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On Test Circuit Design on Predicate Integrated Circuit with Logic Simulation Tool

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ON TEST CIRCUIT DESIGN ON PREDICATE INTEGRATED CIRCUITS WITH LOGIC SIMULATION TOOL.

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Abstract—This article is on test circuits designed to check a functional logic based on the digital circuits embedded in the integrated circuits developed from [11]. The testing of integrated circuits are described in this article with schematic capture of circuits. A complete setup of switching components are made in the process of defining the connection switches. Finally, this research demonstrates an example of IC testing outputs with computer-aided design(cad).

Index Terms—digital circuit, logic circuit, design, simulation, integrated circuit, truth table, tool, cad, timing diagrams.

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1 Introduction

With variables MbA and MbNg,

These logic functions are generated[11]:

$$\overline{MbA}.\ MbNg + MbA.\overline{MbNg} \quad (1)$$

$$MbA.\ \overline{MbNg} + \overline{MbA}.MbNg \quad (2)$$

In setting up an IC for MbANbW logic gate circuit, Logic Circuit Sim Professional (full version) was used in achieving this. With single selection mode activation, the following are labelled IO points in orange color in the preview after :

1.MbA
2.MbNg
3.IO_or
4.IO_Xor.

The next setup for MbAMbNg logic circuit is shown in the steps below in the schematic captures in [11].

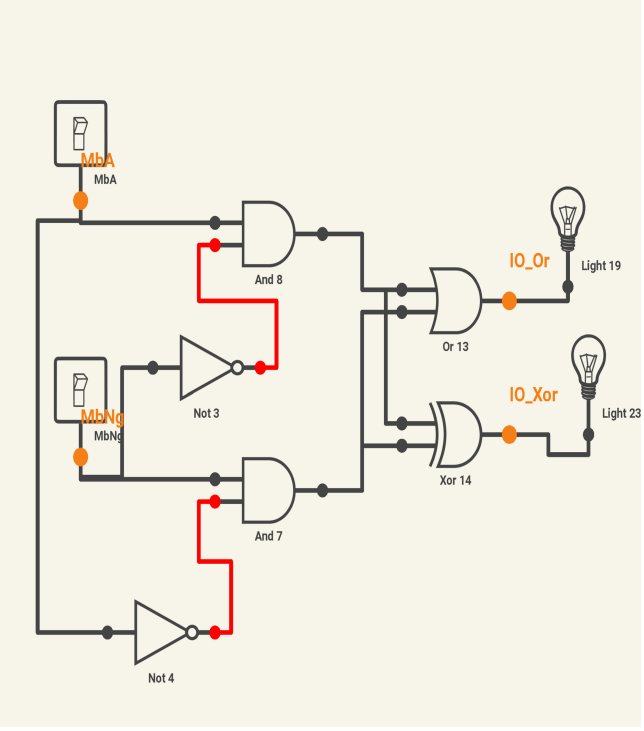


Figure 1.

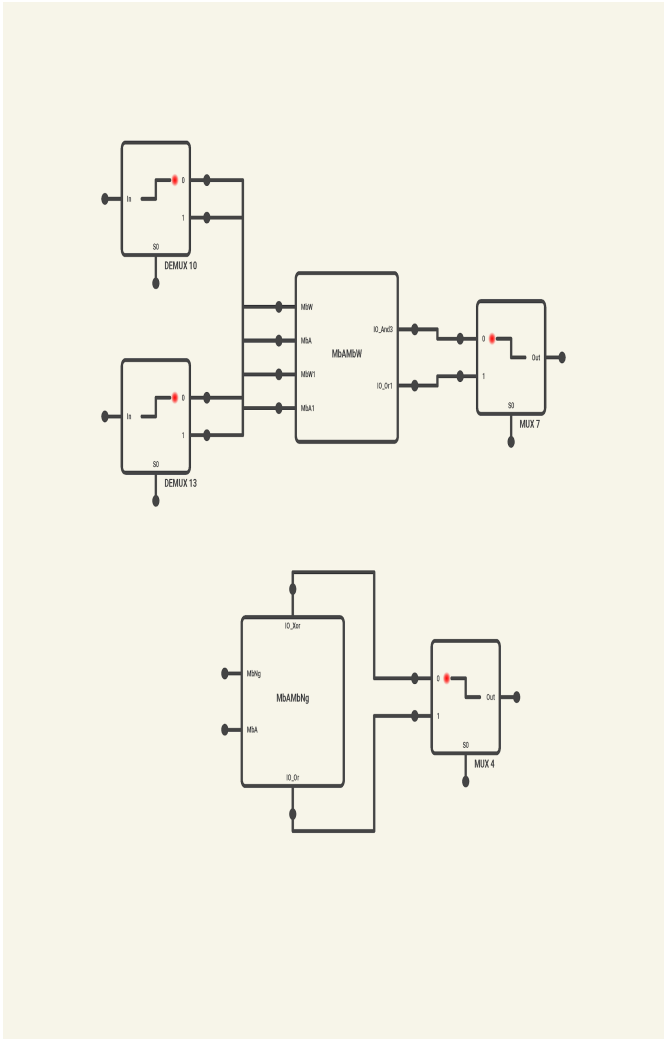
The next stage is to show the completed ic elements in use. I started a new project then add the elements from the ic menu. The menu shows the ic elements of MbAMbW and MbAMbNg logic circuits.[11]

