

Multiplexing and Demultiplexing

Eighth Laboratory Report for CENG 3331

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Abstract

The goal of this lab was to understand the concept of multiplexing and demultiplexing. During this lab, we built a multiplexer circuit and a demultiplexer circuit in Multisim and viewed the outputs generated by both of them. We also answered some questions given to us in the lab manual and also filled out some truth tables.

Write-Up

Introduction

A multiplexer is a combinational circuit that takes multiple inputs and transmits them as one. There are three types of multiplexing: time division, statistical time division, and frequency division. A demultiplexer is another combinational circuit that takes one input and transmits it as many. There are four types of demultiplexing: 1-2, 1-4, 1-8, and 1-16.

Task 1:

We began our experiment by answering some questions given to us in the lab manual.

For question 1, the difference between multiplexing and demultiplexing is that multiplexing takes in multiple inputs and combines them into a single output while demultiplexing does the opposite, it takes in one input and separates it into multiple outputs. For question 2, there are three main types of multiplexing techniques: time division, statistical time division, and frequency division. Time division multiplexing divides time slots and assigns them equally among users and two applications are ISDN and PSTN. Statistical time division multiplexing analyzes priority and determines how much time the users should get, and two applications are UDP and TCP. Frequency division multiplexing divides the frequency bands to each carry a separate signal and two applications are telephone and fiber optic cables. For question 3, three real-life uses of multiplexing are: telephone, data communications, and audio/video broadcasting. Also, three real-life uses of demultiplexing are: control systems, boolean functions, and data acquisition.

Task 2:

For task 2, we continued the experiment by constructing the multiplexer circuit using 16 components: 10 interact-digital constants, 2 grounds, 2 4-input digital multiplexers, and 2 probes. This circuit can be seen in the appendices section under Figure 1. We viewed the output of this circuit by changing the input values of the A and B digital constants on the bottom of the figure. Following this, we filled out a truth table and answered some questions given to us in the lab instructions. For question 1, the completed truth table can be seen under Figure 2 in the appendix. For question 2, 110 0110 translates to 'f' in ASCII, 111 0101 translates to 'u' in ASCII, 110 1110 translates to 'n' in ASCII, and 111 1110 translates to '~' in ASCII.

Task 3:

For this final task, we concluded the experiment by constructing the demultiplexer circuit using 18 components: 4 interact-digital constants, 2 grounds, 2 Vcc power sources, 2 digital demultiplexers, and 8 probes. This circuit can be seen in the appendices section under Figure 3. We viewed the output of this circuit by changing the input values of the A and B digital constants on the left of the figure. Following this, we filled out a truth table and answered some questions given to us in the lab instructions. For question 1, the completed truth table can be seen under Figure 4 in the appendix. For question 2, 1101 1110 translates to a right half block, 1011 1111 translates to a single down and left, and 1101 1011 translates to a full block.

