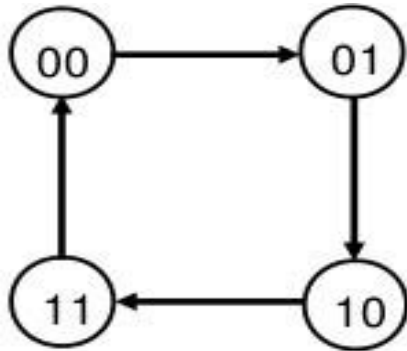




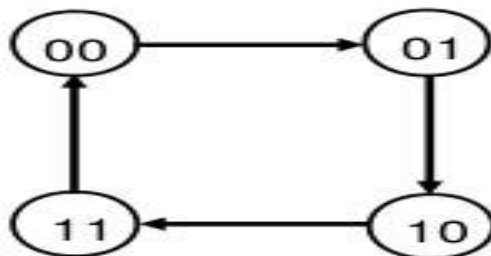
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What is Counter?

- 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





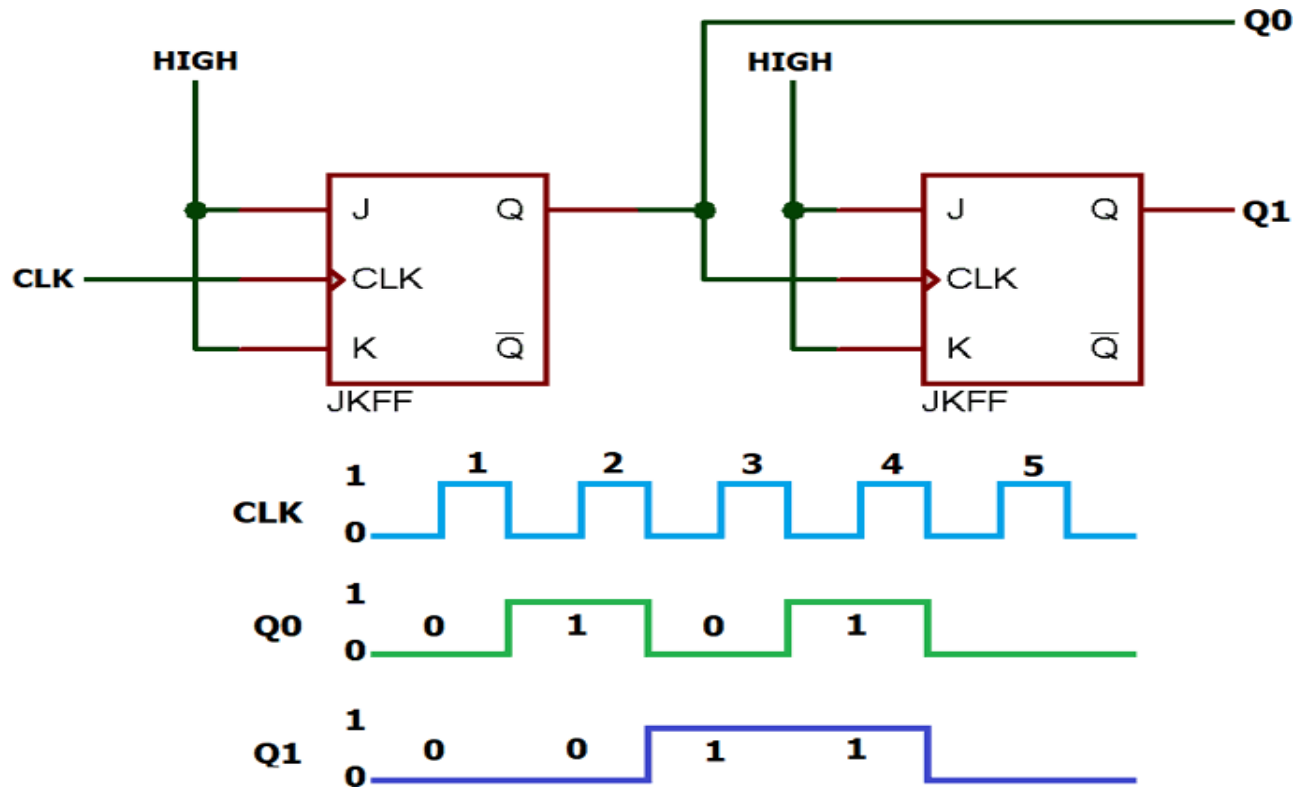
Types of Counters



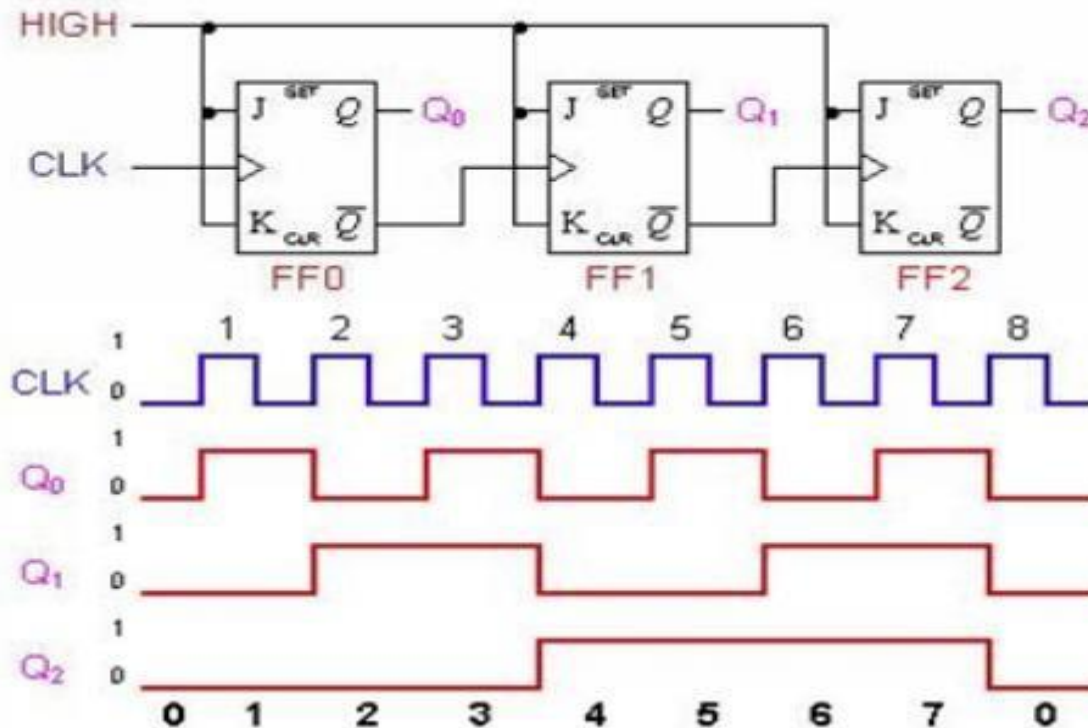
- **synchronous counter**, the clock input across all the flip-flops use the same source and create the same clock signal at the same time.
- **Asynchronous Counters** are those whose output is free from the clock signal.
- **In a synchronous counter**, all the flip-flops are triggered by the same clock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



