MIT WORLD PEACE UNIVERSITY

Digital Electronics and Computer Architecture
Second Year B. Tech, Semester 3

DESIGN AND IMPLEMENTATION OF ASYNCHRONOUS COUNTERS USING JK- FLIP FLOP.

PRACTICAL REPORT
ASSIGNMENT 4

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Contents

1   Objectives

1. To understand working of Modulo N counter using 7490(N>10).

2   Problem Statement

Design and implement MOD 10, MOD 100 and MOD N counter using IC 7490.

3   ICs Used

1. IC7490

2. IC 7400

4   Platform Used

Digital Trainer Kit

5   Theory

5.1   IC 7490

The IC 7490 is a decade counter. It is a 16 pin DIP IC. It has 4 inputs and 4 outputs. It has a carry output and a carry input. It has a clock input and a reset input. It has a preset input. It has a master reset

5.2   Ripple counter IC-7490 (decade counter)

IC 7490 is a 4 bit ripple type decade counter. It consists of four master or slave flip flops, which are internally connected to form a divide by two section and a divide by five section. Each section has a separate clock input to chnage the output states of the counter on a high to low clock transition.

5.3   Basic Structure of IC 7490

IC 7490 is a 4-bit, ripple-type decade counter. It consists of four master/slave flip-flops, which are internally connected to form a divide-by-two section and a divide-by-five section.

Each section has a separate clock input to change the output states of the counter on a high-to-low clock transition. The output states do not change simultaneously due to the internal ripple delays. Therefore the decoded output signals are subject to decoding spikes and should not be used for clocks or strobes.

Since the output of the divide-by-two section is not internally connected to the succeeding stages, IC 7490 can be operated in various counting modes.

6 Involved Truth Tables

6.1 NAND Gate

A	B	Result
0	0	1
0	1	1
1	0	1
1	1	0

6.2 Function table of IC7490

Count	Qd	Qc	Qb	Qa
(Start) 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
(New Cycle) 10	0	0	0	0

Figure 1: Function Table of IC 7490

6.3 JK Flip Flop Truth table

Q_n	Q_{n+1}	J	K
0	0	0	X
0	1	1	0
1	0	X	1
1	1	X	0

6.4 JK Flip Flop Excitation table

Q_n	Q_{n+1}	J	K
0	0	0	X
0	1	1	0
1	0	X	1
1	1	X	0

6.5 JK Flip Flop Characteristic table

J	K	Q_n	Q_{n+1}	State
0	0	0	0	Q_n (Hold)
0	0	1	1	
0	1	0	0	Reset
0	1	1	0	
1	0	0	1	Set
1	0	1	1	
1	1	0	1	Toggel
1	1	1	0	