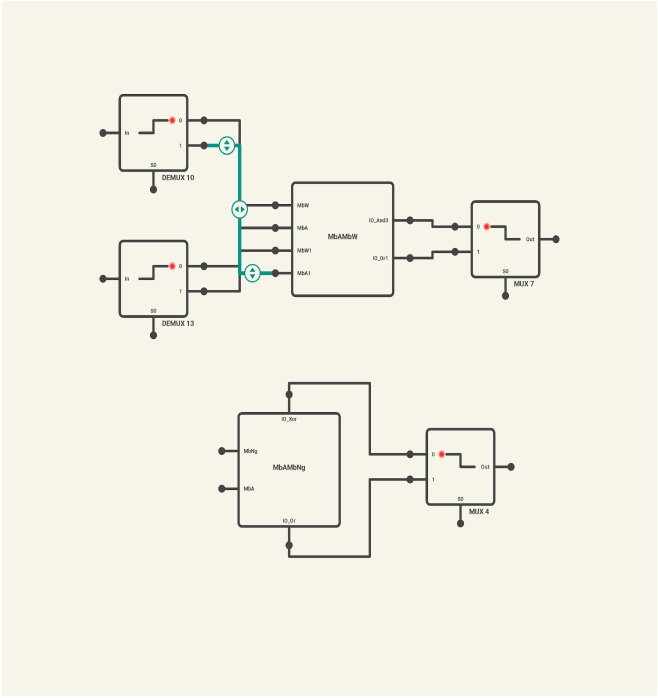
To use is by just selecting them and these appears in the grid layout. These are as shown below in the schematic} : Figure 2.

There are two inputs and two outputs for each embedded circuit/integrated circuit. A demultiplexer is placed in connection to each input to enable selection of one input at a time. For example, MbA and MbA1 inputs to select which is which, a select signal s will enable MbA if s=0 and enable MbA1 if s=1.

The circuit indication for that as described is shown below in the schematic capture :

Figure 3.





The rest of selection for input connections are shown also below in the schematic captures :

Figure 4.