Two Bit Asynchronous Counter



Three Bit Asynchronous Up Counter



K-map Steps

	Q ₀	0	1
Q ₂ Q ₁	00	0	0
	01	0	1
	11	X	X
	10	X	X

J2 map

	Q ₀	0	1
Q ₂ Q ₁	00	0	1
	01	X	X
	11	X	X
	10	0	1

J1 map

	Q ₀	0	1
Q ₂ Q ₁	00	1	X
	01	1	X
	11	1	X
	10	1	X

J0 map

	Q ₀	0	1
Q ₂ Q ₁	00	X	X
	01	X	X
	11	0	1
	10	0	0

K2 map

	Q ₀	0	1
Q ₂ Q ₁	00	X	X
	01	0	1
	11	0	1
	10	X	X

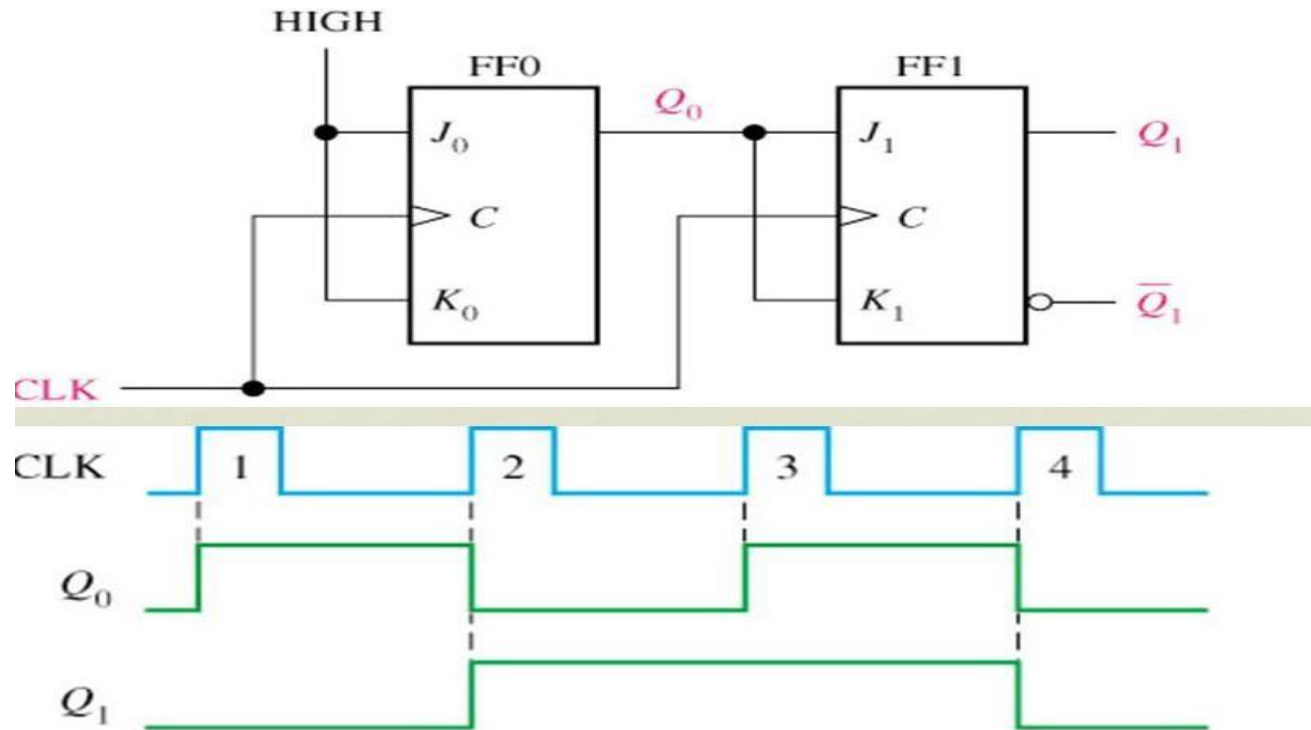
K1 map

	Q ₀	0	1
Q ₂ Q ₁	00	X	1
	01	X	1
	11	X	1
	10	X	1

