IMPLEMENTING THE CIRCUIT BELOW USING ARM(VAMAN)

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FWC22122 IITH-Future Wireless Communications Assignment-ARM

Contents

1 Problem

(GATE2020-EC)

50. For the components in the sequential circuit shown below,t_p is the propagation delay,t_s is the setup time and t_h is the hold time.The maximum clock frequency (rounded off to the nearest integer), at which the given circuit can operate reliably , is .... MHz.
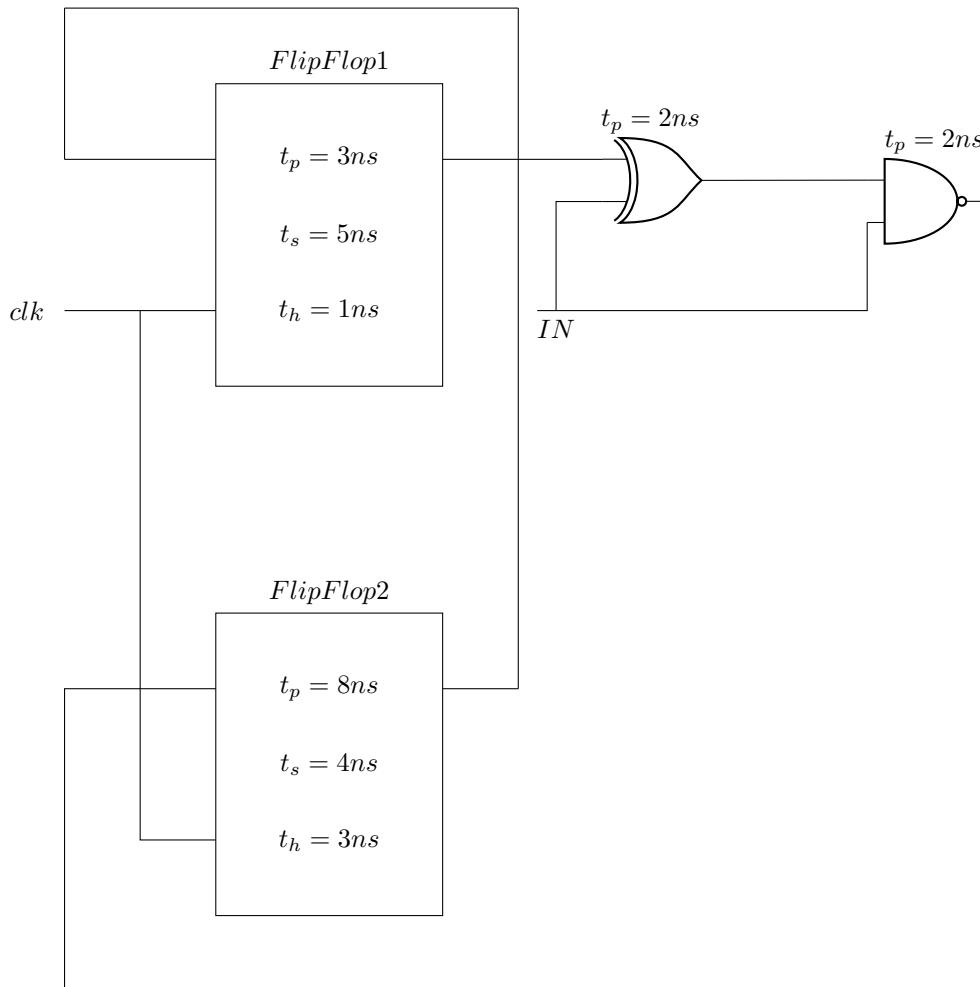

Figure 1: circuit

2 Introduction

The aim is to implement the above sequential circuit using D flip-flops.IC 7474 is a dual positive edge triggered D type flip flop,which means it has two separate flip-flop that are triggered by the rising edge of a clock signal.

In the above circuit Q_1,Q_2 and X are inputs and D_1,D_2 are outputs.So,from the circuit the expressions of D_1 and D_2 are:

$D_1 = Q_2$.
$D_2 = Q_1.X$.

Below is the transition table of the above circuit which is as follows:

INPUT			OUTPUT	
X	Q_1	Q_2	D_1	D_2
0	0	0	0	0
1	0	0	0	0
0	1	0	0	0
1	1	0	0	1
0	0	1	1	0
1	0	1	1	0
0	1	1	1	0
1	1	1	1	1

Table 1: Transition table

3 Components

COMPONENTS		
Component	Value	Quantity
Resistor	=220 Ohm	1
Vaman		1
Arduino	UNO	1
Seven Segent Display	Common Anode	1
Decoder	7447	1
Flip Flop	7474	1
Jumper Wires		20
Breadboard		1

Table 2: Components

3.1 Vaman

The Vaman (pygmy) has some ground pins, digital pins that can be used for both input as well as output.It also has two power pins that can generate 3.3V. In the following exercises, we use digital pins,GND and 5V .

3.2 Seven Segment Display

The seven segment display has eight pins, a,b,c,d,e,f,g and dot that take an active LOW input,i.e. the LED will glow only if the input is connected to ground.Each of these pins is connected to an LED segment.The dot pin is reserved for the LED.

4 Implementation

The above problem can be implemented using vaman and seven-segment display by connecting both of them as mentioned in the table below:

	INPUT		OUTPUT		CLOCK		VCC			
ARDUINO	D2	D3	D5	D6	D13		5V			
7474	5	9	2	12	3	11	1	4	10	13
7447			1	7				16		

Table 3: connections

5 Software

To implement the above code using arm the following code can be used to implement:

https://github.com/SivaLakkireddy/FWC/blob/main/Vaman/ARM/codes/src/main.c