[Computer Architecture Midterm Project]

[Benha Bank queue Monitor]

[The team]

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Supervised by :
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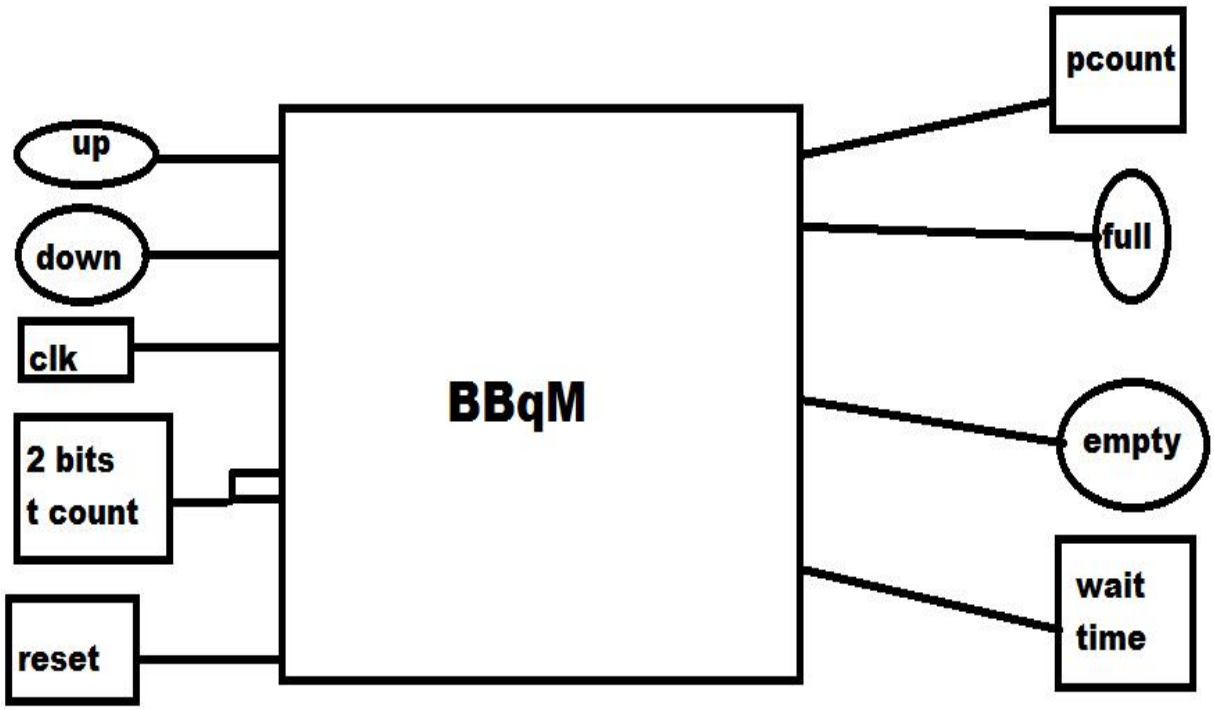
Overview :

this system is an embedded system to monitor the client queue in front of the tellers. The proposed system describes a branch of a bank , located in a BFCAI.
It has a specific method that controls the number of people waiting in the queue ,the number of tellers available to serve people ,and shows the waiting time for each one in the queue on a seven segment .

The Icon for the system(BBqM):-



System Inputs :-

inputs	Description	Possible values
Up	This input is taken from a push button . It indicates that someone enters the waiting room .	[0,1]
Down	This input is taken from a push button . It indicates that some one is out from the waiting room ,heading to a teller.	[0,1]

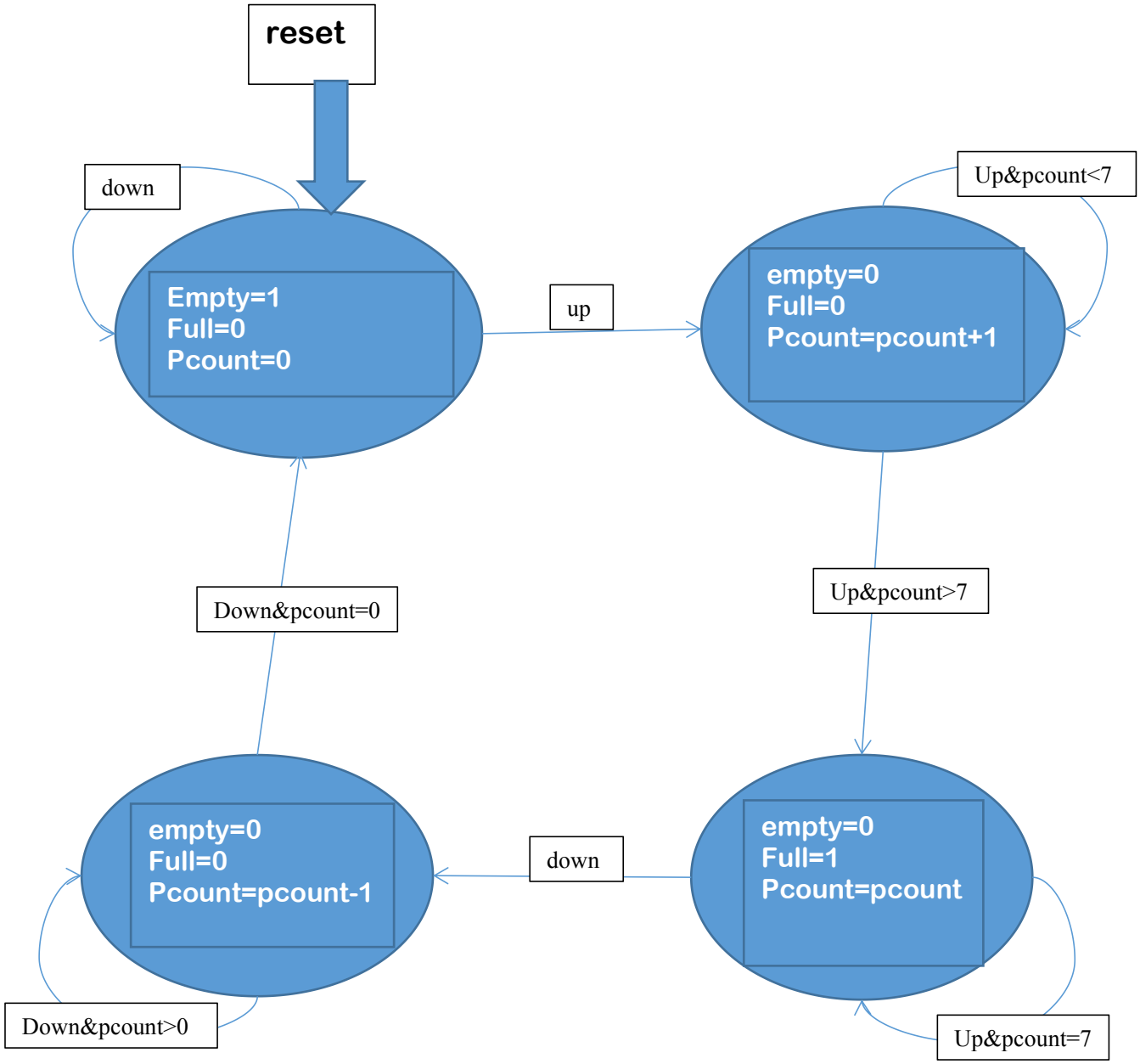
Clk	This input is taken from the FPGA clock .
	It counts 50_000_000 in one second .
	It passes over a clock divider to control its speed .
		[10mill second]
		//for this the clock counts 250000 then triggers
		// generate a clock every 500000 HZ

