Digital System Design
Module 5 - COUNTERS AND SHIFT REGISTERS

Dr. Deepthi Sasidharan

Assistant Professor, Department of Information Technology
GEC Barton Hill, Thiruvananthapuram

November 19, 2020

RIPPLE COUNTERS

A register that goes through a prescribed sequence of states upon the application of input pulses is called a *counter* .

A counter that follows the binary number sequence is called a *binary counter*.

Counters are available in two categories: ripple counters and synchronous counters.

- ▶ In a ripple counter, a flip-flop output transition serves as a source for triggering other flip-flops.
- ▶ In a synchronous counter, the Clock inputs of all flip-flops receive the common clock.
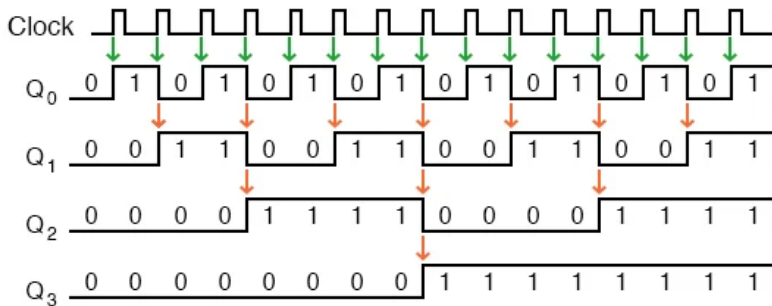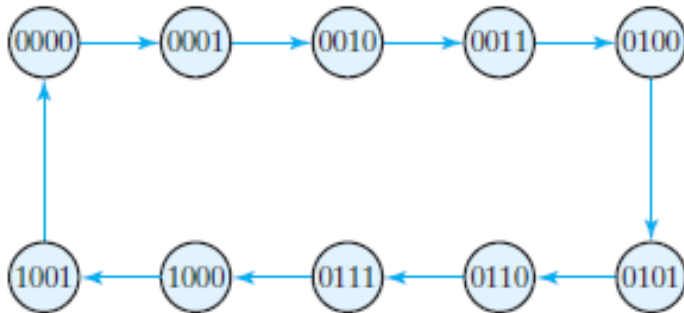
Binary Ripple Counter
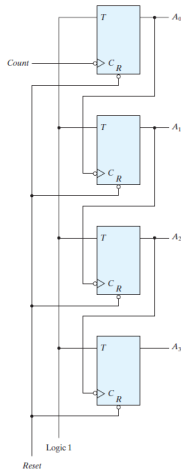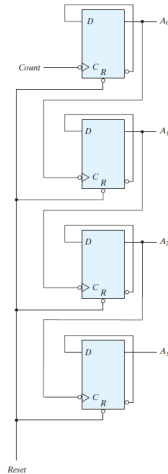
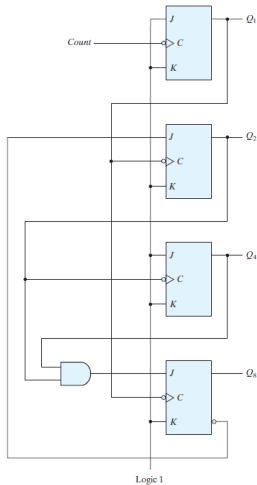(a) With T flip-flops   (b) With D flip-flops

Timing Diagram

BCD Ripple Counter

BCD Ripple Counter

Clock Count	Output bit Pattern				Decimal Value
	QD	QC	QB	QA	
1	0	0	0	0	0
2	0	0	0	1	1
3	0	0	1	0	2
4	0	0	1	1	3
5	0	1	0	0	4
6	0	1	0	1	5
7	0	1	1	0	6
8	0	1	1	1	7
9	1	0	0	0	8
10	1	0	0	1	9
11	Counter Resets its Outputs back to Zero				

BCD Ripple Counter

BCD Ripple Counter
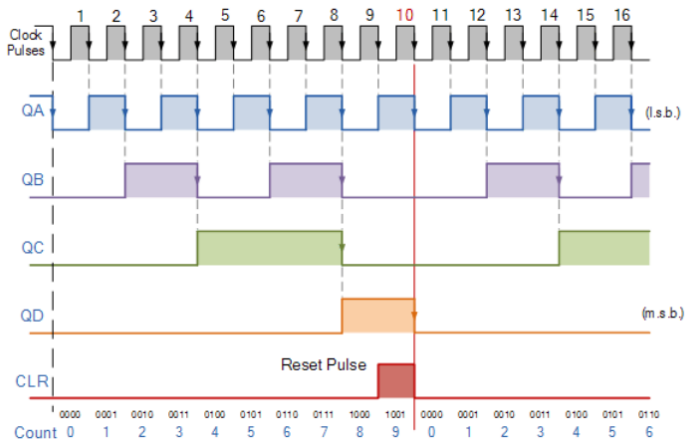
A three-decade decimal BCD counter