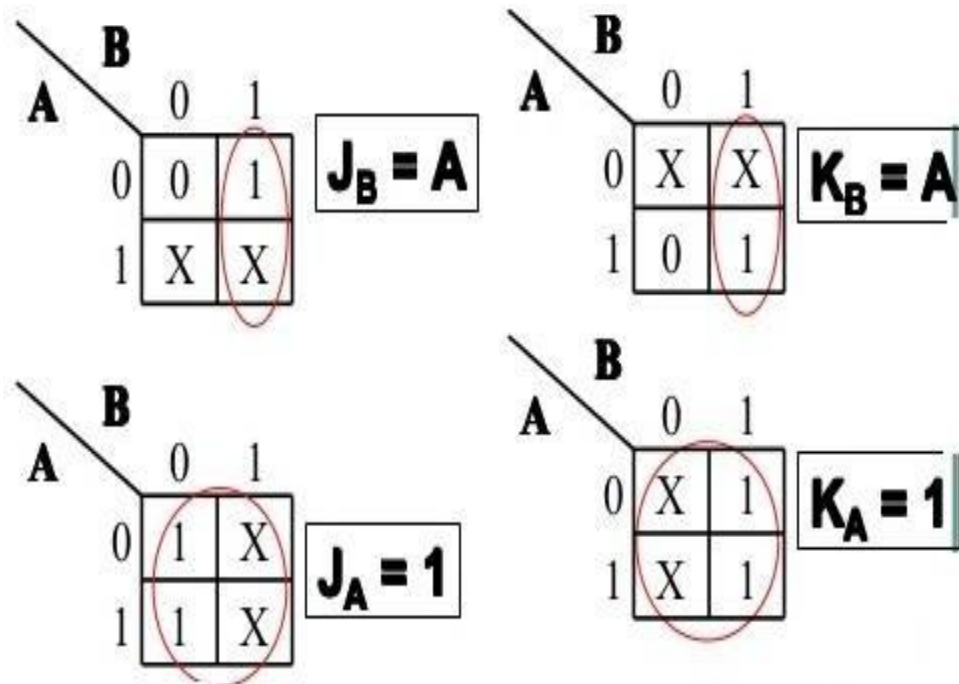
K0 map



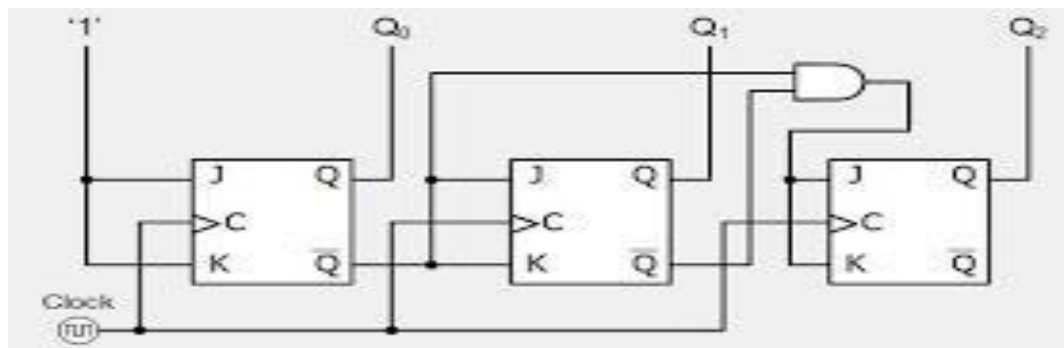
Two bit Synchronous Counter



K-map Steps



3-Bit Synchronous Counter



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





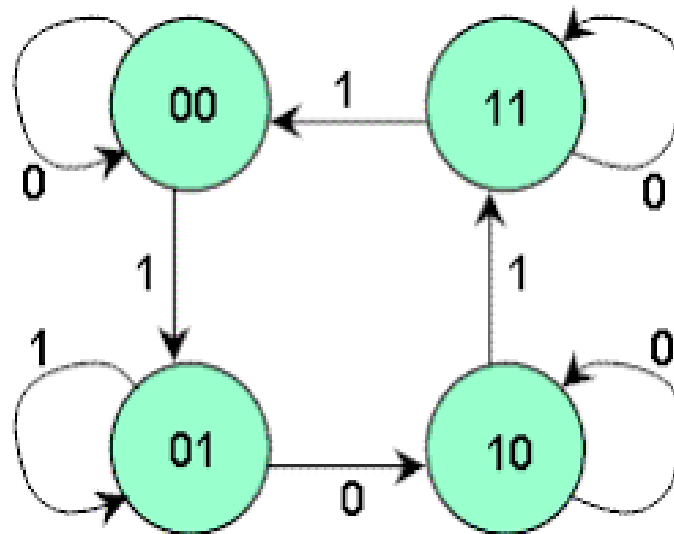
K-map Steps

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



Assessment

Find the Present & Next State





Thank
you



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