Reset	This is taken from a switch . It sets the whole system to zero .	[0,1]
2 bit Tcount	This input indicates the number of tellers available to serve people .it has a look_up table in the Rom that shows the waiting time for each one.	[01,10,11]

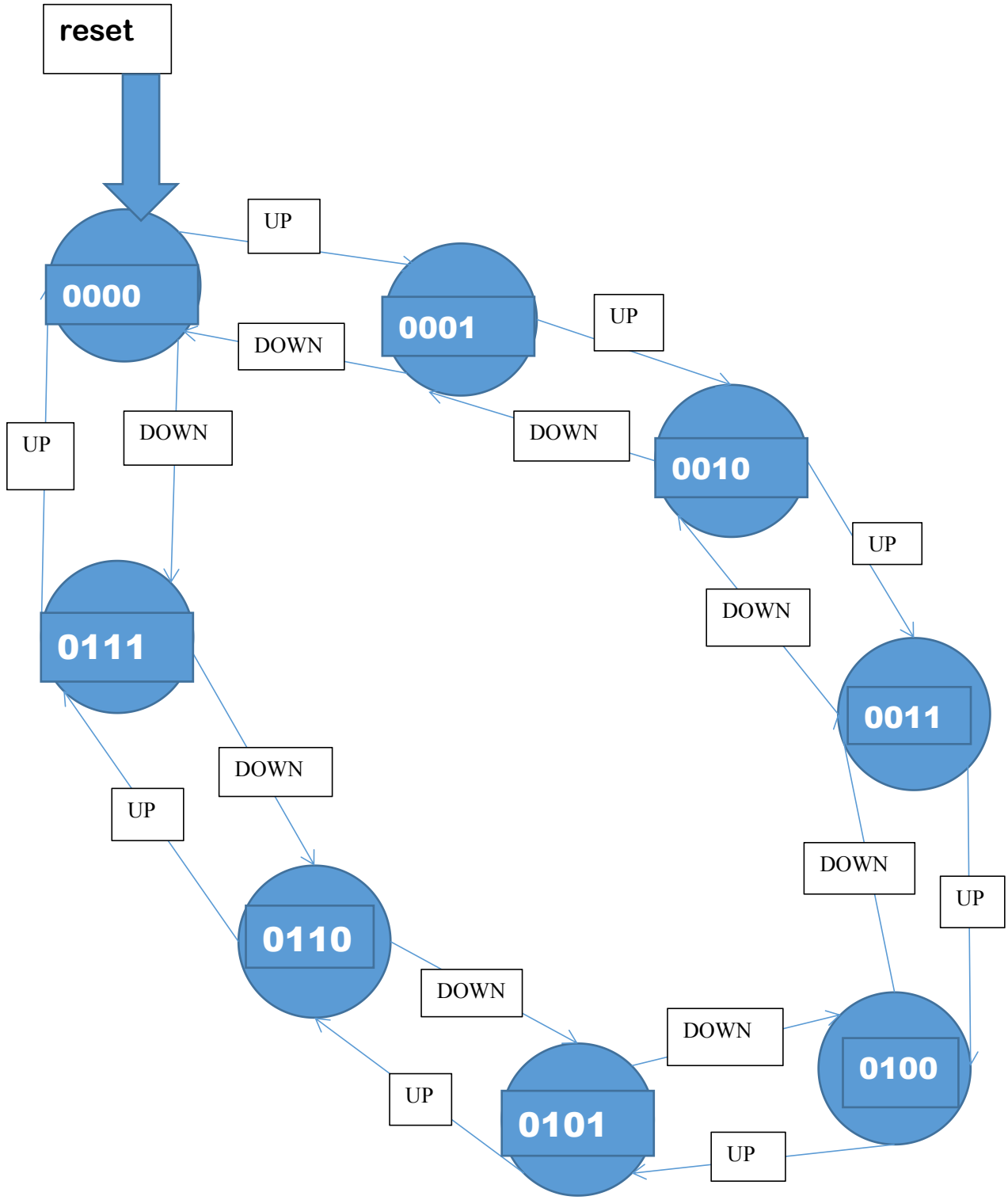
System Outputs :-

Output	Description	Possible values
Pcount	This is the number of people in the waiting room . It is displayed on a 7segment .	[0:7]
Full	This is a led that lights on when the waiting room is full , (the queue is full and someone tries to enter.	[on,off]
Empty	This is a led that lights when the queue is empty and someone tries getting people out.	[on,off]
Wait time	This is a two 7segments that displays the waiting time from the look-up table in the Rom with respect to the Pcount entering.	2digit decimal number

