

# ECE213: Digital Electronics



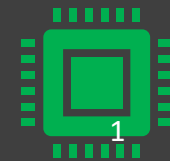
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# Introduction to Sequential Logic Circuits

## Master Slave JK Flip flop.

✓ +ve level clock for Master

✓ -ve level clock for Slave.

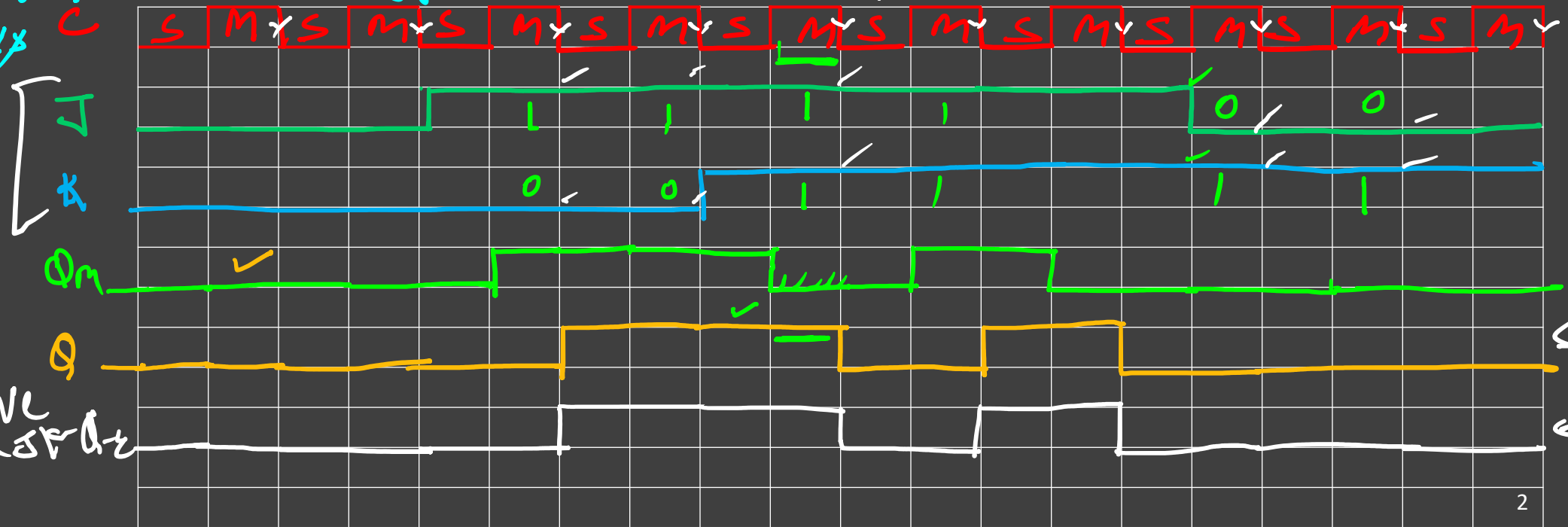
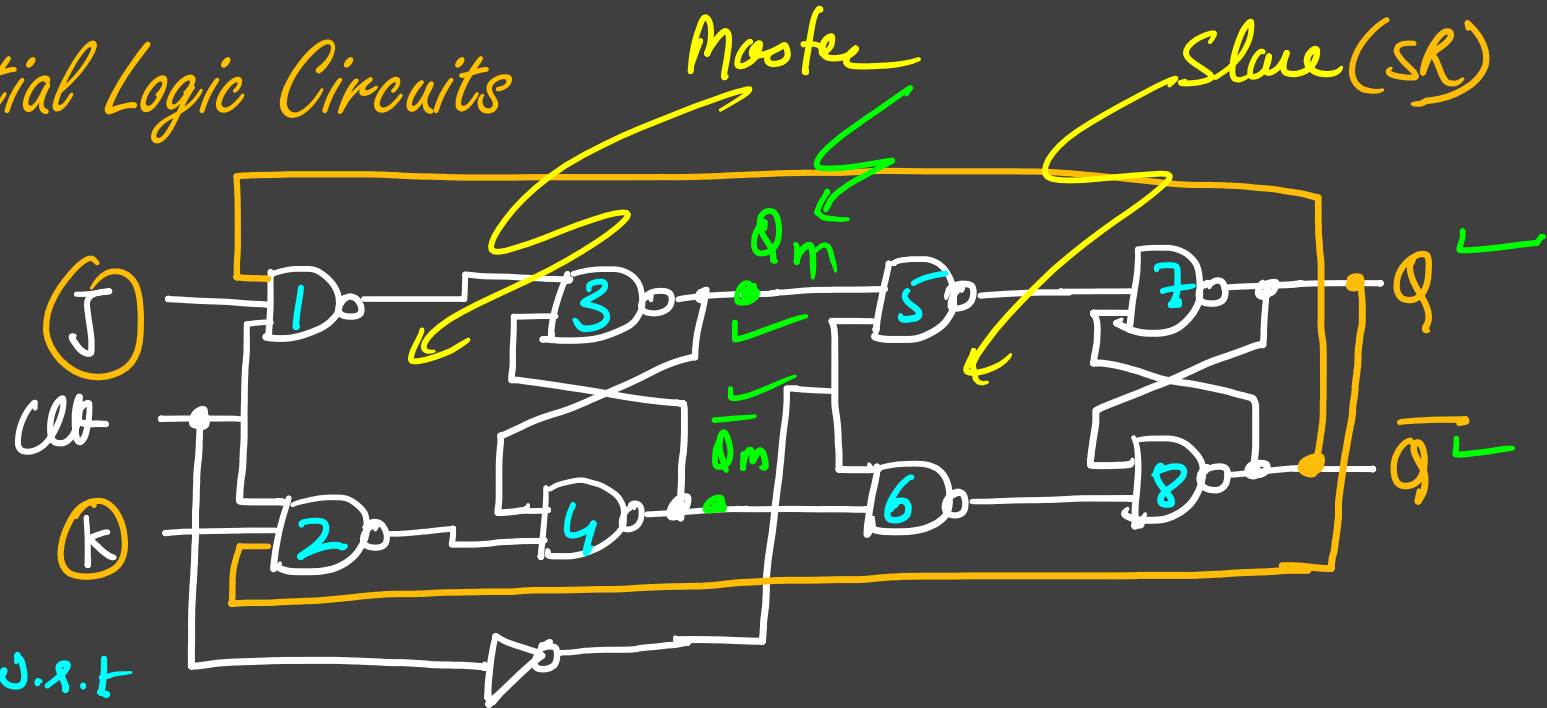
Note: i/p for Master is JK ←

