IDE

JOHNSON COUNTER

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***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.

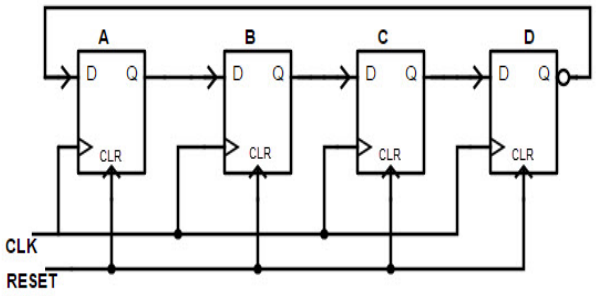

Fig. 1: Four bit Johnson Counter

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.

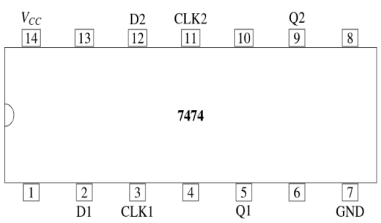

Fig. 2: 7474 IC

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.

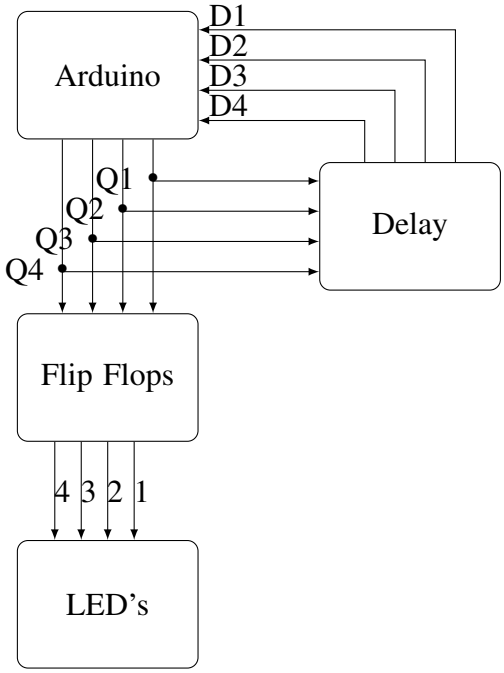

Fig: 3 Sequential Circuit

V. Truth Table

CLK	**D1**	**D2**	**D3**	**D4**	**Q1**	**Q2**	**Q3**	**Q4**
0	0	0	0	0	0	0	0	0
1	1	0	0	0	1	0	0	0
2	1	1	0	0	1	1	0	0
3	1	1	1	0	1	1	1	0
4	1	1	1	1	1	1	1	1
5	0	1	1	1	0	1	1	1
6	0	0	1	1	0	0	1	1
7	0	0	0	1	0	0	0	1

Table II: Truth Table.

Conclusion

Thus the Johnson counter designed and Implemented.