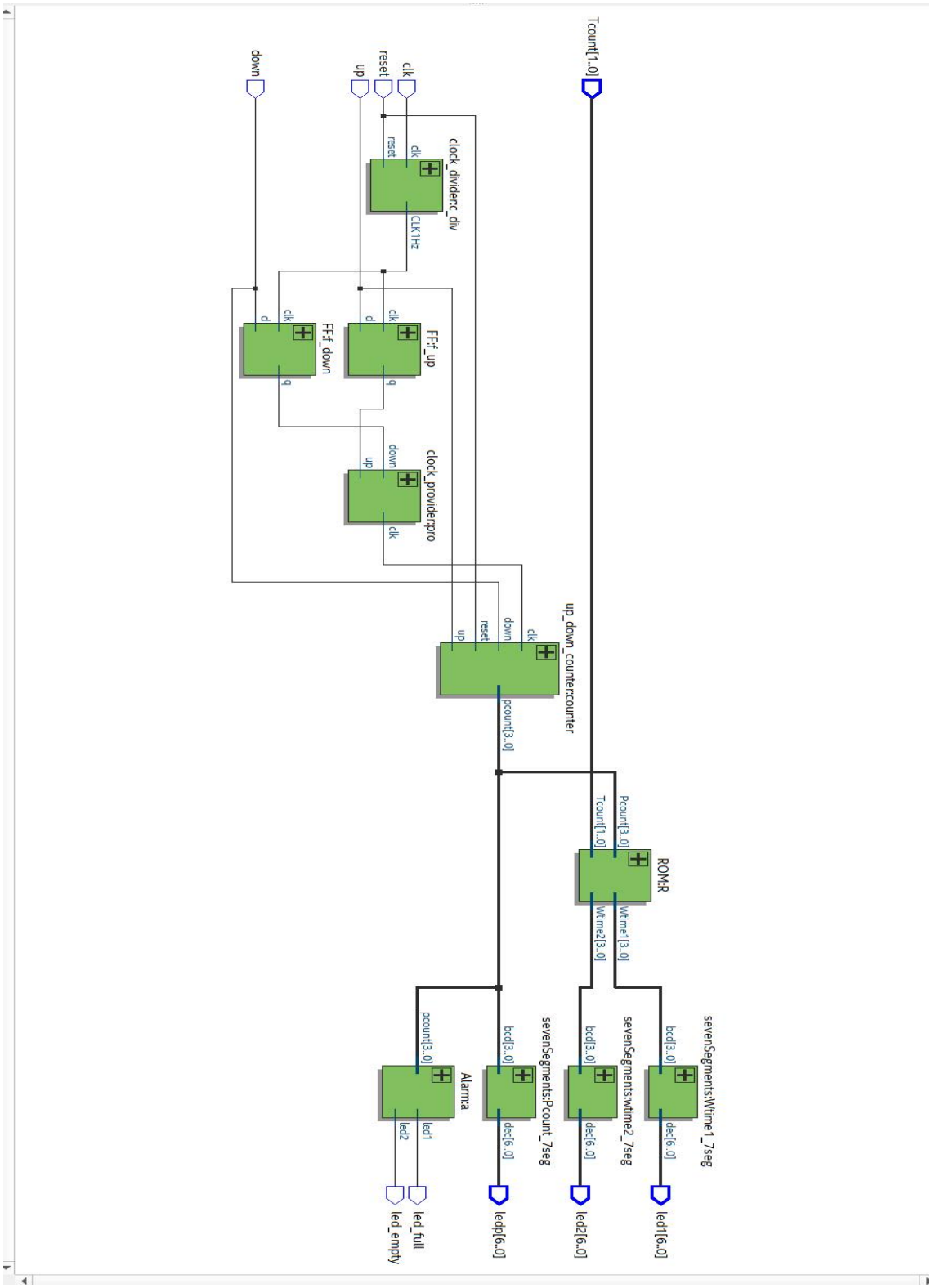
BBQM FSM :-


reset
down
Empty=1
Full=0
Pcount=0
up
Up&pcount<7
empty=0
Full=0
Pcount=pcount+1
Down&pcount=0
Up&pcount>7
empty=0
Full=0
Pcount=pcount-1
down
empty=0
Full=1
Pcount=pcount
Down&pcount>0
Up&pcount=7

