Shift Register Counters:-

A shift register Counters is basically a shift register with serial o/p is connected to the serial i/p to produce special sequence. Two of the most Common types of shift register Counters are:-

1- Ring Counter.

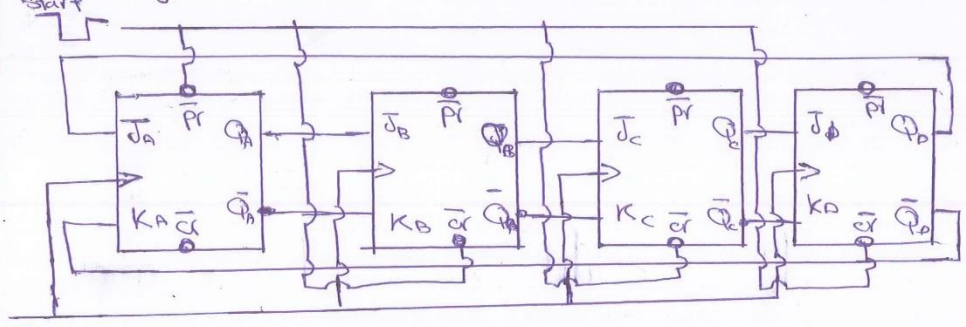
2- Johnson Counter.

1- Ring Counter:-

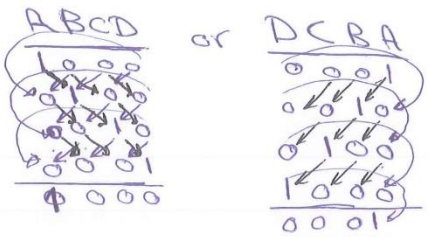
This type of counter has the characteristic that in most instances only a single 1 is in the register and it is made to circulates around the register as long as clock pulses are applied.

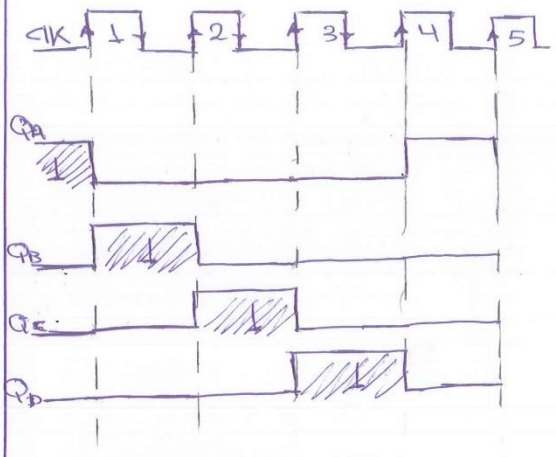
Note:- the max. length of the code patterens generated by this type of Counter is N, where N is the number of flip-flop in the ring counter. And the no. of state = no. of flip flop.

This typ of Counter is constructed as shown below:-



4-bit Ring Counter





Start	CLK	Q_A	Q_B	Q_C	Q_D
0	X	1	0	0	0
1	1	0	1	0	0
1	1	0	0	1	0
1	1	0	0	0	1
1	1	1	0	0	0

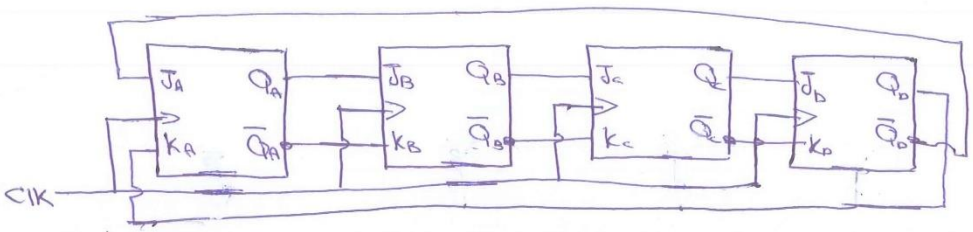
2- Johnson Counter:-

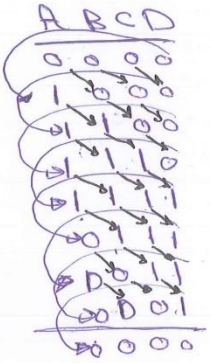
This type of Counter Sometimes known as a Shift Counter or Twisted Counter, by feeding back the Complement of the output this possible with a register with N stages, to generate patterns of 2N,

Note:- The max length of the code sequence patterns generated by this type of Counter is 2×N, wher N is the number of Flip-flop in the Jhonson Counter.

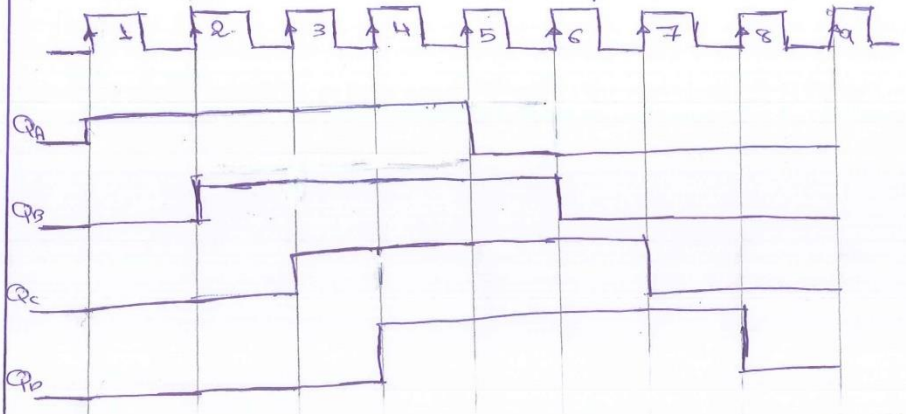
No. of states = 2 × No. of Flip-flips.

The general arrangment is shown below, show the logic circuit diagram of 4-bit Johnson Counter.





Start	CLK	Q_A	Q_B	Q_C	Q_D
0	X	0	0	0	0
1	↑	1	0	0	0
1	↑	1	1	0	0
1	↑	1	1	1	0
1	↑	1	1	1	1
1	↑	0	1	1	1
1	↑	0	0	1	1
1	↑	0	0	0	1
1	↑	0	0	0	0



H.w:- If a six bit Ring Counter have the initial state of (101000) determine waveform of each of Qoutput.
Q_C Q_A