o/p for slave is  $Q_m, \bar{Q}_m$

Note: The Master FP will toggle w.r.t the slave's o/p.

$Q_m$   $\bar{Q}_m$   
S R  
0 1  
1 0

-ve edge of clock



# Introduction to Sequential Logic Circuits

Flip Flop Conversions :

- JK
- SR
- D
- T

To make your own flip flop-

A	S	Q	$\bar{Q}$
0	0	0	1
0	1	1	0
1	0	$\bar{Q}$	Q
1	1	Q	$\bar{Q}$

Reset  
Set  
Toggle  
No change

To convert

JK	to	SR
JK	to	D
JK	to	T
SR	to	JK
SR	to	D
SR	to	T
D	to	JK
D	to	SR
D	to	T
T	to	JK
T	to	SR
T	to	D

# Introduction to Sequential Logic Circuits

## Flip Flop Conversions

# Steps to convert the flip flop.

Step 1: Find/Identify the available and require flip flop.

Step 2: Make the excitation table of available flip flop.

Step 3: Make the char. table of require flip flop.

Step 4: Map the excitation table over the char. table.

Step 5: Solve for the Boolean  $Q$ .

Step 6: Implement the require flip flop using  $Q$ .

# Introduction to Sequential Logic Circuits

## Flip Flop Conversions

Ex Convert the JK to D flip flop.

Step 1 av. JK key: D

Step 2 Excitation table of av. (JK)

$Q_n$	$Q_{n+1}$	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

Step 3 Char. table of key (D)

D	$Q_n$	$Q_{n+1}$	J	K
0	0	0	0	X
0	1	0	X	1
1	0	1	1	X
1	1	1	X	0

Step 4 Mapping

Step 5: Solve for each, for J

$Q_n$	0	1
D	0	X
1	1	X

$$J = D$$

for K

$Q_n$	0	1
D	X	1
1	X	0

$$K = \bar{D}$$