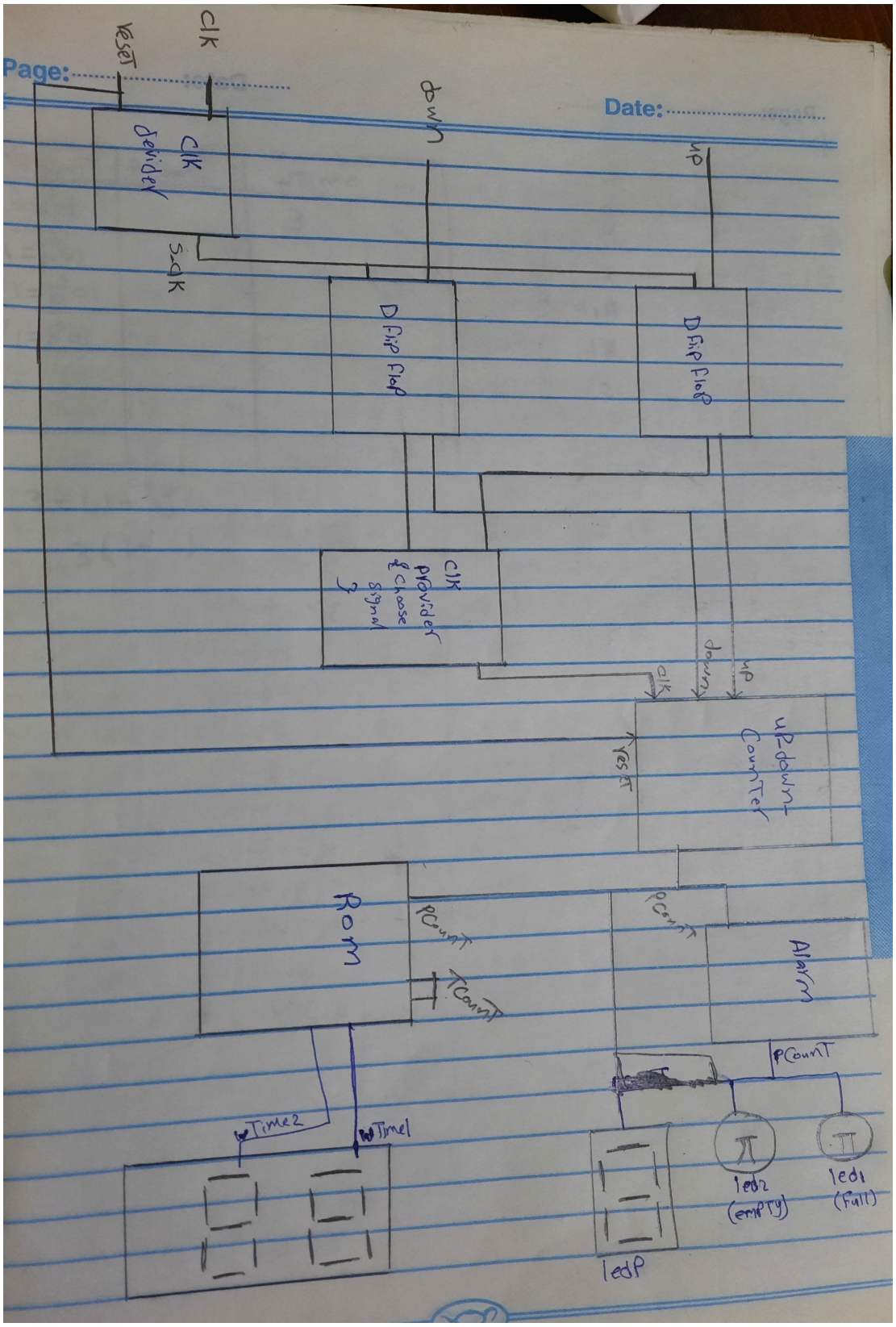
Up_down_counter FSM:-



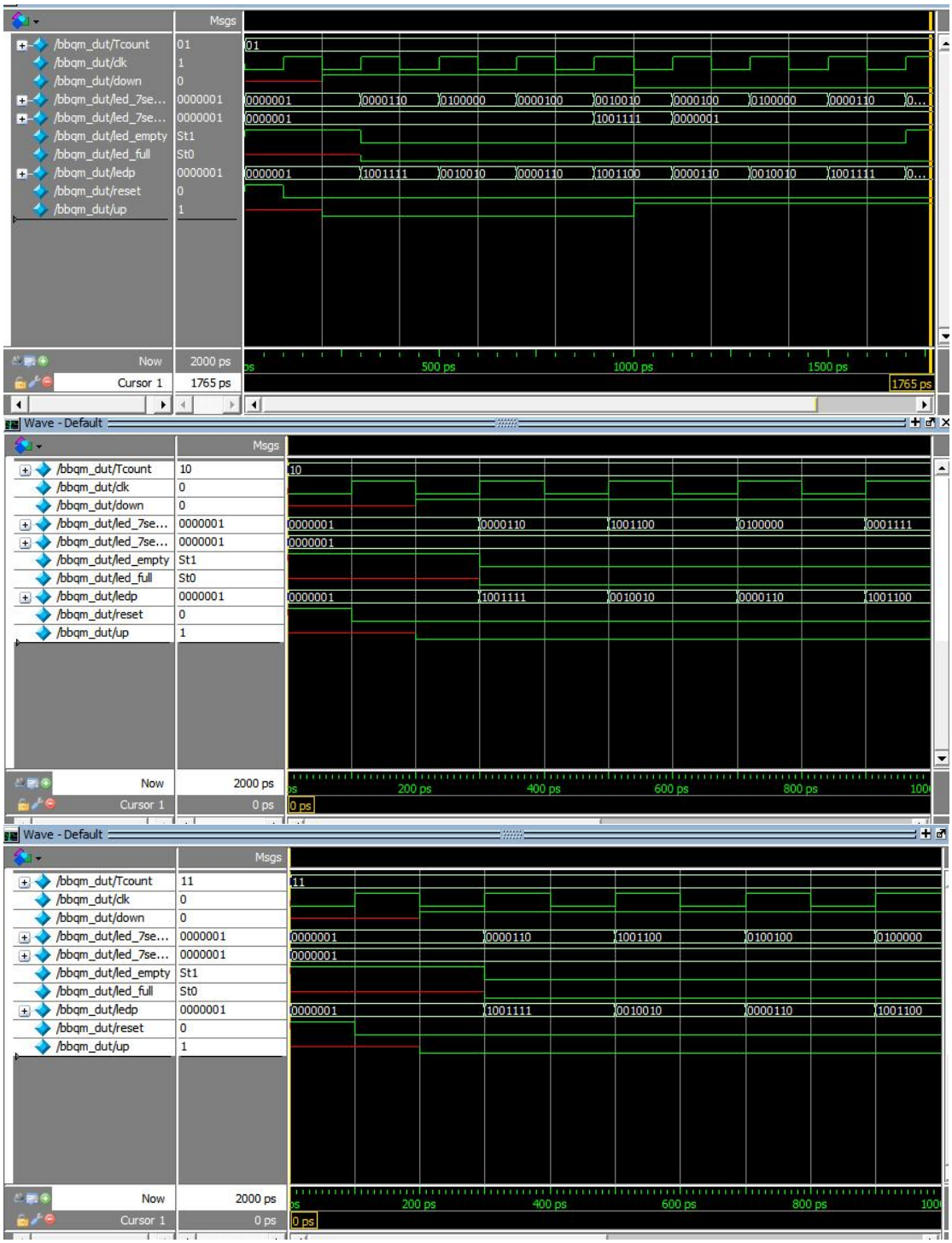
The BBqM™ structure.



