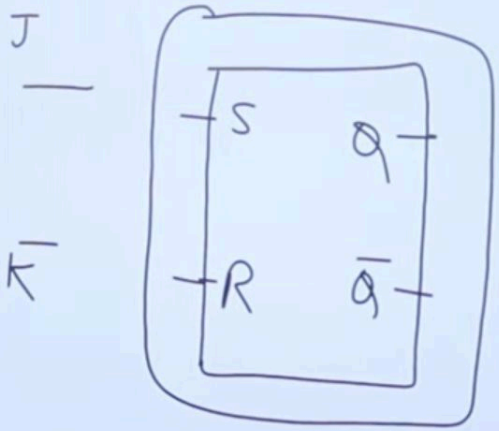

J
K
Q_{n+1}
S
R
0 0 0 X
0 X 0
0 1 0 X
0 0 1
1 0
X 0
1 0
J
K
S
Q
R
$\bar{Q}$
Excitation
Q_n Q_{n+1} S R
0 0 0 X
0 1 1 0
1 0 0 1
1 1 X 0
SUBSCRIBE

J	K	Q_n	Q_{n+1}	S	R
0	0	0	0	0	X
0	0	1	1	X	0
0	1	0	0	0	X
0	1	1	0	0	1
1	0	0	1	1	0
1	0	1	1	X	0
1	1	0	1	1	0
1	1	1	0	0	1



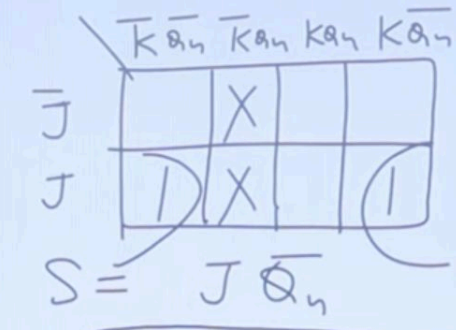
Excitation

Q_n	Q_{n+1}	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0



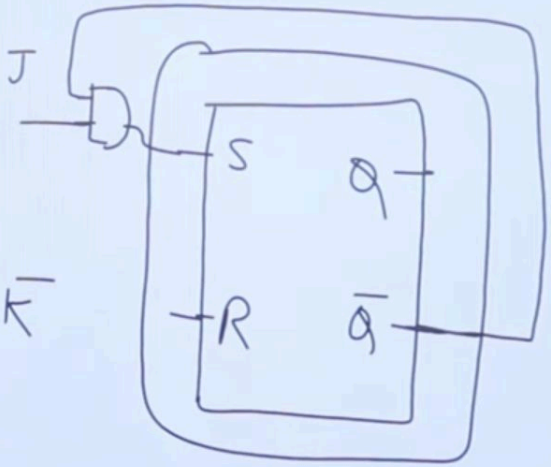
SUBSCRIBE

J	K	Q_n	Q_{n+1}	S	R
0	0	0	0	0	X
0	0	1	1	X	0
0	1	0	0	0	X
0	1	1	0	0	1
1	0	0	1	1	0
1	0	1	1	X	0
1	1	0	1	1	0
1	1	1	0	0	1



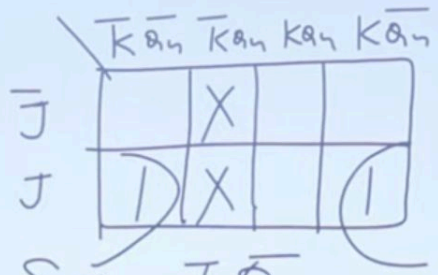
Excitation

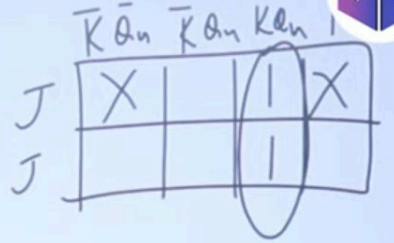
Q_n	Q_{n+1}	S	R
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0



