Assignment I
Sequence Detector Using D Flip Flop

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CONTENTS

***Abstract*—This manual shows how to use the 7474 D-Flip Flop IC to detect the sequence 1001.**

I. COMPONENTS

Components	Value	Quantity
Resistor	220 Ohm	1
Arduino	UNO	1
Seven Segment Display		1
Decoder	7447	1
Flip Flop	7474	1
Bread Board		1
Jumper Wires		20

II. HARDWARE

1) Make connections between the seven segment display in Fig 1 and the 7447 IC in Fig 2 as shown in Table I
2) Connect the Arduino, 7447 IC and the 7474 IC according to Table 2 and Fig 3.
3) Input is given from Arduino D8.

7447	a’	b’	c’	d’	e’	f’	g’
Display	a	b	c	d	e	f	g

Table I: Connection Table

III. FINITE STATE MACHINE

1) A sequential detector is a sequential state machine that takes an input string of bits and generates an output 1 whenever the target sequence has been detected.
2) The Input is changed to 0 and 1 to display the Next state.
3) The LED glows when the sequence 1001 is detected.

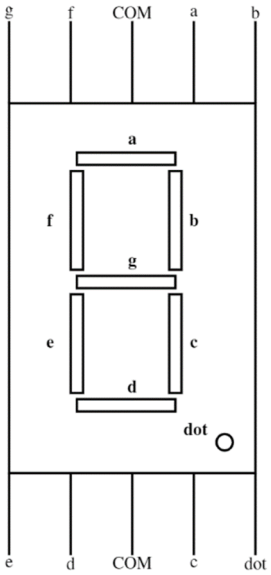

Figure 1: Seven Segment Display

Figure 2: Pin Diagram of 7447 IC

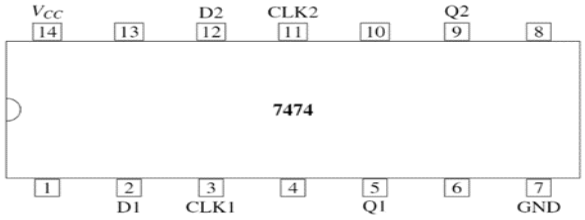

Figure 3: Pin Diagram of 7474 IC

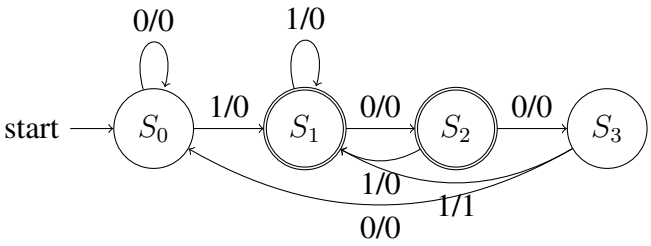

Figure 4: State Diagram

	INPUT		OUTPUT				CLOCK		5V			
	P	Q	D	C	B	A						
Arduino	D6	D7	D2	D3	D4	D5	D13					
7474	2	12			9	5	CLK1	CLK2	1	4	10	13
7447					1	7			16			

Table II: Connection Table

Present State	Input	Next State	Output
B A	X	P Q	Y
0 0	0	0 0	0
0 0	1	0 1	0
0 1	0	0 1	0
0 1	1	0 1	0
1 0	0	1 1	0
1 0	1	0 1	0
1 1	0	0 0	0
1 1	1	0 1	1

Table III: State Table

X \ AB	00	01	11	10
0	0	1	0	1
1	0	0	0	0

$$P = A'BX' + AB'X' \quad (1)$$

X \ AB	00	01	11	10
0	0	0	0	1
1	1	1	1	1

$$Q = AB' + X \quad (2)$$

B \ XA	00	01	11	10
0	0	0	0	0
1	0	0	1	0

$$Y = ABX \quad (3)$$

Conclusion

The detection of 1001 sequence using D-Flip flop is implemented using

https://github.com/SinkonaChinthamalla/fwc/blob/main/Assignment1/code.cpp