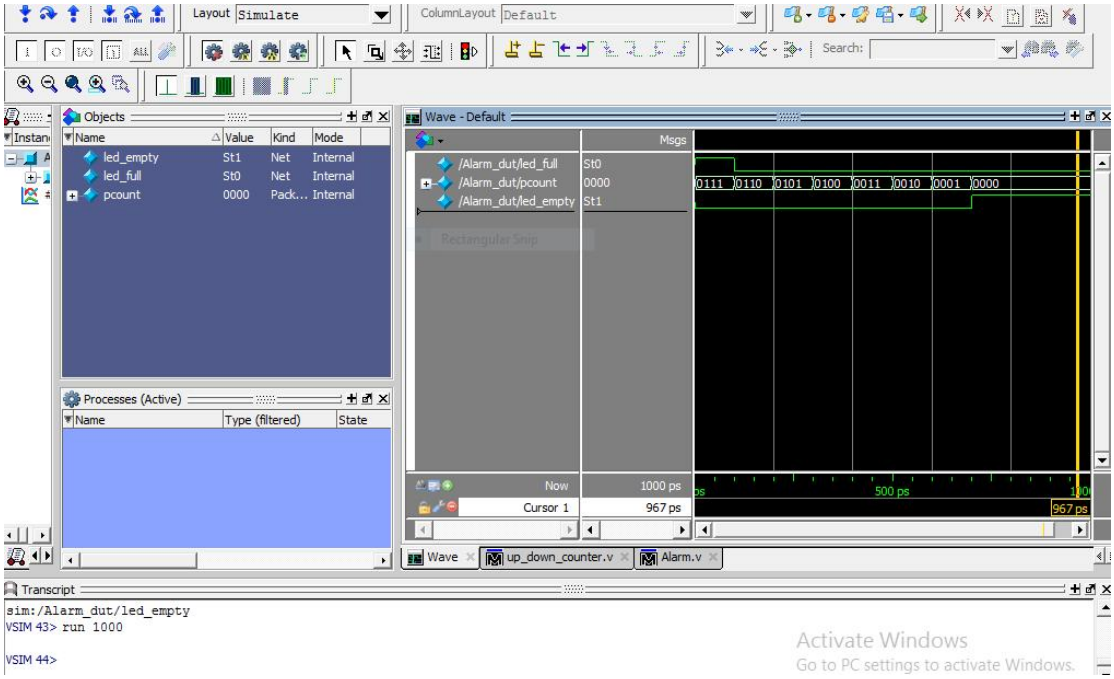
Bbqm structure



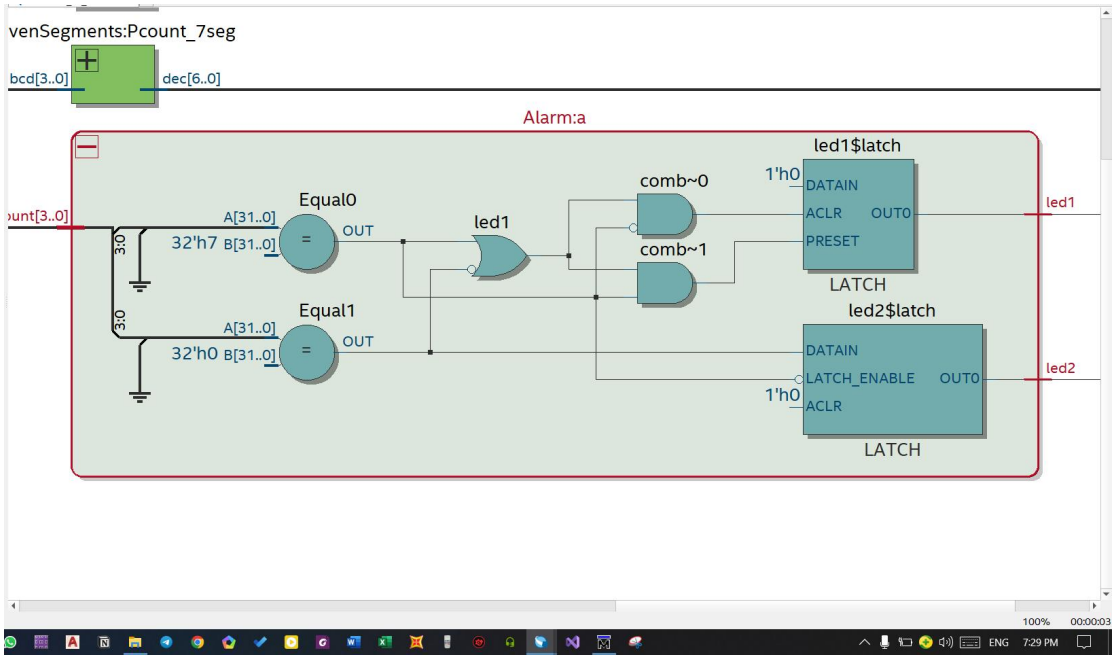
BBqM test bench:-



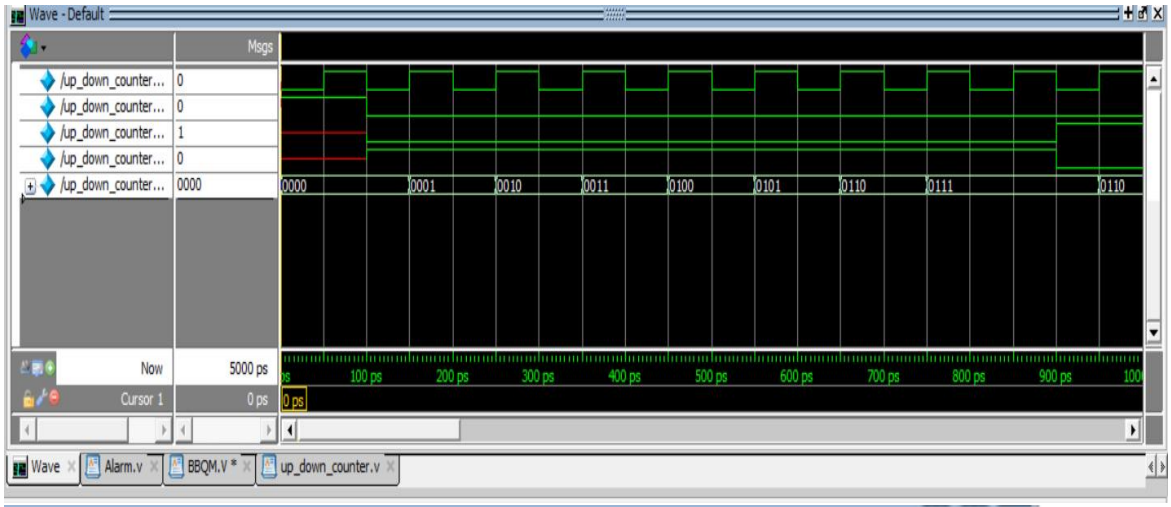
Alarm test bench

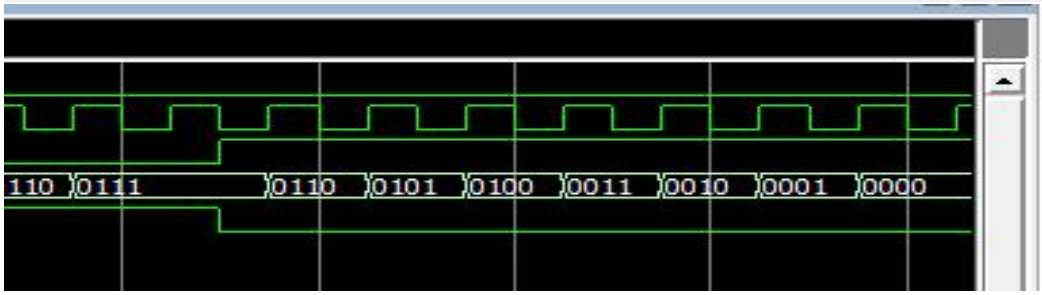


