

COUNTERS

Aim:- Realization of 3-bit counters as a sequential circuit and Mod-N counter design (7476, 7490, 74192, 74193).

Apparatus Required: -

IC 7408, IC 7476, IC 7490, IC 74192, IC 74193, IC 7400, IC 7416, IC 7432

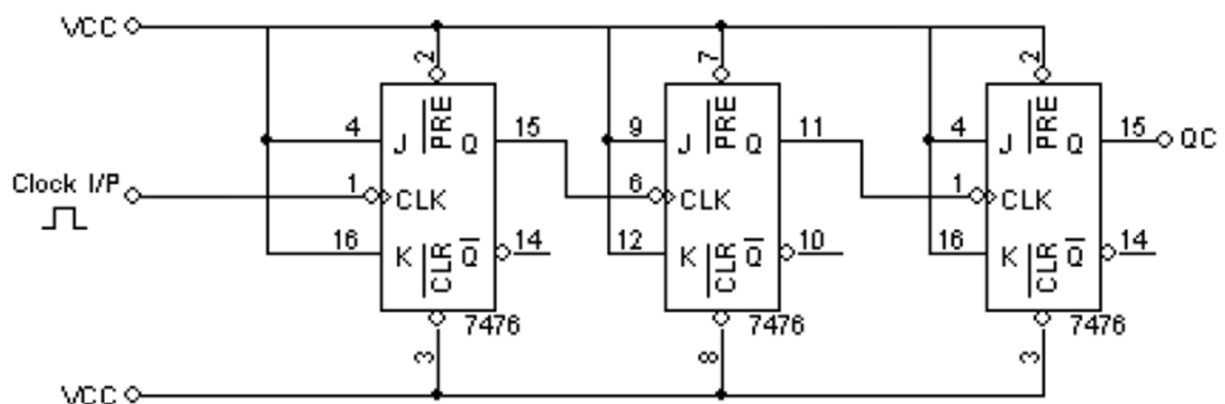
Procedure: -

1. Connections are made as per circuit diagram.
2. Clock pulses are applied one by one at the clock I/P and the O/P is observed at QA, QB & QC for IC 7476.
3. Truth table is verified.

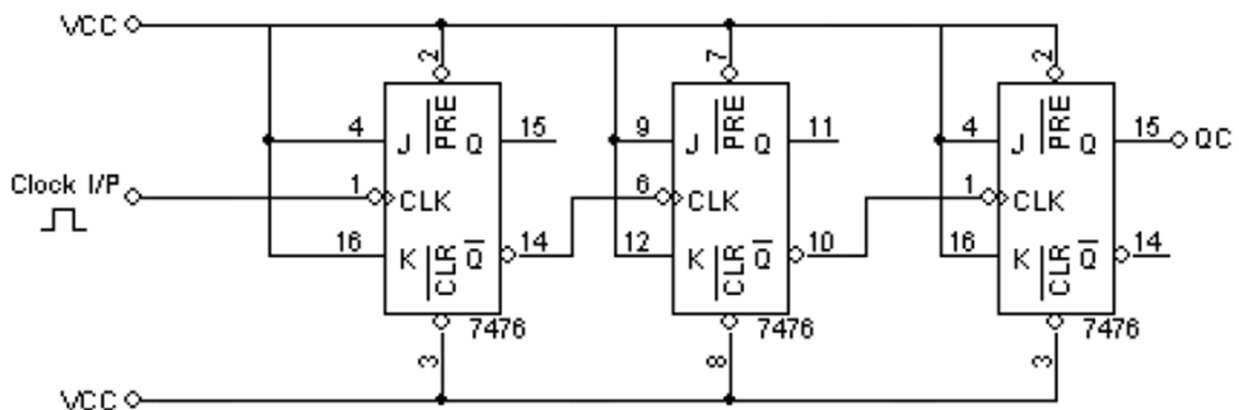
Procedure (IC 74192, IC 74193):-

1. Connections are made as per the circuit diagram except the connection from output of NAND gate to the load input.
2. The data (0011) = 3 is made available at the data i/ps A, B, C & D respectively.
3. The load pin made low so that the data 0011 appears at QD, QC, QB & QA respectively.
4. Now connect the output of the NAND gate to the load input.
5. Clock pulses are applied to "count up" pin and the truth table is verified.
6. Now apply (1100) = 12 for 12 to 5 counter and remaining is same as for 3 to 8 counter.
7. The pin diagram of IC 74192 is same as that of 74193. 74192 can be configured to count between 0 and 9 in either direction. The starting value can be any number between 0 and 9.

