



School of Computing
Computer Science Program

CDA 3101

Introduction to Computer Logic

Assignment 5

Rubric

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|--|--|------------------------|--|
| Student Name | | | |
| Assignment Name | Assignment 5 : Decoders, Multiplexers | | |
| Checklist | Maximum Available Points | Received Points | Information |
| | | | |
| Logic diagram of designed circuit using a multiplexer Part A | 15 | | Inputs and outputs clearly marked including bit-weights. Use logic analyzer to prove proper operation. |
| Waveform of multiplexer circuit | 10 | | Waveform via Multisim Grapher View. Must compare to truth table. |
| Logic diagram of designed circuit using a decoder. Part B | 15 | | Inputs and outputs clearly marked including bit-weights. Use logic analyzer to prove proper operation. |
| Waveform of decoder circuit | 10 | | Waveform via Multisim Grapher View. Must compare to truth table. |
| Logic diagram of designed circuit using three decoders. Part C | 15 | | Inputs and outputs clearly marked including bit-weights. Use logic analyzer to prove proper operation. |
| Waveform of decoder circuit | 10 | | Waveform via Multisim Grapher View. Must compare to truth table. |
| Other Documents | 25 | | Truth tables for all circuits and design work. |
| Multisim files | | | See Notes for Scoring |
| Final Grade | Total = | | |

Notes for Scoring:

Note 1: Assignments will not be accepted late.

Note 2: Any assigned quizzes that are associated with this assignment will be taken on Canvas unless otherwise noted.

Note 3: No "print screens" will be accepted from Multisim. Print all documents using the print function within the software.

Note 4: All submitted documents from MultiSim must contain the student's name and UNF n-number printed via the software (insert text). No name and number; no points!!!!

Note 5: You must also submit the Multisim circuit that was used to create the required documents for this assignment. A final grade of "0" will be assigned if the submitted circuit fails to work completely or is not submitted.

Note 6: All waveforms must be derived from the submitted logic diagram associated with the waveform.

Assginment 5: Decoders, Multiplexers

The purpose of this assignment is to help the student become familiar with circuit design using a decoder, and a multiplexer.

Equipment needed:

74LS151 & 74LS138
Other Assorted TTL chips
Multisim Software

Pre-lab:

A) Design a circuit using a single *multiplexer chip (74LS151)* and any other required logic gates to implement the Boolean function given below. Note that you must use a single 8x1 Multiplexer (74LS151).

$$F_{(w,x,y,z)} = \sum_m (1,2,6,7,10,11,12,15)$$

B) Design a circuit using a single *decoder chip (74LS138)* and any other needed logic gates to implement the Boolean functions given below.

$$F_{(x,y,z)} = \sum_m (0,2,4,6)$$

$$F_{(x,y,z)} = \sum_m (1,3,5,7)$$

C) Design a circuit using *three decoder chips (two 74LS138 & one 74LS139)* and any other needed logic gates to implement the Boolean functions given below. Note that the three decoders should function as one 4x16 decoder.

$$F_{(w,x,y,z)} = \sum_m (1,2,5,7,11,12,15)$$

D) Create the truth tables for all three designed circuits. These tables will be used to prove that your assignment circuit is operating correctly. **Submit these documents for grading along with all design work.**

Using the Multisim Software:

A) Implement the three designs using the simulation software. Inputs and outputs should be clearly marked and include bit weights. Feed the decoder and multiplexer circuit inputs with synchronized clocks or word generator as was done in earlier assignments. Use a logic analyzer to display the results vs. the inputs.

B) Print the logic diagrams of the three designed circuits to a “pdf” file using procedures within Multisim. Note that print screens (screenshots) will not be accepted. **Submit these documents for grading.**

C) Use the waveforms to confirm that your designs are correct. **Printout the resultant waveforms for the decoder and multiplexer circuits and submit for grading.**

Grading:

Submit all documents (“pdf”) through Canvas. Scan to “pdf” any handwritten work and include with submitted material. You must also submit the Multisim circuit that was used to create the required documents for this assignment.

Notes for Circuit Designs:

If you wish to combine more than one design on a single Multisim page, note that the input signals can feed multiple circuits without a problem. This should help keep the wiring to a minimum.