Alarm structure

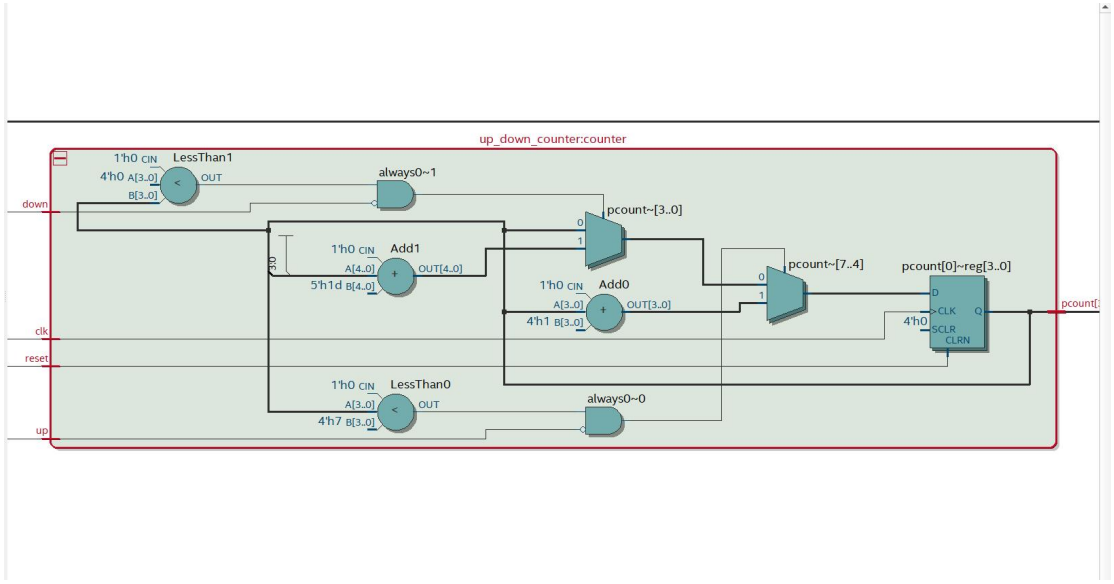


Up -down-counter test bench

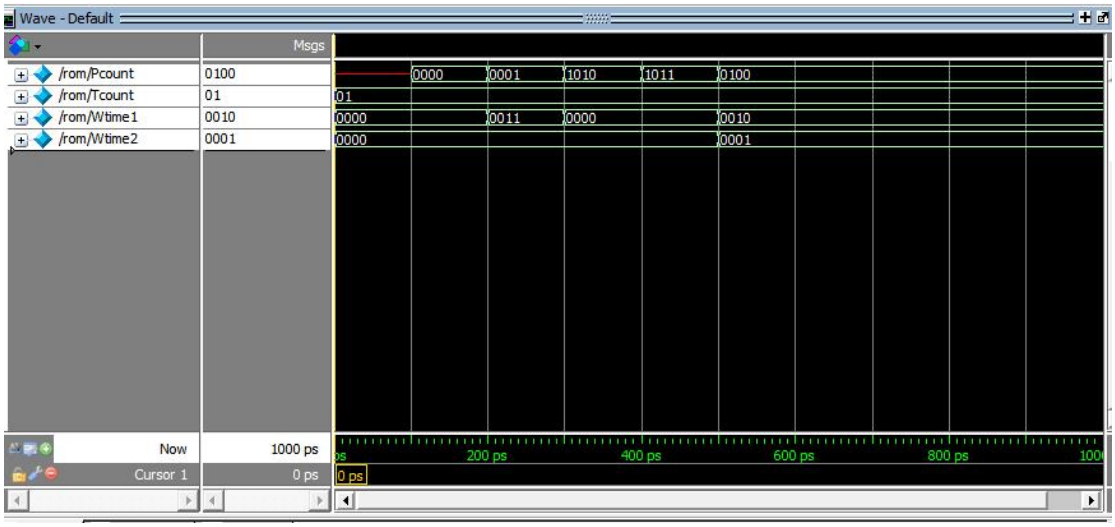


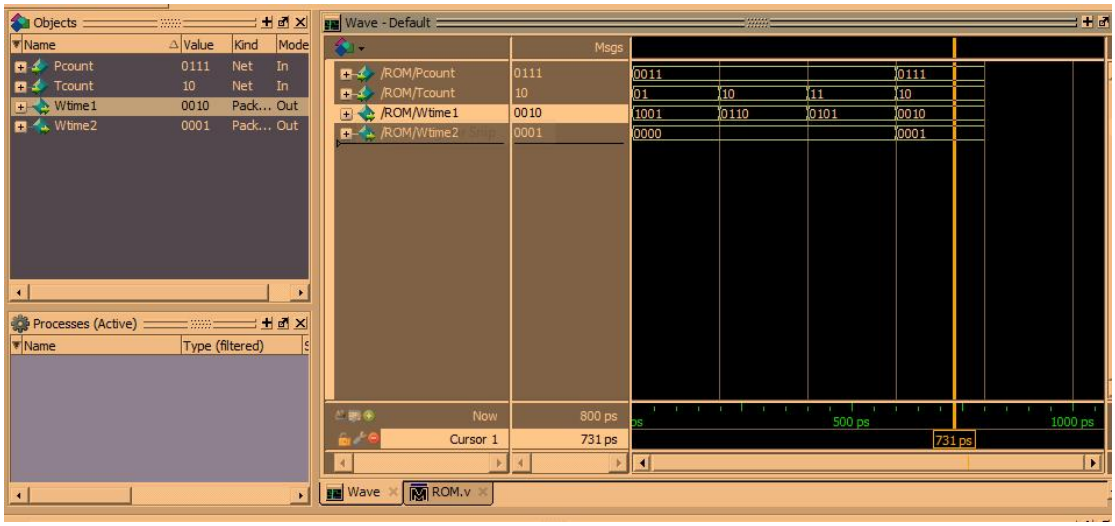


