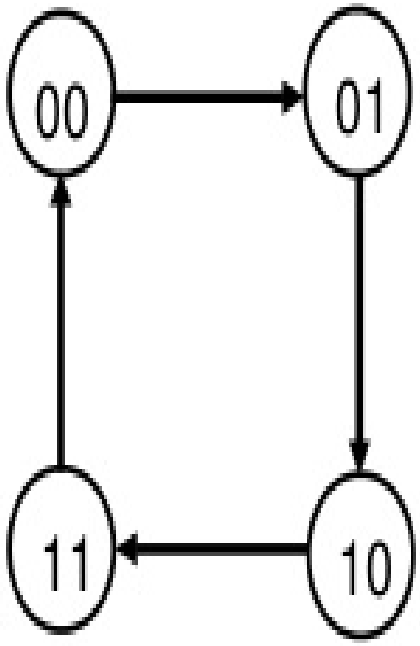
SNS COLLEGE OF ENGINEERING

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DIGITAL CIRCUITS

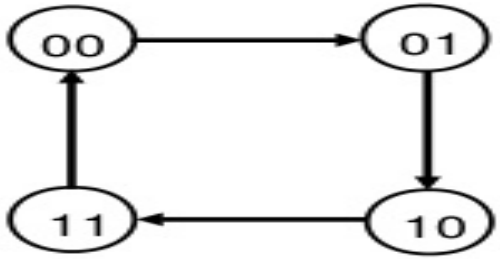
Guess Today's Topic????



What is Counter?

- Counters are a specific type of sequential circuits
- The output value increases by one on each clock cycle
- After the largest value ,the output “wraps around ” back to zero

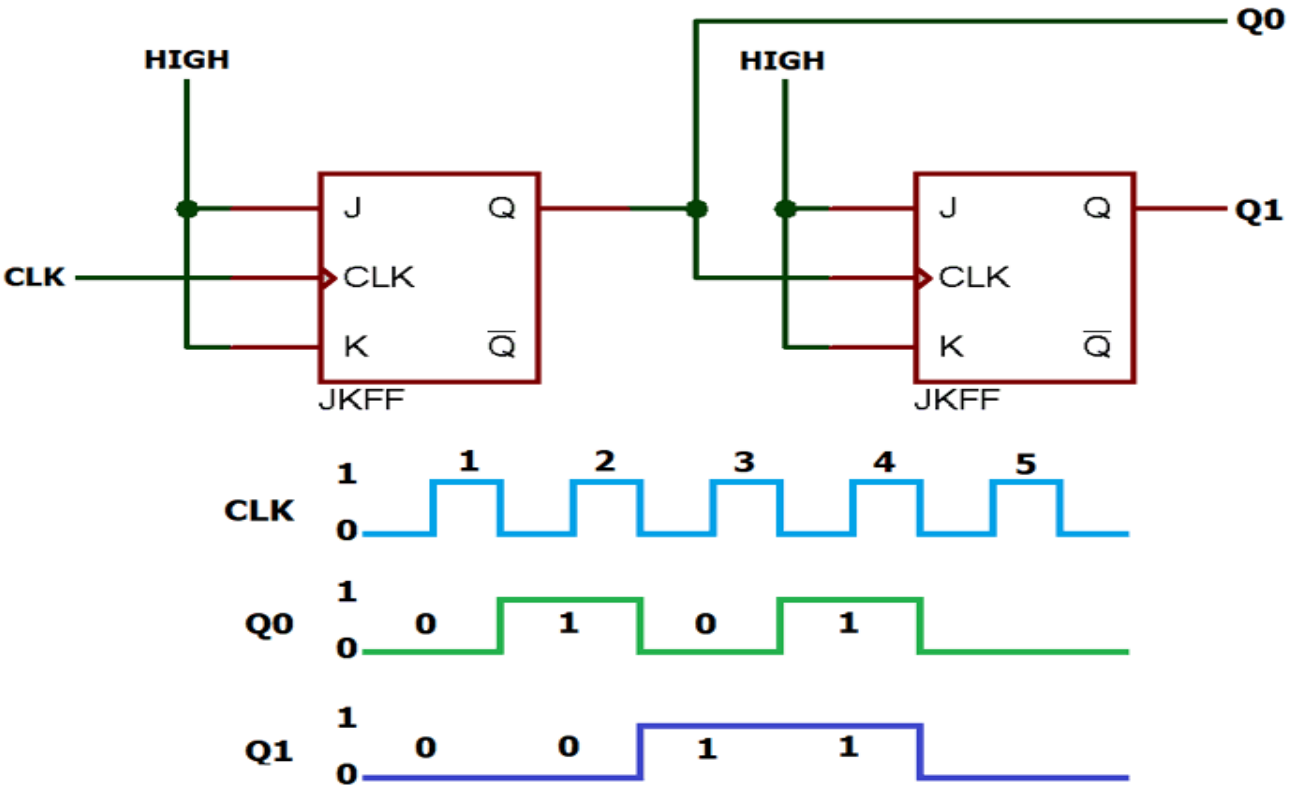
Present State		Next State	
A	B	A	B
0	0	0	1
0	1	1	0
1	0	1	1
1	1	0	0