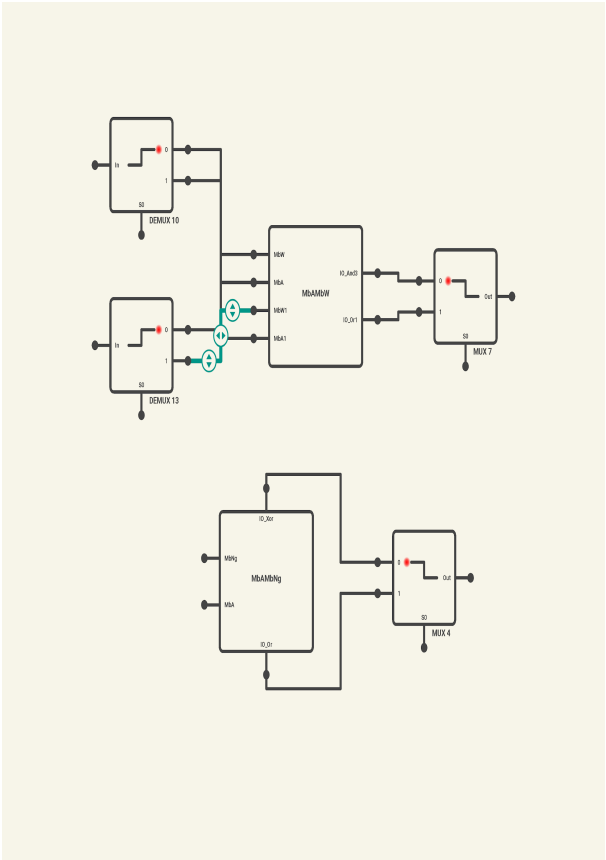


Figure 5.

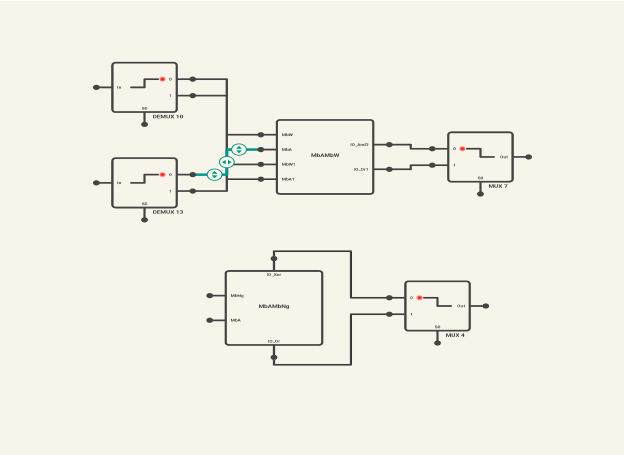


Figure 6.

On the output connection is also a multiplexer to select one output at a time. For MbAMbW ic, the outputs are IO_And3 which is selected when s=0 and IO_or1 when s=1 from MUX 7 multiplexer.
For MbAMbW ic, the outputs are IO_Xor when s=0 from MUX 4 multiplexer and IO_or when s=1 against MUX 4.

Input-State Connection Table: Table 1

DEMUX Name	Select State	Input State
DEMUX 10	0	MbW
Demux 10	1	MbA
Demux 13	0	MbA1
Demux 13	1	MbW1

Output-State Connection Table : Table 2

Mux Name	Select State	Output State
Mux 7	0	IO_And3
Mux 7	1	IO_or1
Mux 4	0	IO_Xor
Mux 4	1	IO_or

The two integrated circuit blocks are separated but MbA input can get the two connected into a complete circuit. This is shown in the schematic capture Figure 7:

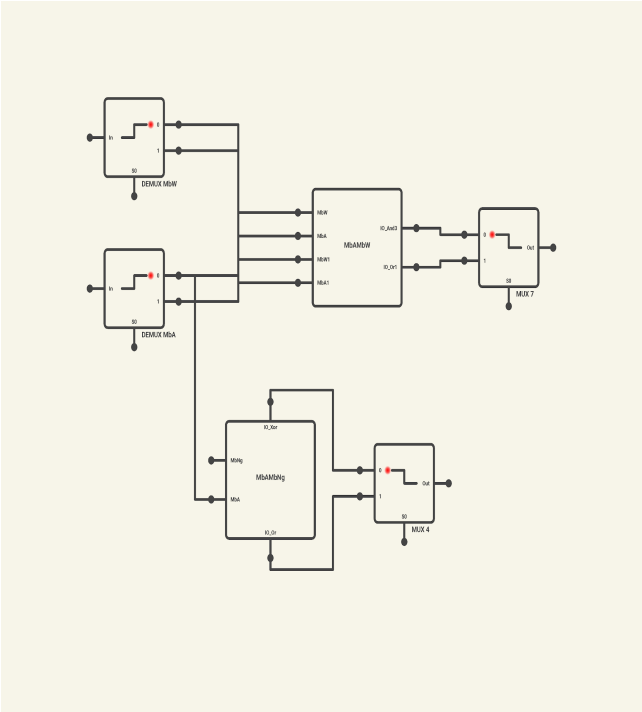


Figure 7. *NB:DEMUX 10 IS DEMUX MBW AND DEMUX 13 IS NOW DEMUX MBA.*

A further connection will be necessary to create a more compact integrated circuit just like a physical ic package.

