KTU NOTES

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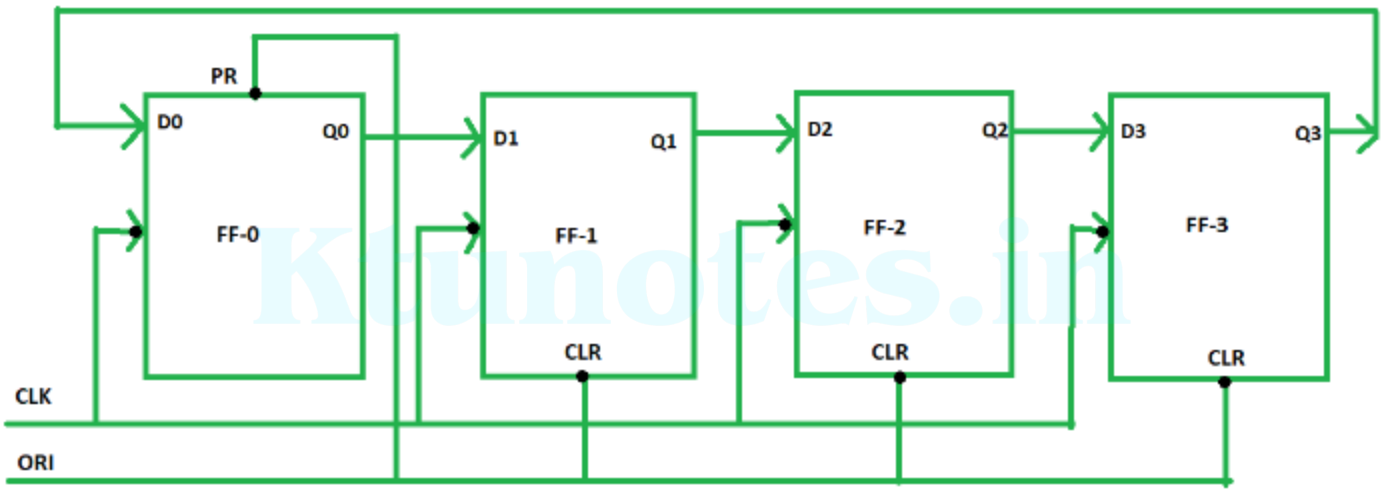
MODULE 5

Ring Counter

- Ring counter is a typical application of Shift register
- Output of last flip-flop is connected to input of first flip-flop in case of ring counter but in case of shift resister it is taken as output
- Except this all other things are same
- No. of states in Ring counter = No. of flip-flop used