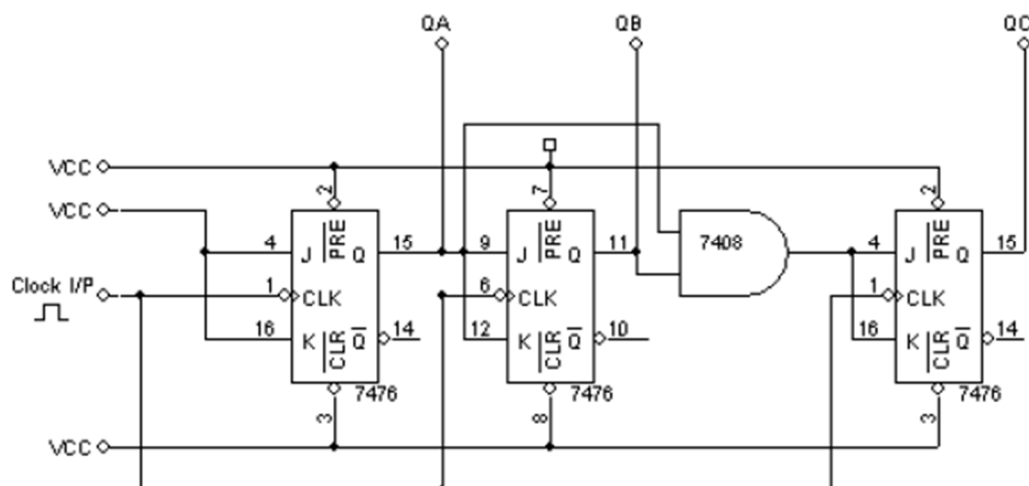
Circuit Diagram: - 3-Bit Asynchronous Up Counter



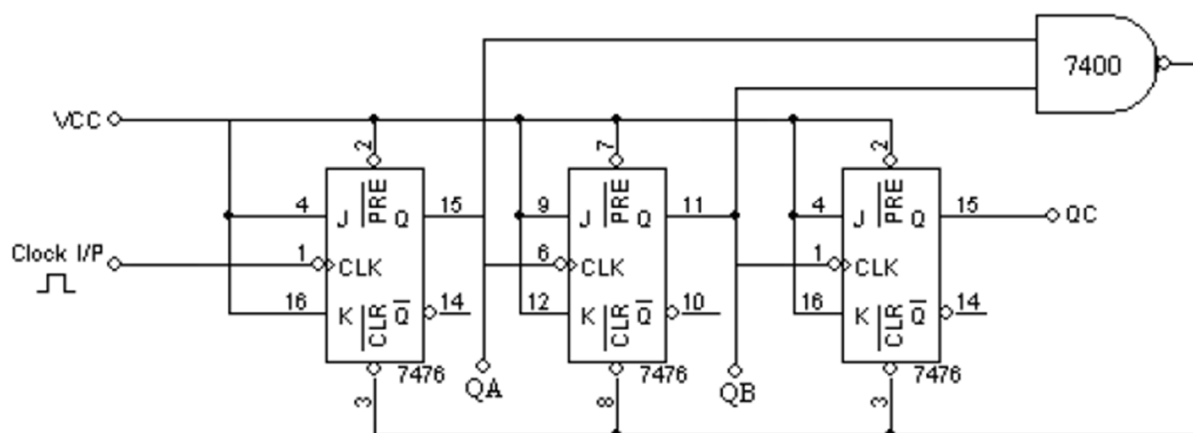
Circuit Diagram: - 3-Bit Asynchronous Down Counter