This is as shown in the schematic capture :

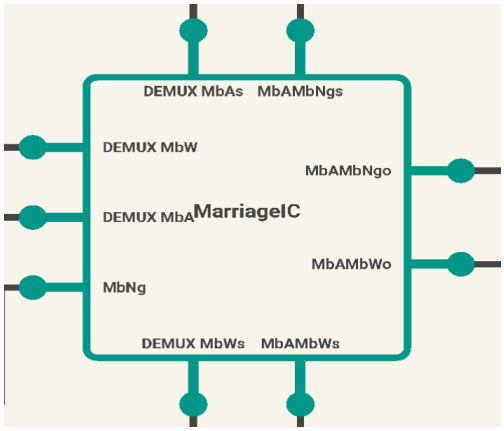
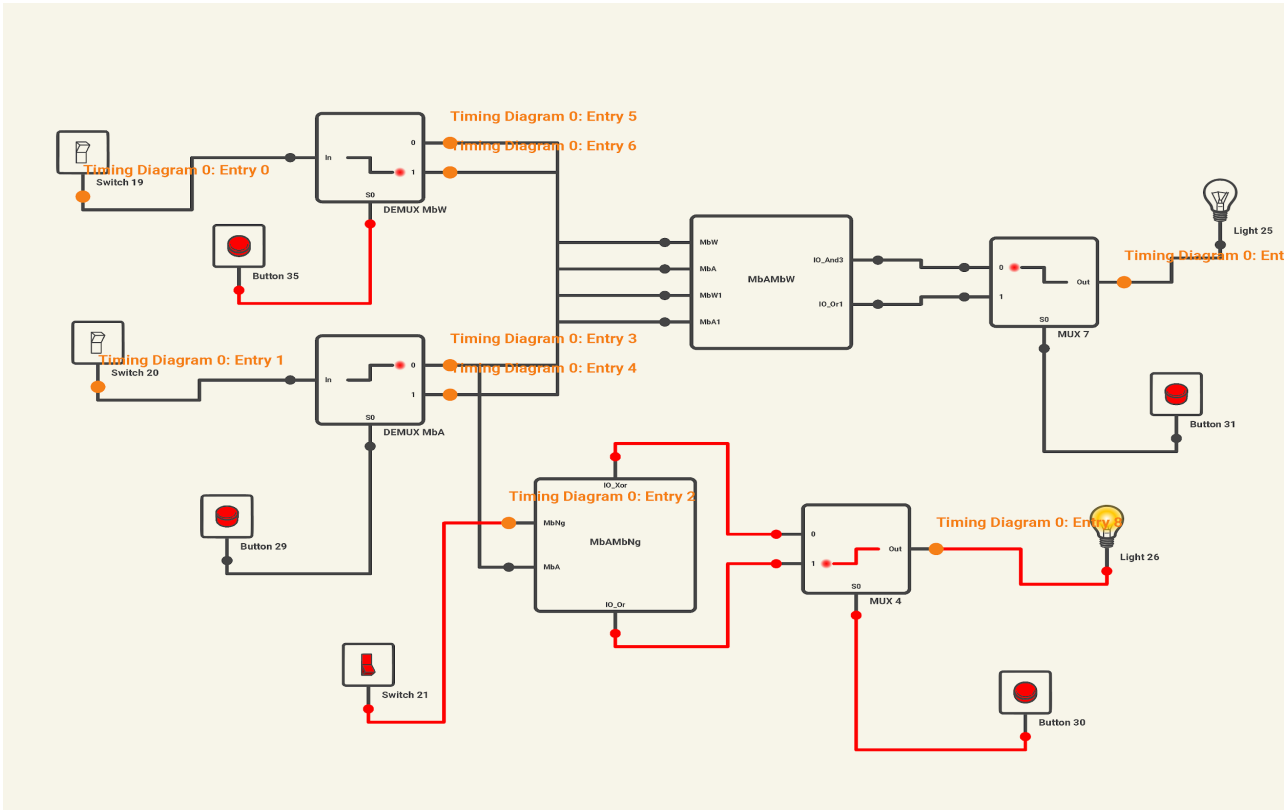


FIGURE 8.