Appendix

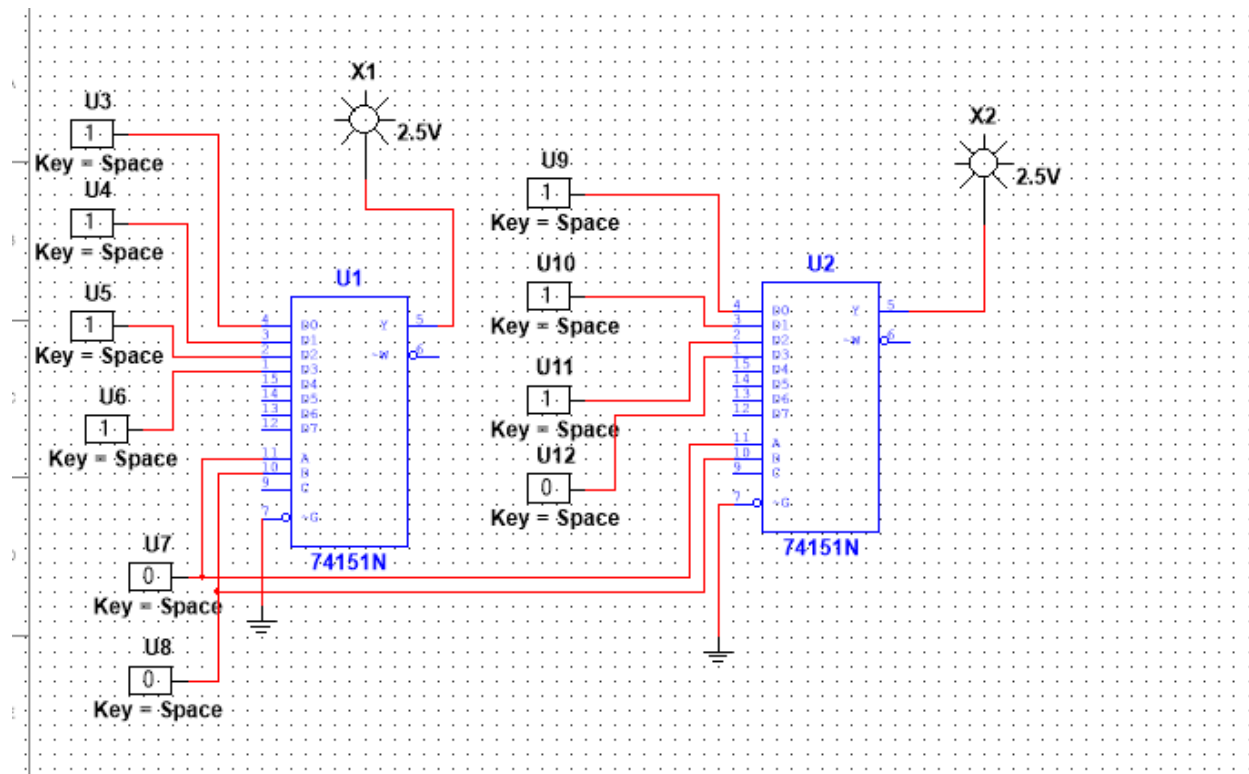


Fig. 1. Circuit Diagram Task 2

A	B	D0 D4	D1 D5	D2 D6	D3 D7	X1 X2
0	0	11	XX	XX	XX	11
1	0	XX	11	XX	XX	11
0	1	XX	XX	11	XX	11
1	1	XX	XX	XX	11	11

Fig. 2. Task 2 Part 1 Truth Table

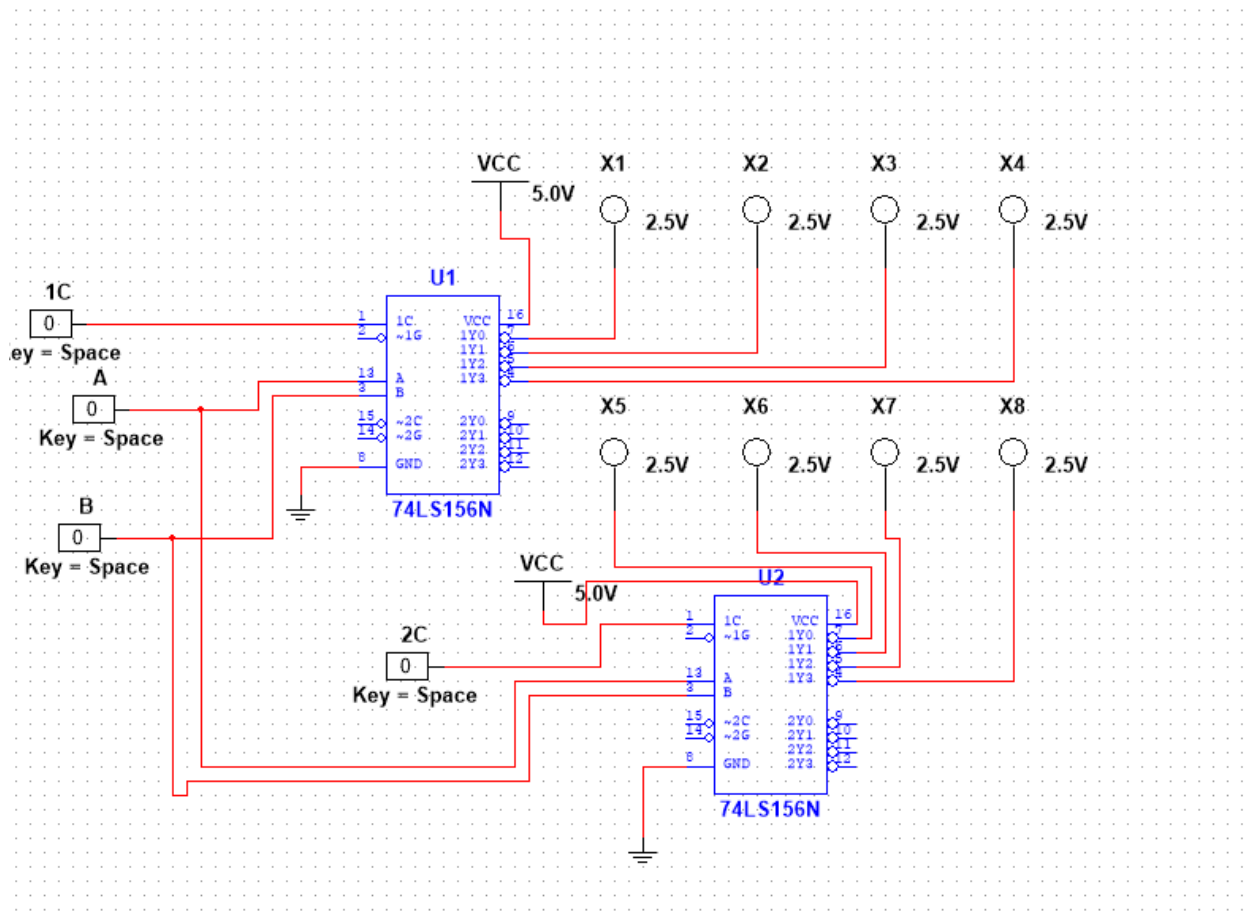


Fig. 3. Circuit Diagram Task 3

B	A	1C 2C	1Y0 2Y0	1Y1 2Y1	1Y2 2Y2	1Y3 2Y3
0	0	10	01	XX	XX	XX
0	1	10	XX	01	XX	XX
1	0	10	XX	XX	01	XX
1	1	10	XX	XX	XX	01

Fig. 4. Task 3 Part 1 Truth Table

Conclusion

In conclusion, this experiment showed us how a multiplexer and a demultiplexer work. It also allowed us to get a deeper understanding on them by answering questions and filling out some truth tables.