8-bit Johnson Counter

Johnson Counter:

In digital electronics, Johnson counters are used to store or process or count the number of events occurred within the circuit. Johnson counter also known as creeping counter, is an example of synchronous counter. It is one of the digital sequential logic circuits that count several pulses. It is designed with a group of D flip-flops, where the inverted output from the last flip-flop is connected to the input of the first flip-flop.

Working of 8-bit Johnson Counter:

The Johnson counter circuit diagram is the cascaded arrangement of 8 flip-flops. In such design, the output of the proceeding flip-flop is fed back as input to the next flip-flop. For example, the inverted output of the last flip-flop is fed back to the first flip-flop in the sequence bit pattern. The counter registers cycles in a closed-loop i.e circulates within the circuit.

In the 8-bit Johnson counter, it contains 8 D flip-flops, which is called 8-bit Johnson counter. It has preset and clear pins to initialize or start and reset the counted. Reset pin acts as an on/off switch. So, the flip-flops can be enabled by clicking the Reset switch. CLK pin is used to observe the changes in the output of the flip-flops.

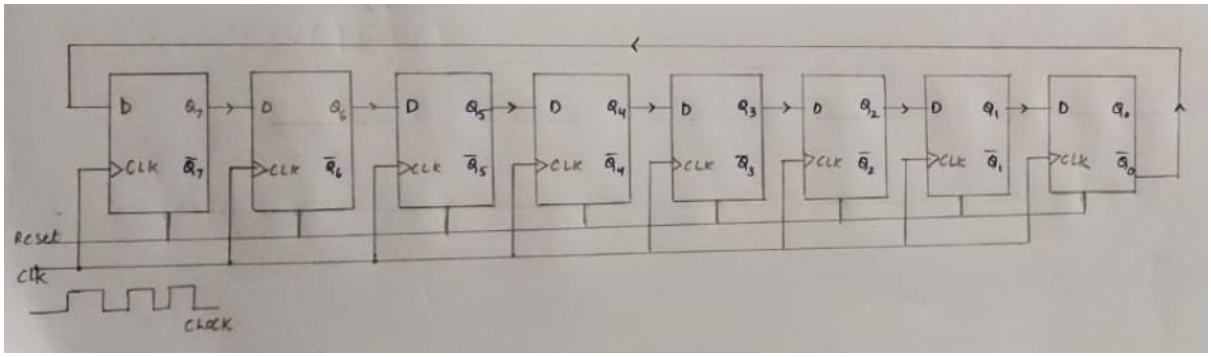
Advantages of Johnson counter:

- The Johnson counter has same number of flip flop but it can count twice the number of states the ring counter can count.
- It can be implemented using D and JK flip flop.
- Johnson ring counter is used to count the data in a continuous loop.
- Johnson counter is a self-decoding circuit.

Truth Table:

State	Q_0	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7
0	0	0	0	0	0	0	0	0
1	1	0	0	0	0	0	0	0
2	1	1	0	0	0	0	0	0
3	1	1	1	0	0	0	0	0
4	1	1	1	1	0	0	0	0
5	1	1	1	1	1	0	0	0
6	1	1	1	1	1	1	0	0
7	1	1	1	1	1	1	1	0
8	1	1	1	1	1	1	1	1
9	0	1	1	1	1	1	1	1
10	0	0	1	1	1	1	1	1
11	0	0	0	1	1	1	1	1
12	0	0	0	0	1	1	1	1
13	0	0	0	0	0	1	1	1
14	0	0	0	0	0	0	1	1
15	0	0	0	0	0	0	0	1
16	0	0	0	0	0	0	0	0

Circuit Diagram:



The clock signal (CLK) is used to know the changes in the output. It contains 8 flip-flops, Q_0, Q_1, Q_2, Q_3, Q_4, Q_5, Q_6 and Q_7 are the outputs of the flip-flops. The counter counts the state of cycles in a continuous closed loop.