2 TEST CIRCUIT DESIGN

Figure 9.



In this section, I model a circuit to test the functional design of the embedded circuits as at now. The switching test circuit as inputs with light indicators as outputs, the logic gates are put to test to assess the accuracy of functional requirements.
Henceforth, a switch component will function as a logical input to a demultiplexer that forms the switching test circuit and light /led component will function as a logical output to a multiplexer that forms the lightning test circuit.

View on Test Circuit Design: Above Figure

Switch No.	Demux Select	Button No. / Demux	Button No./Mux	Mux select	Light /State
19	1	35/MbW	31/7	0	25/OFF
20	0	29/MbW	31/ 7	0	25/OFF
21	X	X	30/Mux 4	1	26/ON

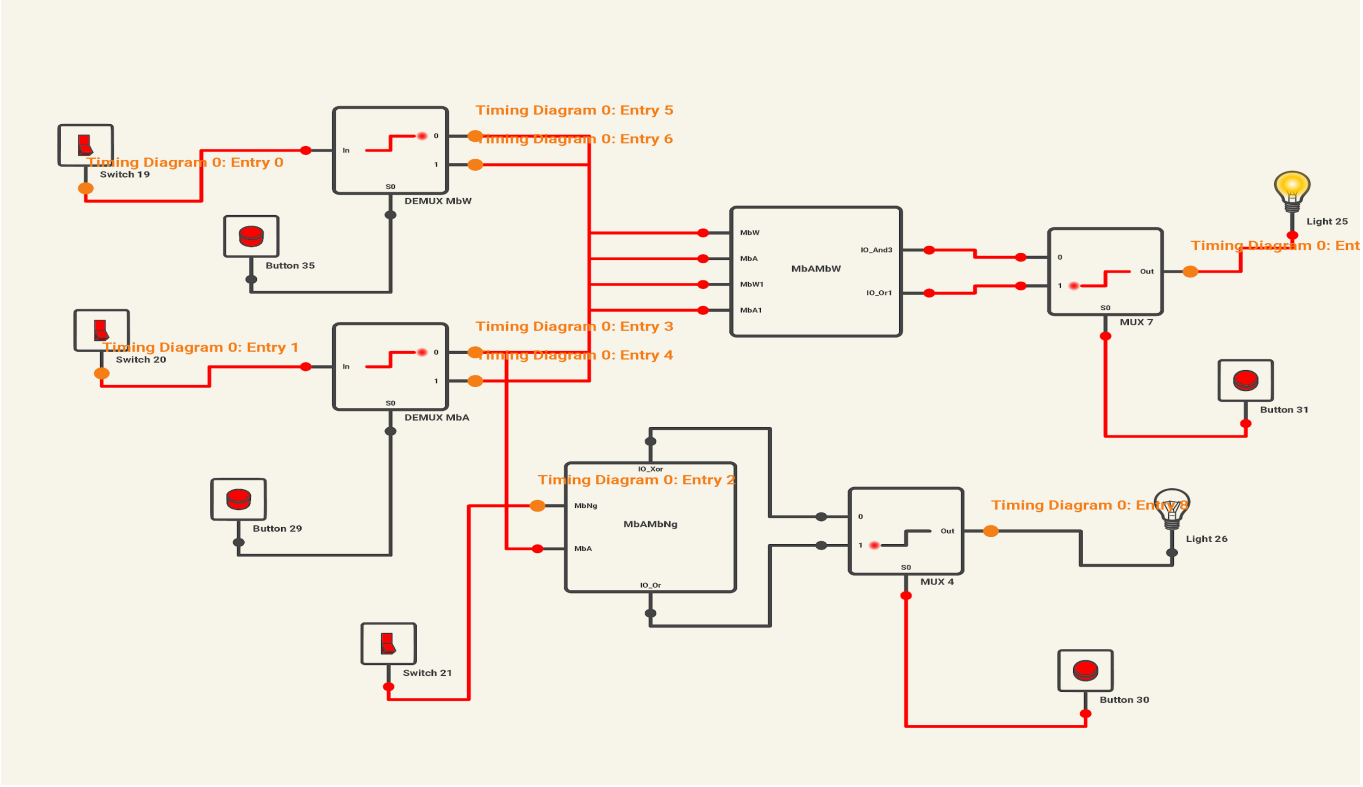
Switch-Lightning State

YTT: YET TO TEST

Switch States			Indicator/ Area	Demux	
19	20	21	Light	MbW	MbA
OFF	ON	ON	YTT	YTT	YTT
ON	ON	ON	ON/Top /Bot	0/1	0/1
OFF	OFF	OFF	YTT	YTT	YTT
ON	OFF	OFF	YTT	YTT	YTT
ON	ON	OFF	YTT	YTT	YTT
OFF	OFF	ON	ON/Bot	1	0
OFF	ON	OFF	YTT	YTT	YTT
OFF	ON	ON	YTT	YTT	YTT

OFF	ON	OFF	ON/Bot	0	0

Figure 10



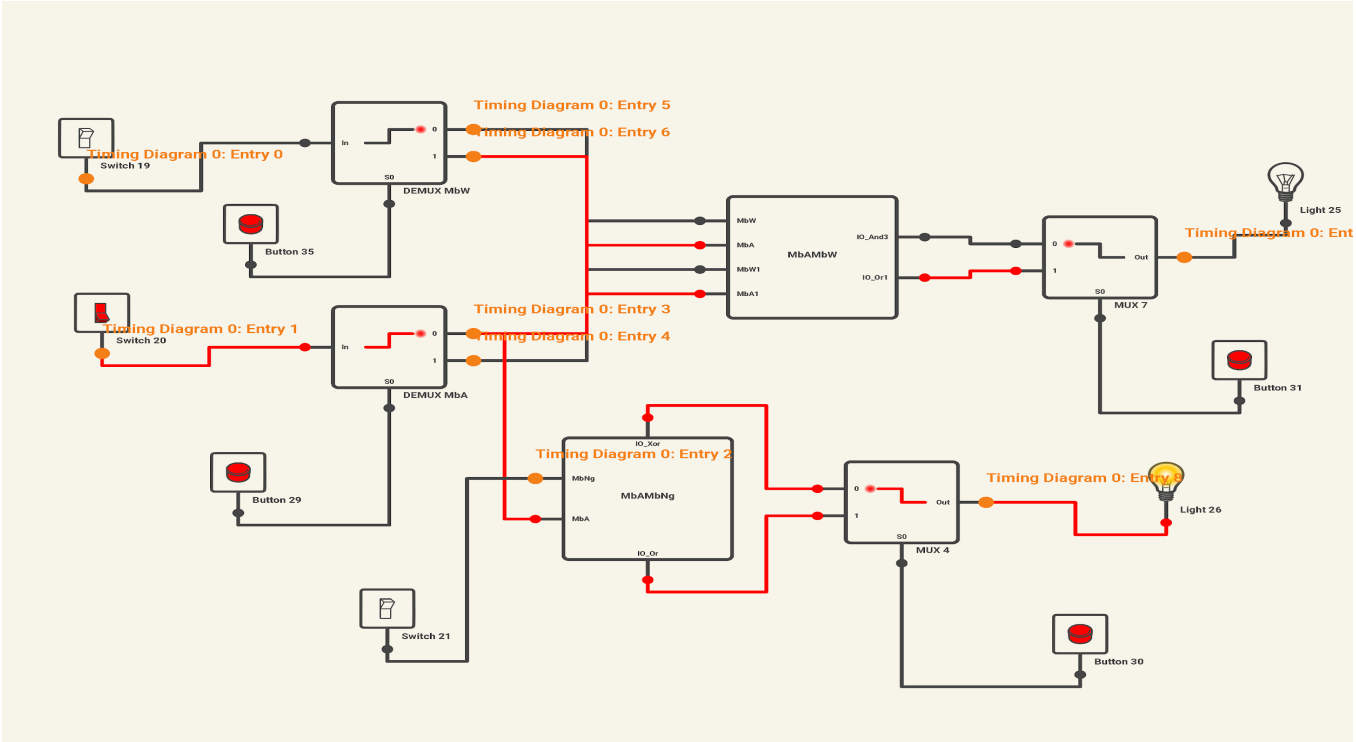


Figure 11.