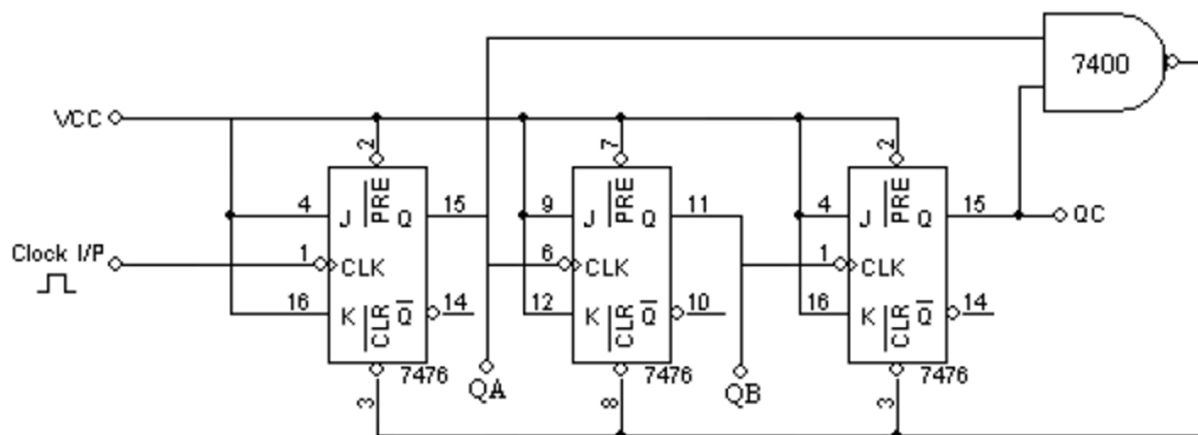
3-bit Synchronous Counter:-



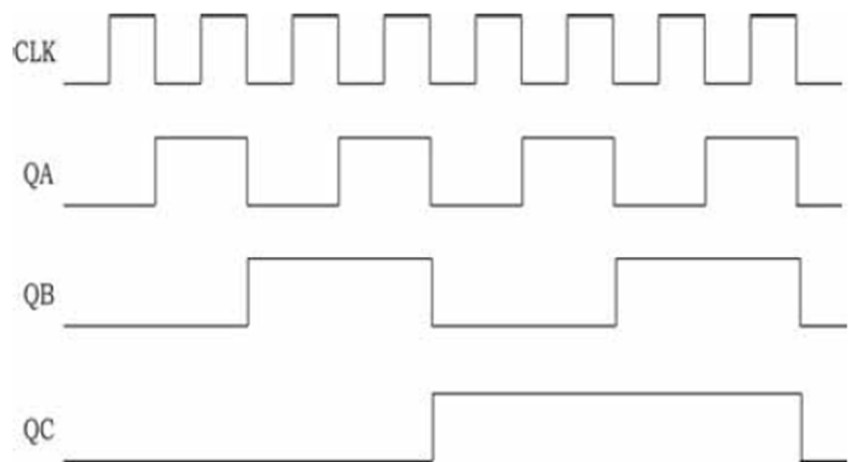
Mod 3 Asynchronous Counter:-



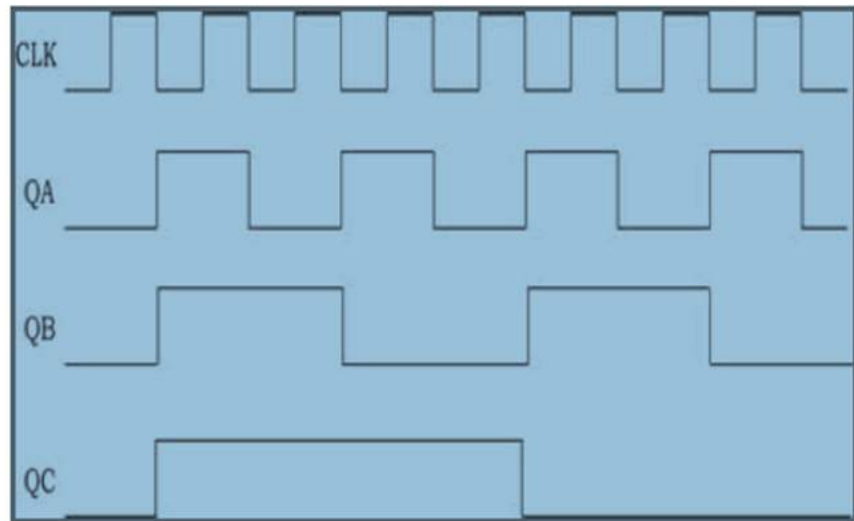
Mod 5 Asynchronous Counter:-



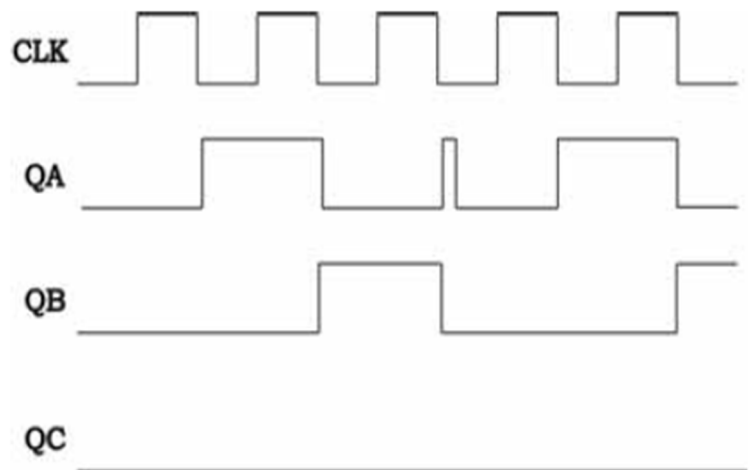
3-bit Asynchronous up counter			
Clock	QC	QB	QA
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1
8	0	0	0



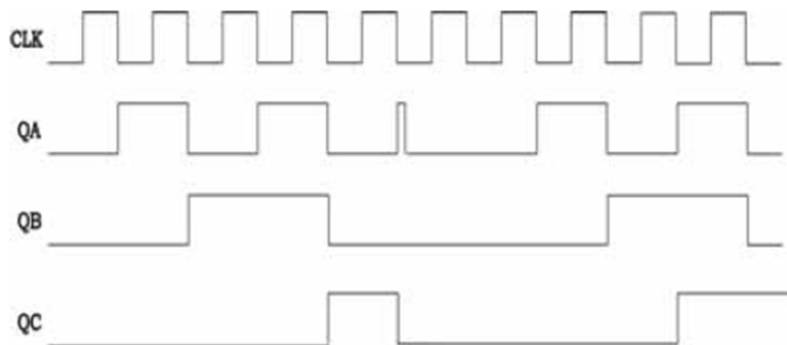
3 bit Asynchronous down counter			
Clock	QC	QB	QA
0	1	1	1
1	1	1	0
2	1	0	1
3	1	0	0
4	0	1	1
5	0	1	0
6	0	0	1
7	0	0	0
8	1	1	1
9	1	1	0