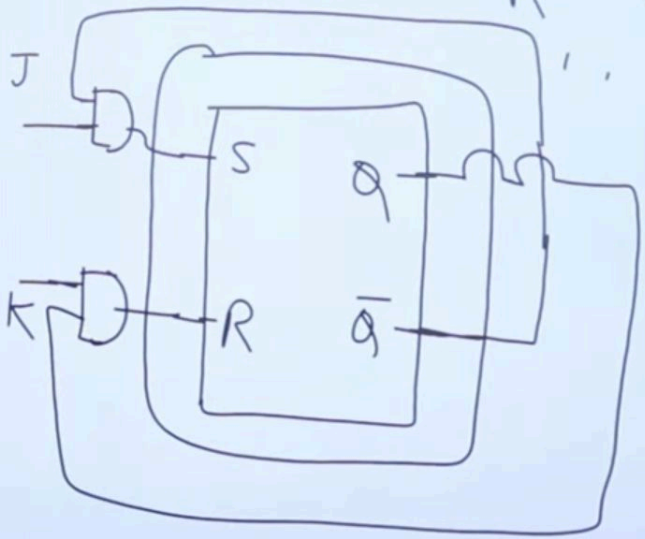
SUBSCRIBE

J	K	Q_n	Q_{n+1}	S	R
0	0	0	0	0	X
0	0	1	1	X	0
0	1	0	0	0	X
0	1	1	0	0	1
1	0	0	1	1	0
1	0	1	1	X	0
1	1	0	1	1	0
1	1	1	0	0	1

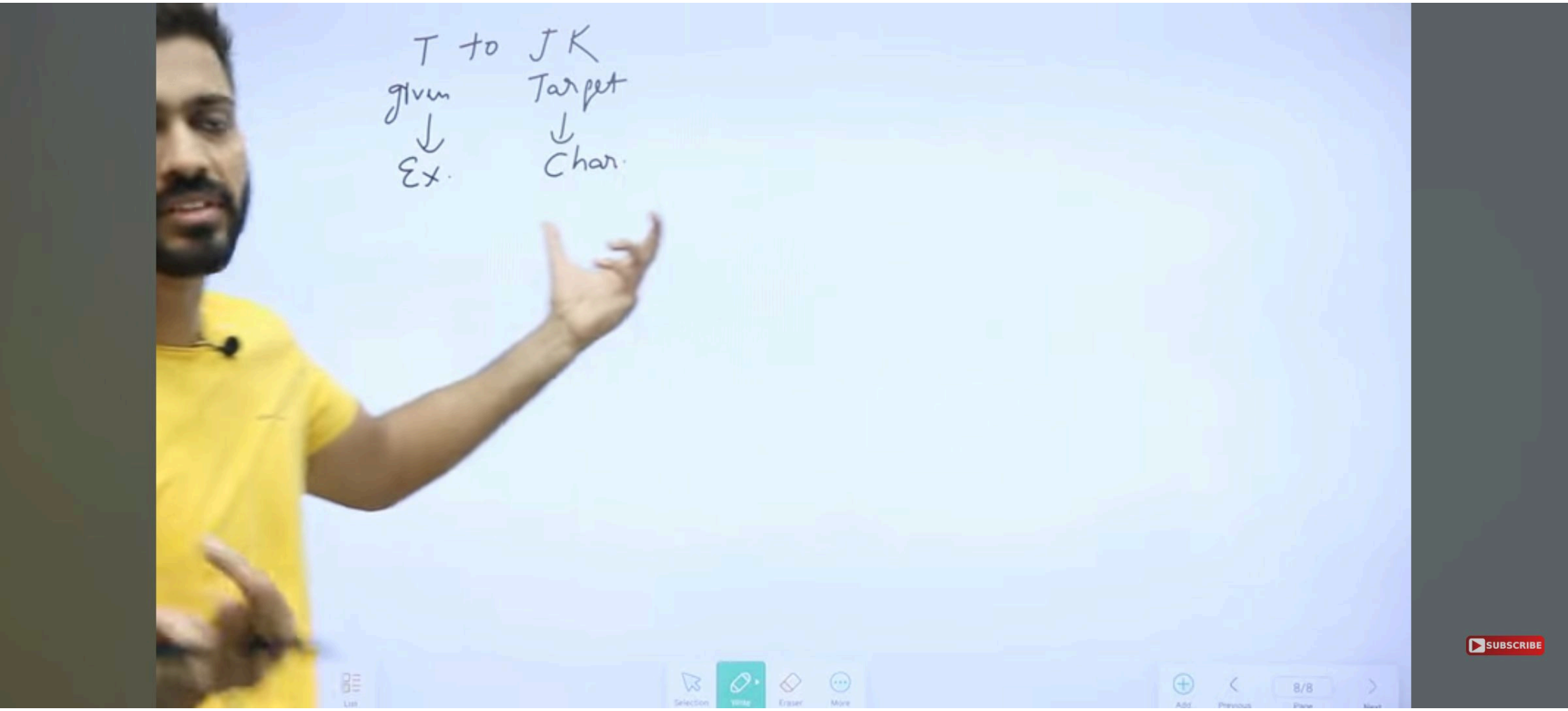




$R = K \cdot Q_n$



T flipflop to JK


T to JK
given
Ex.
Target
Char.
SUBSCRIBE

