IDE

JOHNSON COUNTER

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CONTENTS

***Abstract*—This Manual shows the design and Implemantation of four bit Johnson counter with 7474 IC's.**

I. COMPONENTS

S.No	Component	Number
1.	Arduino	1
2.	Bread Board	1
3.	Jumper Wires(M-M)	Required
4.	LED	4
5.	7474	2

II. INTRODUCTION

1) Johnson counters are used to store or process or count the number of events occurred within the circuit.
2) It is designed with a group of flip-flops, where the inverted output from the last flip-flop is connected to the input of the first flip-flop.
3) In Johnson counter
   No. of states = No. of flip-flop used
   Number of used states=2n
   Number of unused states=2n - 2*n
4) Generally, it is implemented by using D flip-flops or JK flip-flops. Here, It is implemented by D flip-flop.

III. CIRCUIT DIAGRAM

1) The inverted output of the last flip-flop '$\bar{Q}$n' is fed back to the first flip-flop in the sequence bit pattern.
2) The counter registers cycles in a closed-loop i.e circulates within the circuit.

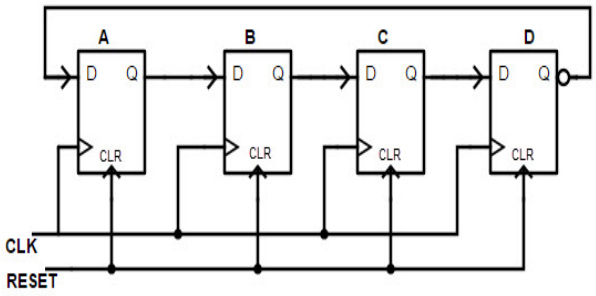

Fig. 1: Four bit Johnson Counter

3) Reset pin acts as an on/off switch. So, the flip-flops can be enabled by clicking the Reset switch.
4) CLK pin is used to observe the changes in the output of the flip-flops.

IV. PROCEDURE

1) Connect the two 7474 IC's, LED's and Aurdino according to table I
2) Observe the states of LED and verify the truth table using the code from the link.

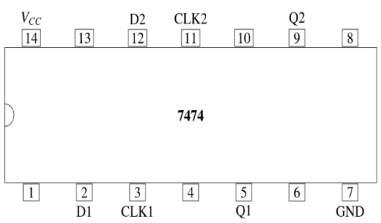

Fig. 2: 7474 IC

https://github.com/ManojChavva/FWC/blob/main/IDE/JohnsonWithIC/code.cpp

Arduino									GND	Vcc				ClK	13
7474	2	2,5	5,12	12,9	9				7	14	1	4	10	3	11
7474	8				2	2,5	5,12	12,9	7	14	1	4	10	3	11
LED		LED1		LED2		LED3		LED4							

TABLE I: Connection Table.

V. Truth Table

state	Q_0	Q_1	Q_2	Q_3
0	0	0	0	0
1	1	0	0	0
2	1	1	0	0
3	1	1	1	0
4	1	1	1	1
5	0	1	1	1
6	0	0	1	1
7	0	0	0	1

Table II: Truth Table.

- The above table state that

1) The counter produces the output 0000 when there is no clock input passed(0).
2) The counter produces the output 1000 when the 1st clock pulse is passed to the flip flops.
3) The counter produces the output 1100 when the 2nd clock pulse is passed to the flip flops.
4) The counter produces the output 1110 when the 3rd clock pulse is passed to the flip flops.
5) The counter produces the output 1111 when the 4th clock pulse is passed to the flip flops.
6) The counter produces the output 0111 when the 5th clock pulse is passed to the flip flops.
7) The counter produces the output 0011 when the 6th clock pulse is passed to the flip flops.
8) The counter produces the output 0001 when the 7th clock pulse is passed to the flip flops.

Conclusion

Thus the Johnson counter designed and Implemented.