Ring Counter



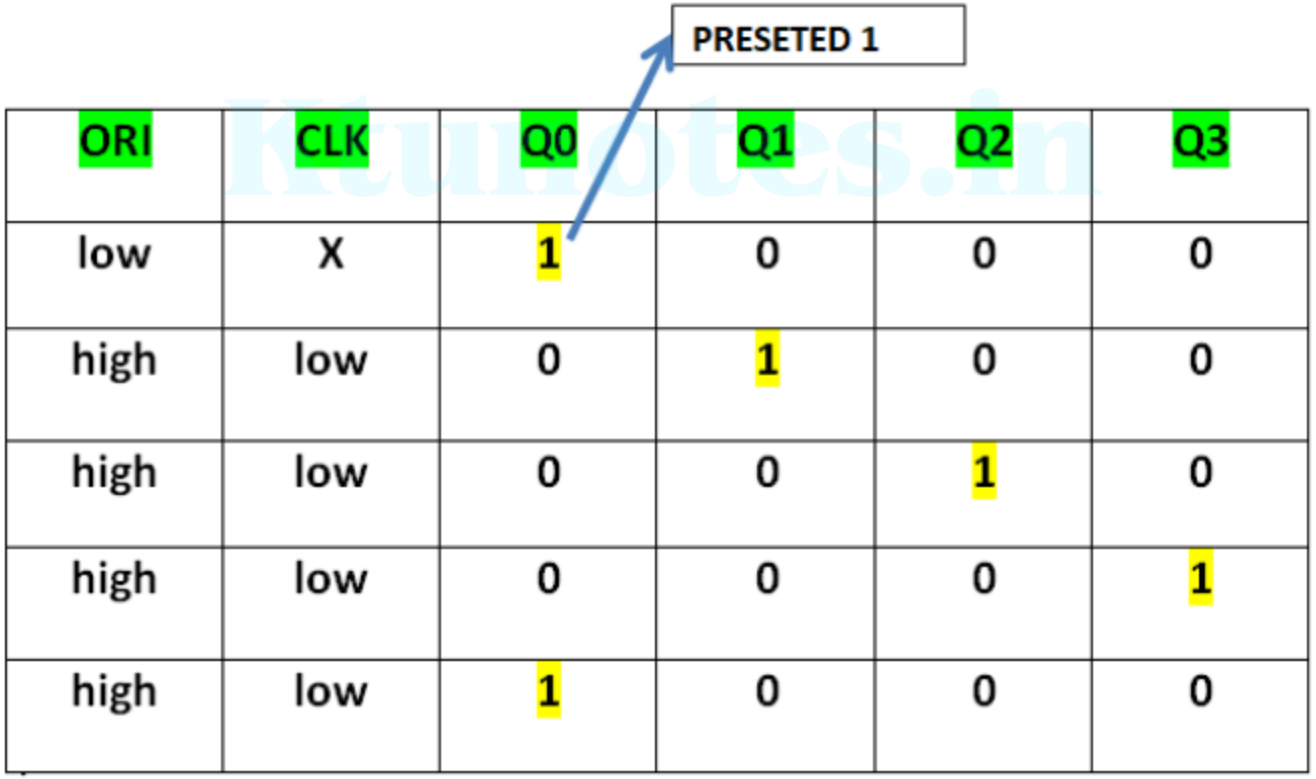
Ring Counter

Ring Counter

- In this diagram, clock pulse (CLK) is applied to all flip-flop simultaneously
- Therefore, it is a Synchronous Counter
- Also, here we use Overriding input (ORI) to each flip-flop
- Preset (PR) and Clear (CLR) are used as ORI
- When PR is 0, then output is 1 and when CLR is 0, then output is 0
- Both PR and CLR are active low signal that is always works in value 0

Ring Counter

- PR = 0, Q = 1
- CLR = 0, Q = 0



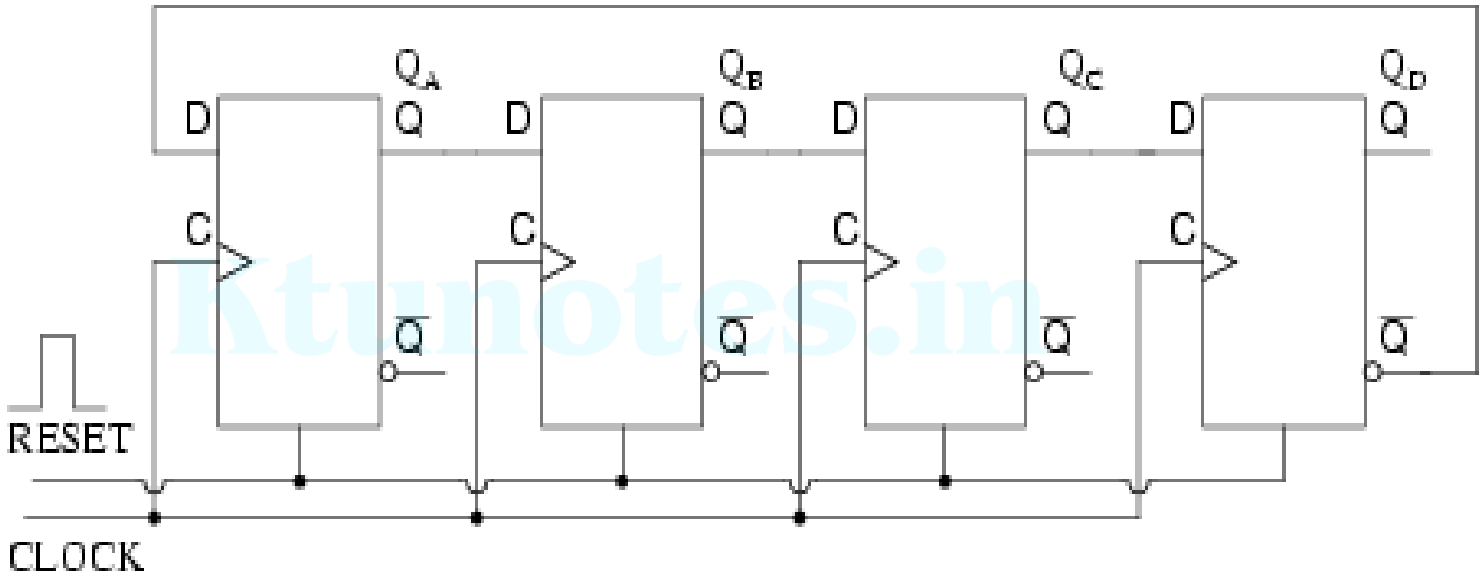
ORI	CLK	Q0	Q1	Q2	Q3
low	X	1	0	0	0
high	low	0	1	0	0
high	low	0	0	1	0
high	low	0	0	0	1
high	low	1	0	0	0

Johnson Counter

- A Johnson counter is a modified ring counter, where inverted output from last flip flop is connected to input to first
- Number of used states Johnson counter is 2n if n flip-flops are used
- Main advantage of Johnson counter counter is that it only needs half number of flip-flops compared to standard ring counter for same number of states

Johnson Counter

Q_A	Q_B	Q_C	Q_D
0	0	0	0
1	0	0	0
1	1	0	0
1	1	1	0
1	1	1	1
0	1	1	1
0	0	1	1
0	0	0	1
repeat			



Johnson counter (note the $\overline{Q}_D$ to D_A feedback connection)