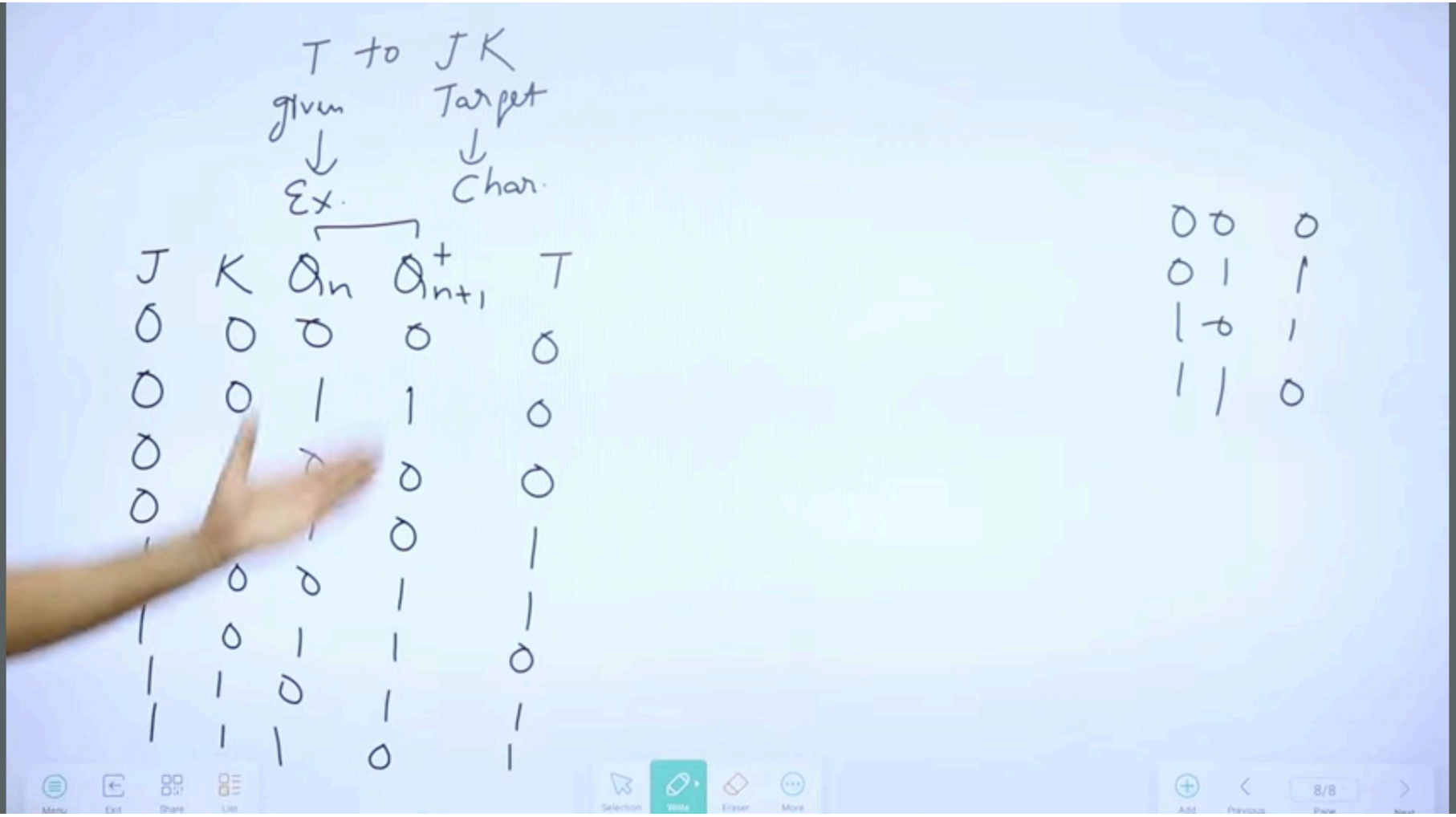
T to JK

given → Ex.

Target → Char.

J	K	Q_n	Q_{n+1}^+
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

SUBSCRIBE

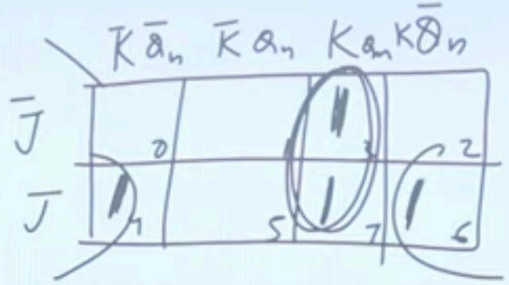

T to JK
given
Target
Ex.
Char.
J K Q_n Q_{n+1} T
SUBSCRIBE

T to JK

given → Ex.

Target → Char.