3 Figures

3.1 Appendices

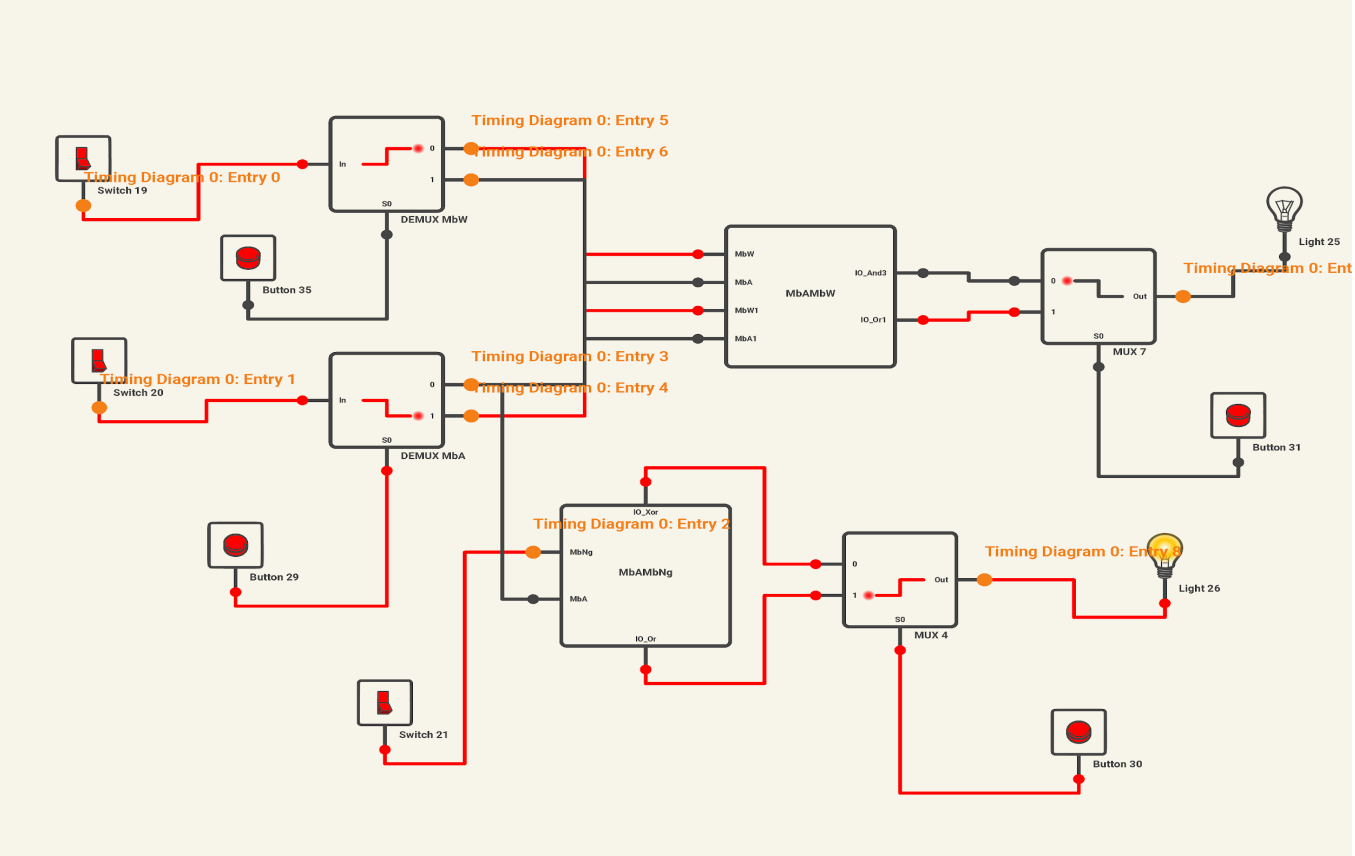


Figure 12.

4 Conclusion

This research looks mainly at essential integrated circuit design based on predicate task involving a Marriage Problem [2,3,7]. The integrated circuits are test designed with switching and (de)multiplexing circuits to make integrated lightning circuits. Finally, a view on several testing scenarios of the two ICs in generalized switch[12,13,14] and Button fashion. [15,16,17]

Figure 12.

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Figure 13.