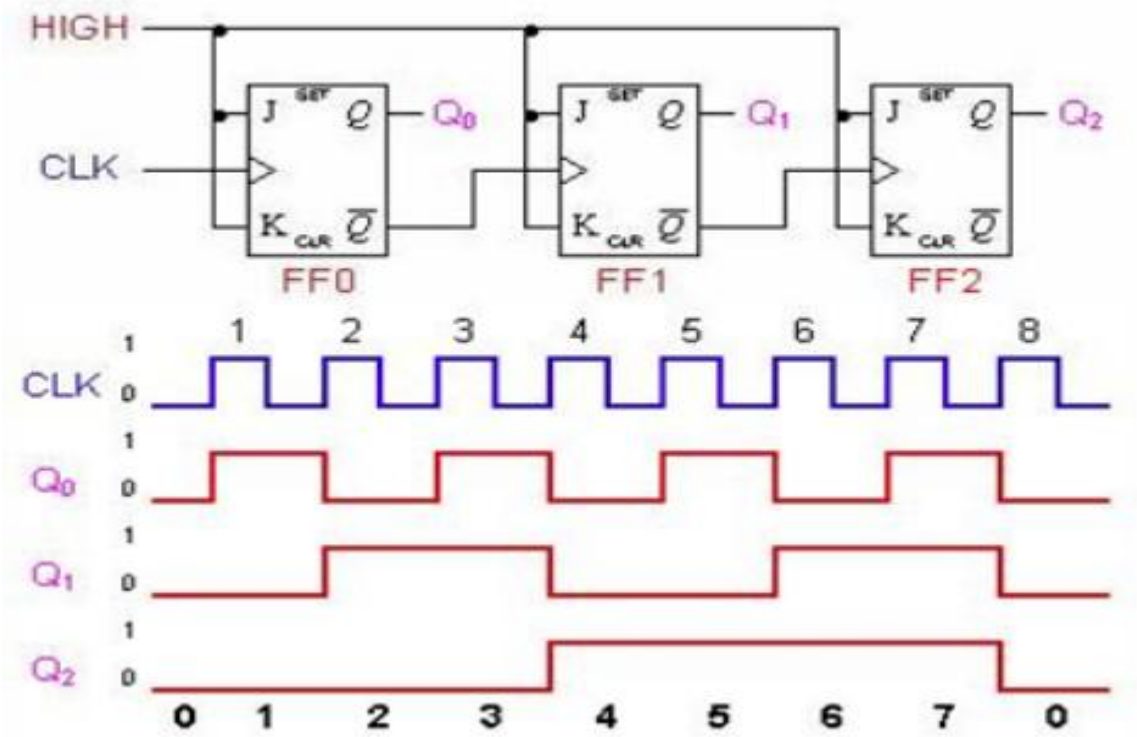
Types of Counters

- **synchronous counter**, the clock input across all the flip-flops use the same source and create the same clock signal at the same time
- **Asynchronous Counters** are those whose output is free from the clock signal
- **In a synchronous counter**, all the flip-flops are triggered by the same clock signal whereas **in an asynchronous counter**, flip-flops are triggered with **different** clock signals