Up-down-counter structure



Rom test bench





Alarm test table

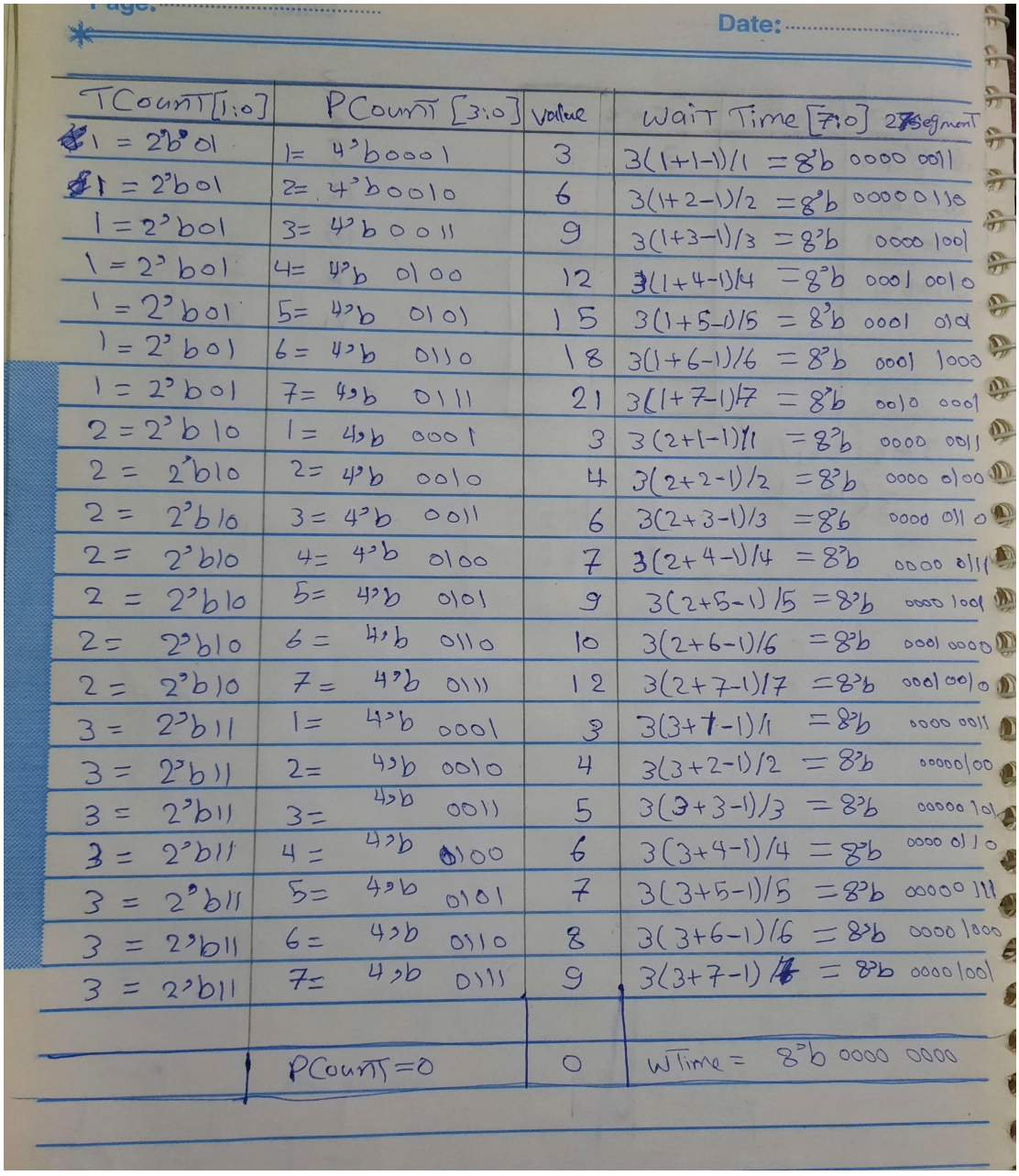
Pcount	Led_full	Led_empty
0000	0	1
0001	0	0
0010	0	0
0011	0	0
0100	0	0
0101	0	0
0110	0	0
0111	1	0