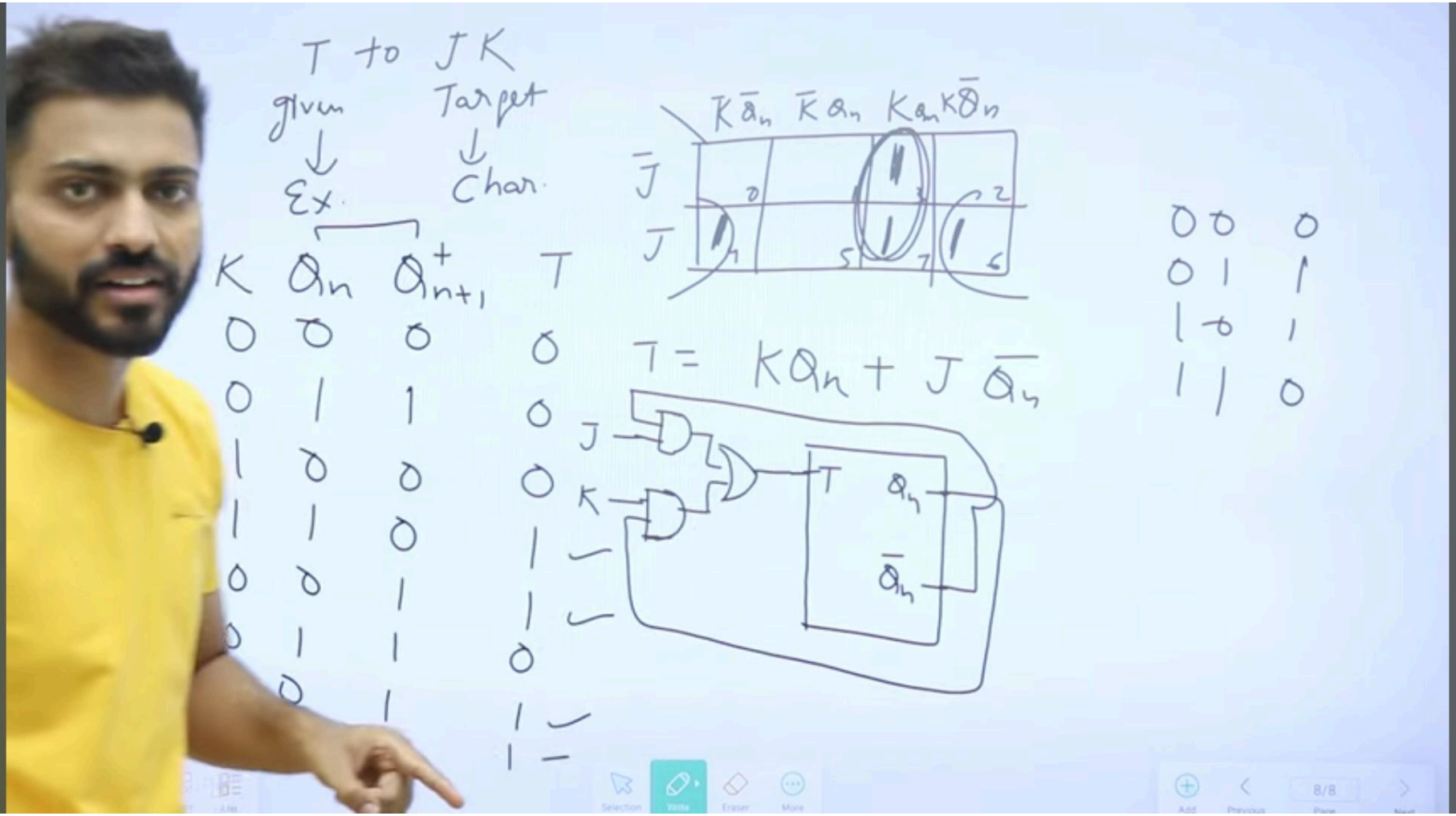
	J	K	Q_n	Q_{n+1}	T
0	0	0	0	0	0
1	0	0	1	1	0
2	0	1	0	0	0
3	0	1	1	0	1
4	1	0	0	1	1
5	1	0	1	1	0
6	1	1	0	1	1
7	1	1	1	0	1



$$T = KQ_n + J\overline{Q_n}$$

0	0	0
0	1	1
1	0	1
1	1	0

SUBSCRIBE


T to JK
given
Target
Ex.
Char.
K
Q_n
Q_{n+1}
T
$\bar{K}\bar{Q}_n$ $\bar{K}Q_n$ KQ_n $K\bar{Q}_n$
$\bar{J}$
J
$T = KQ_n + J\bar{Q}_n$
J
K
T
Q_n
$\bar{Q}_n$
0 0 0
0 1 1
1 0 1
1 1 0
SUBSCRIBE