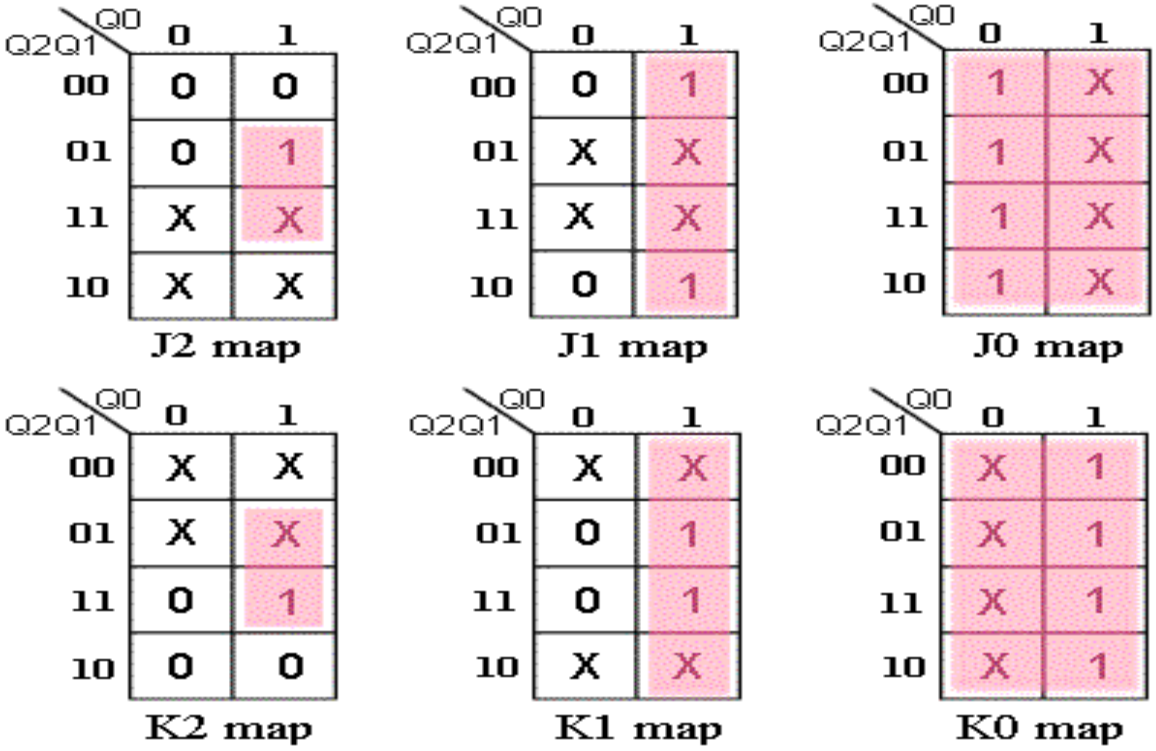
Two Bit Asynchronous Counter



Three Bit Asynchronous UpCounter



K-map Steps



Q2Q1 \ Q0	0	1
00	0	0
01	0	1
11	X	X
10	X	X

J2 map

Q2Q1 \ Q0	0	1
00	0	1
01	X	X
11	X	X
10	0	1

J1 map

Q2Q1 \ Q0	0	1
00	1	X
01	1	X