Rom test table

Tcount	Pcount	Wtime1	Wtime2
01	0000	0000	0000
01	0001	0000	0011
10	0000	0000	0000
10	0001	0000	0011
11	0000	0000	0000
11	0001	0000	0011
11	0010	0000	0100

And so on as the look up table

Look-up table for Rom



TCount[1:0]	PCount[3:0]	value	wait Time[7:0] 2 segment
1 = 2'b01	1= 4'b0001	3	3(1+1-1)/1 = 8'b 0000 0011
1 = 2'b01	2= 4'b0010	6	3(1+2-1)/2 = 8'b 0000 0110
1 = 2'b01	3= 4'b0011	9	3(1+3-1)/3 = 8'b 0000 1001
1 = 2'b01	4= 4'b0100	12	3(1+4-1)/4 = 8'b 0001 0010
1 = 2'b01	5= 4'b0101	15	3(1+5-1)/5 = 8'b 0001 0101
1 = 2'b01	6= 4'b0110	18	3(1+6-1)/6 = 8'b 0001 1000
1 = 2'b01	7= 4'b0111	21	3(1+7-1)/7 = 8'b 0010 0001
2 = 2'b10	1= 4'b0001	3	3(2+1-1)/1 = 8'b 0000 0011
2 = 2'b10	2= 4'b0010	4	3(2+2-1)/2 = 8'b 0000 0100
2 = 2'b10	3= 4'b0011	6	3(2+3-1)/3 = 8'b 0000 0110
2 = 2'b10	4= 4'b0100	7	3(2+4-1)/4 = 8'b 0000 0111
2 = 2'b10	5= 4'b0101	9	3(2+5-1)/5 = 8'b 0000 1001
2 = 2'b10	6= 4'b0110	10	3(2+6-1)/6 = 8'b 0001 0000
2 = 2'b10	7= 4'b0111	12	3(2+7-1)/7 = 8'b 0001 0010
3 = 2'b11	1= 4'b0001	3	3(3+1-1)/1 = 8'b 0000 0011
3 = 2'b11	2= 4'b0010	4	3(3+2-1)/2 = 8'b 0000 0100
3 = 2'b11	3= 4'b0011	5	3(3+3-1)/3 = 8'b 0000 0101
3 = 2'b11	4= 4'b0100	6	3(3+4-1)/4 = 8'b 0000 0110
3 = 2'b11	5= 4'b0101	7	3(3+5-1)/5 = 8'b 0000 0111
3 = 2'b11	6= 4'b0110	8	3(3+6-1)/6 = 8'b 0000 1000
3 = 2'b11	7= 4'b0111	9	3(3+7-1)/7 = 8'b 0000 1001
	PCount=0	0	wTime = 8'b 0000 0000

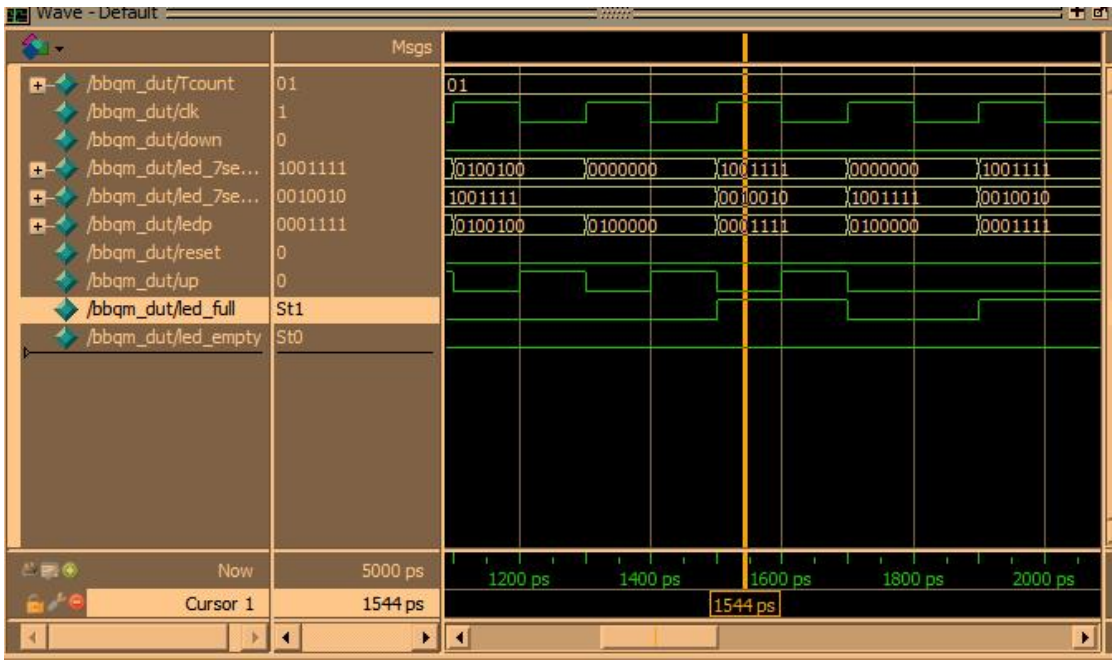
Test table for BBqM

clk	Reset	up	down	Tcount	Led_7segw1	Led_7segw2	Led_7segp	Led full	Led empty
0	1	x	x	01	0000001	0000001	0000001	x	1
1	0	0	1	01	0000110	0000001	1001111	0	0
1	0	0	1	01	0100000	0000001	0010010	0	0
1	0	0	1	01	0000100	0000001	0000110	0	0
1	0	0	1	01	0010010	1001111	1001100	0	0
1	0	0	1	01	0100100	1001111	0100100	0	0

And so on for Tcount {01,10,11}

Led Full test table

clk	Reset	up	down	Tcount	Led_7segw1	Led_7segw2	Led_7segp	Led full	Led empty
1	0	0	0	01	1001111	0010010	0001111	1	0



Led empty test table

clk	Reset	up	down	Tcount	Led_7segw1	Led_7segw2	Led_7segp	Led full	Led empty
1	0	1	0	01	0000001	0000001	0000001	0	1