7 Pin Diagrams of ICs Used

7.1 Pin Diagram of IC7490
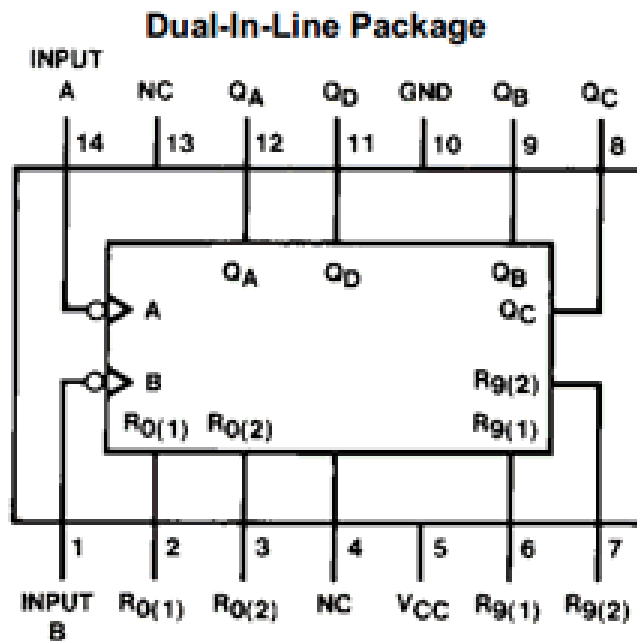
Dual-In-Line Package

Figure 2: Pin Diagram for IC 7490

7.2 Pin Diagram of IC7400
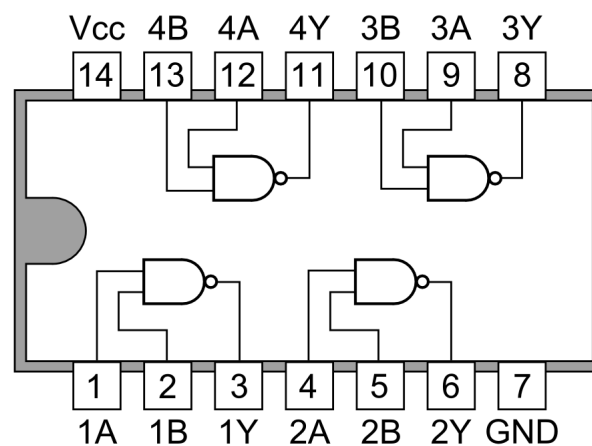
7400 Quad 2-input NAND Gates

Figure 3: Pin Diagram for IC 7400

8 Design and Implementation
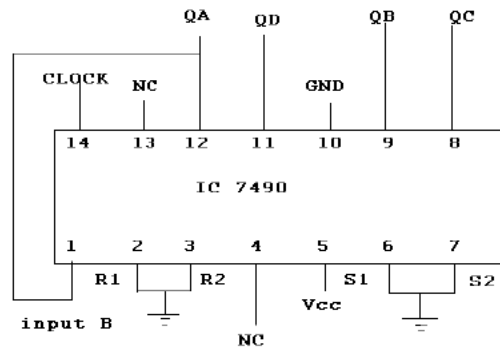
8.1 Circuit diagram of a Mod 10 Counter

Figure 4: Circuit diagram of a Mod 10 Counter
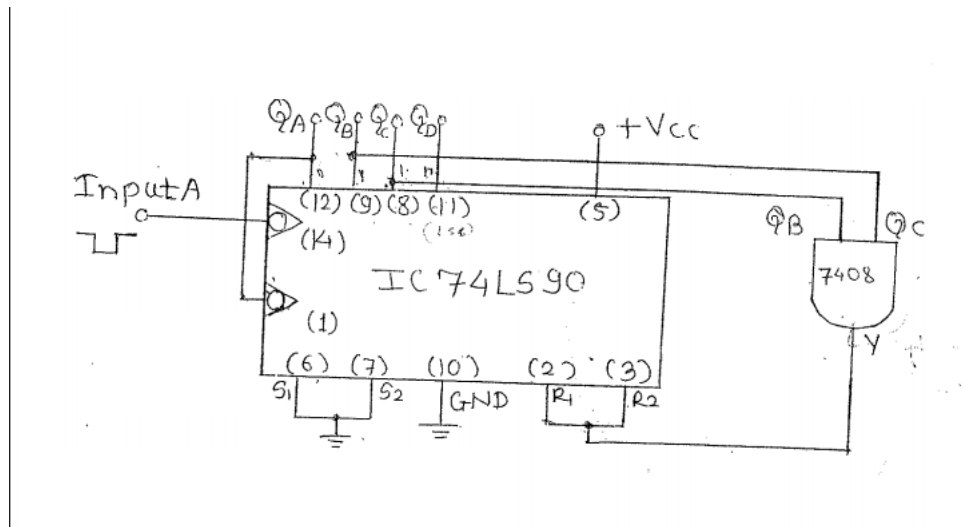
8.2 Circuit diagram of a Mod 6 Counter

Figure 5: Circuit diagram of a Mod 6 Counter
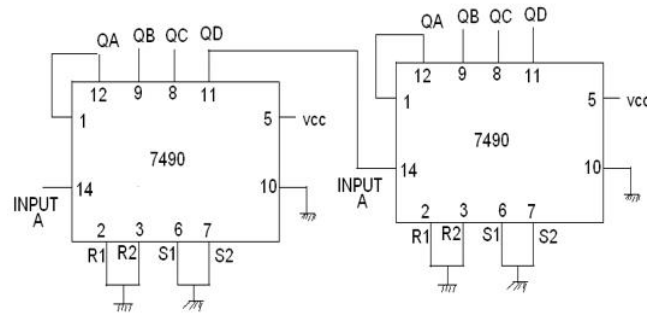
8.3 Circuit diagram Mod 100 Counter

Figure 6: Circuit diagram of Mod 100 Counter

9 Conclusion

Thus, we have learnt how to implement mod 10 and Mod 100 counters. Mod N counter was also learnt and implemented. Working of IC7490 was understood in detail.

10   FAQs

1. What do you mean modulus Counter?
   The modulus of a counter is the number of states it can have. For example, a 4-bit counter can have 16 states. The modulus of a 4-bit counter is 16. Counters are generally classified as either synchronous or asynchronous.

2. Application of IC 7490?
   It is used in the design of asynchronous counters. It is also used in the design of asynchronous shift registers. It is also used in the design of asynchronous binary adders. It is also used in Automatic controller circuits.