11	1	X
10	1	X

J0 map

Q2Q1 \ Q0	0	1
00	X	X
01	X	X
11	0	1
10	0	0

K2 map

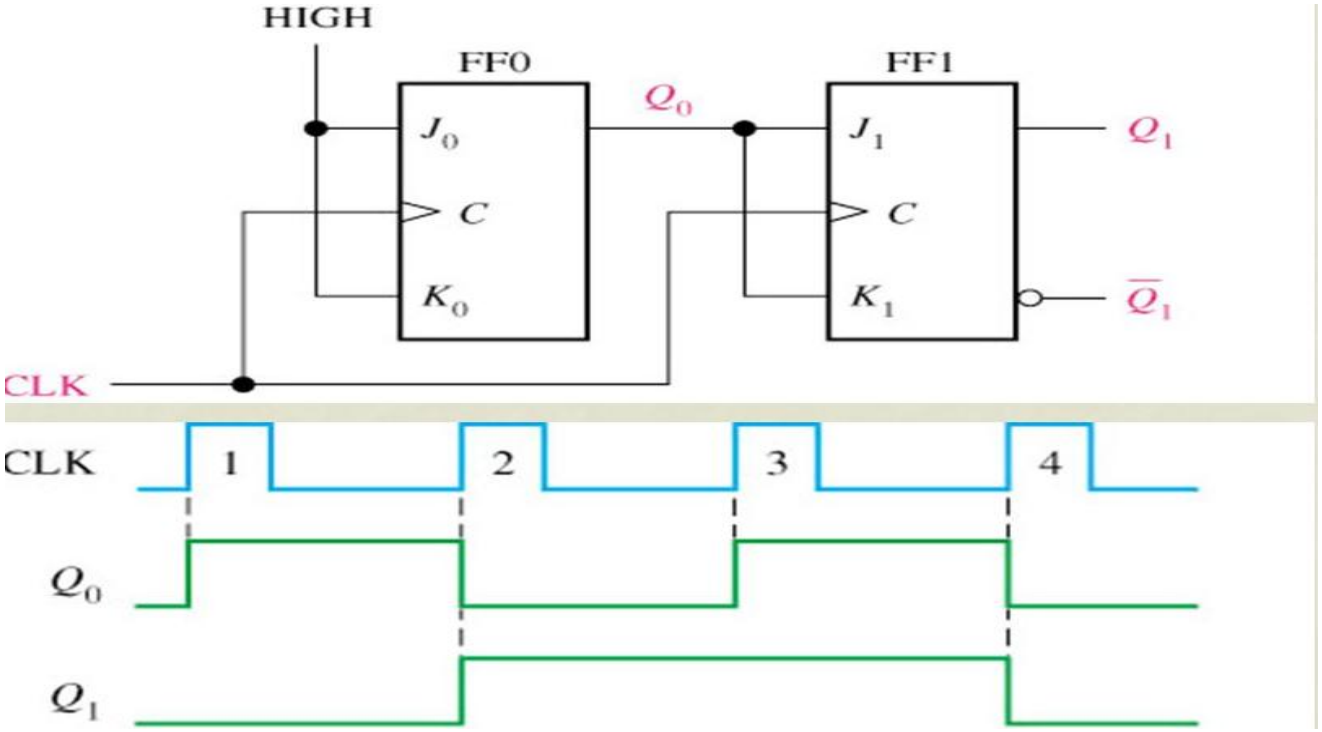
Q2Q1 \ Q0	0	1
00	X	X
01	0	1
11	0	1
10	X	X

K1 map

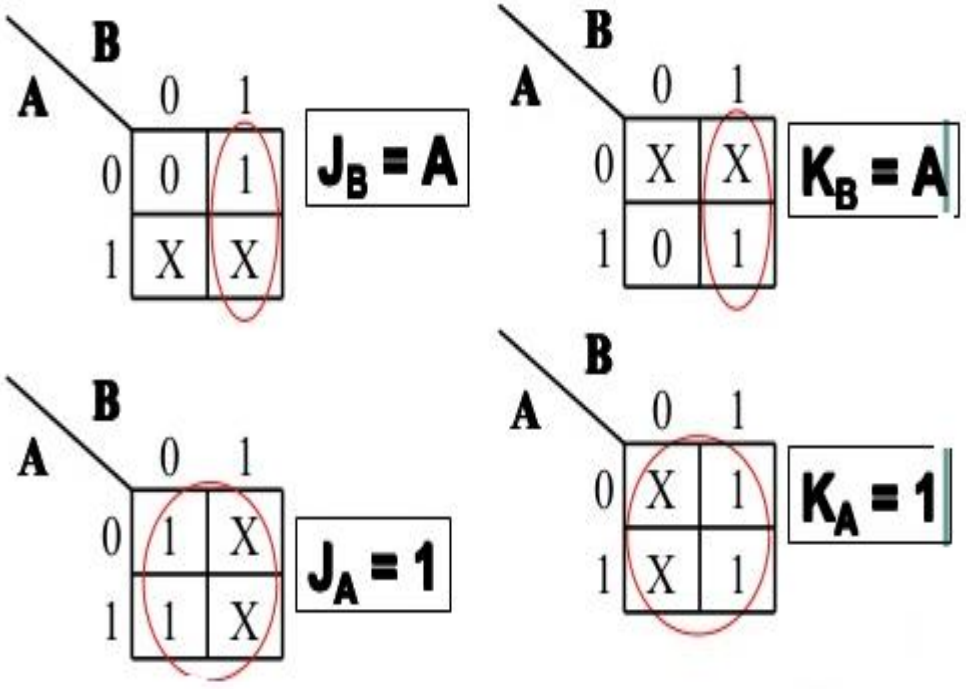
Q2Q1 \ Q0	0	1
00	X	1
01	X	1
11	X	1
10	X	1