Mod 3 Asynchronous counter			
Clock	QC	QB	QA
0	0	0	0
1	0	0	1
2	0	1	0
3	0	0	0
4	0	0	1
5	0	1	0

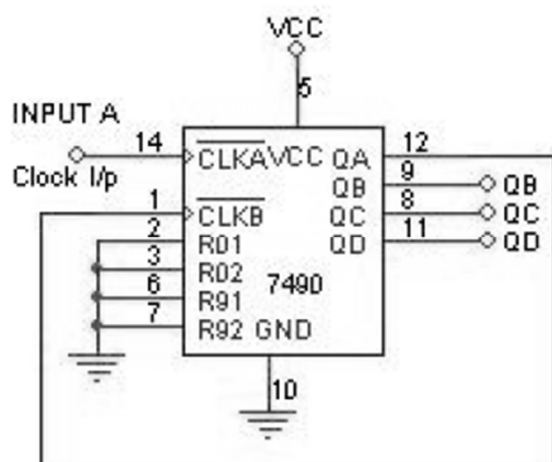


Mod 5 Asynchronous counter			
Clock	QC	QB	QA
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	0	0	0



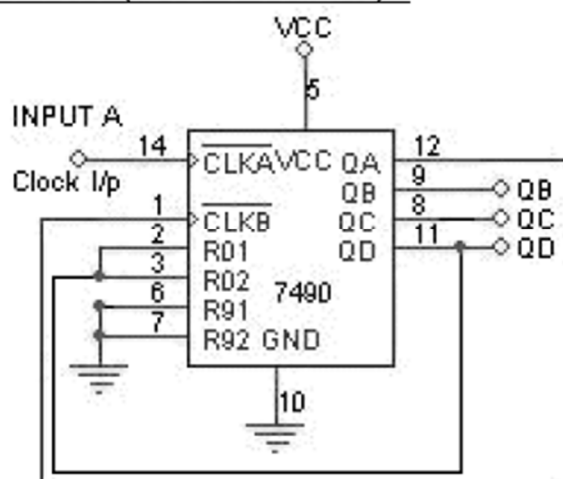
Mod 3 Asynchronous Counter:-

IC 7490 (Decade Counter):-



Clock	QD	QC	QB	QA
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	0	0	0	0

IC 7490 (MOD-8 Counter):-



Clock	QD	QC	QB	QA
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	0	0	0	0
9	0	0	0	1