K0 map

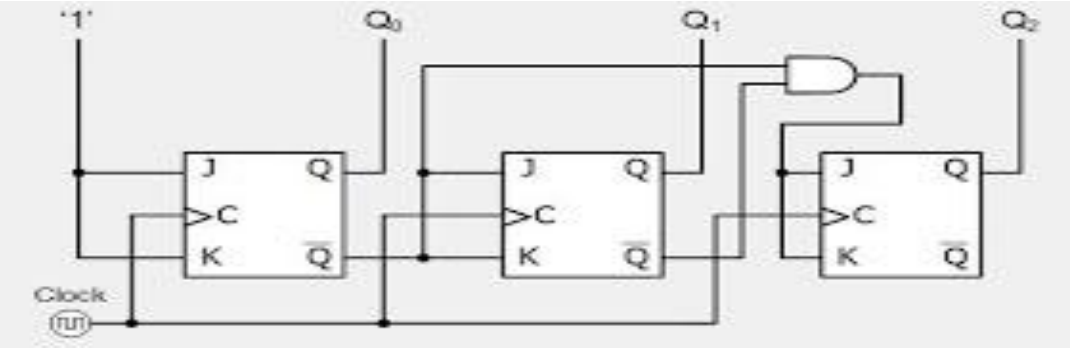
Two bit Synchronous Counter



K-map Steps


B
A
0 1
0 0 1
1 X X
$J_B = A$
B
A
0 1
0 X X
1 0 1
$K_B = A$
B
A
0 1
0 1 X
1 1 X
$J_A = 1$
B
A
0 1
0 X 1
1 X 1
$K_A = 1$

3-Bit Synchronous Counter

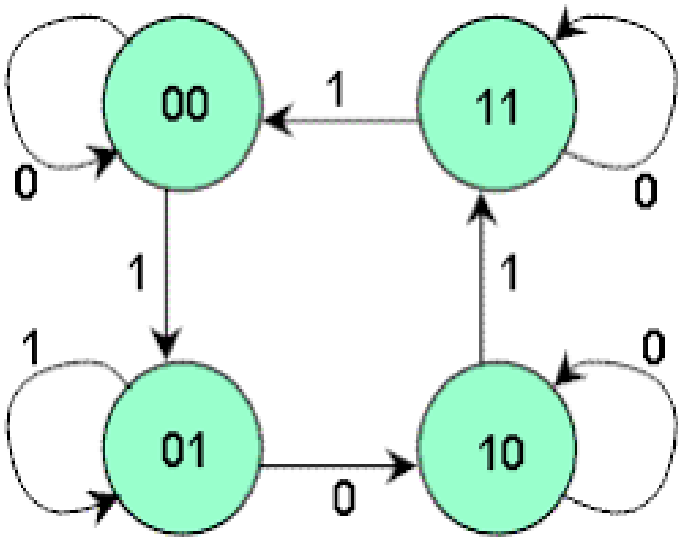


Present State	Next State
111	110
110	101
101	100
100	011
011	010
010	001
001	000
000	111

K-map Steps

Present State	Next State	J_2K_2	J_1K_1	J_0K_0
000	111	1 d	1 d	1 d
001	000	0 d	0 d	d 1
010	001	0 d	d 1	1 d
011	010	0 d	d 0	d 1
100	011	d 1	1 d	1 d
101	100	d 0	0 d	d 1
110	101	d 0	d 1	1 d
111	110	d 0	d 0	d 1

Find the Present & Next State



Thank
you