School of Computing
Computer Science Program

CDA 3101

Introduction to Computer Logic

Assignment 2

Student Name			
Lab Name	**Assignment 2: Boolean Expressions**		
Lab Checklist	**Available Points**	**Received Points**	**Information**
Logic diagram of original 1st function	10		Equal to the original function. Must be the same circuit that generated the original waveform.
Logic diagram of reduced 1st function	10		Equal to the reduced function. Must be the same circuit that generated the reduced waveform.
Waveform of original 1st function	10		Waveform via Multisim Grapher View. Must compare to truth table.
Waveform of reduced 1st function	10		Waveform via Multisim Grapher View. Must compare to truth table.
Reduction Work	10		Document showing all steps of Boolean Laws used to reduce the original function.
Logic diagram of original 2nd function	10		Equal to the original function. Must be the same circuit that generated the original waveform.
Logic diagram of reduced 2nd function	10		Equal to the reduced function. Must be the same circuit that generated the reduced waveform.
Waveform of original 2nd function	10		Waveform via Multisim Grapher View. Must compare to truth table.
Waveform of reduced 2nd function	10		Waveform via Multisim Grapher View. Must compare to truth table.
Reduction Work	10		K-Map with groupings showing resulting reduced function.
Multisim files			See Notes for Scoring
Final Lab 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.

Introduction : Boolean Expressions.

The purpose of this lab is to help the student to become familiar with Boolean functions, their reduction, and their implementation using TTL logic. Boolean theorems will be used to reduce a function and prove that it is equivalent to the original.

Equipment needed:

Chips: Various TTL Gates (74LSxx)
Multisim Software

Pre-lab:

A) Note the Boolean function given below. Use this function to create a truth table.

$$F_{(a,b,c)} = (A + C)(AB + A\bar{B}) + AC + C$$

B) Use Boolean laws and theorems to reduce the function. Record this new function and use it to create another truth table. The new truth tables should match the original if your new function is the logical equivalence of the given function.

C) Note the Boolean functions given below. Use this function to create another truth table.

$$F_{(a,b,c,d)} = \bar{A}\bar{B}D + \bar{A}B + ACD$$

D) Use a K-Map to reduce the given function. Record this new function and use it to create another truth table. The new truth tables should match the original if your new function is the logical equivalence of the given function.

E) **Submit all documents for grading.** This includes original and resultant truth tables, the Boolean reduction, and the K-Map. Note that all Boolean laws used to reduce the original function must be identified in the document.

Using the Multisim Software:

A) Implement both original functions using only AND, NAND, OR, NOR, and NOT gates (74LSxx). Use the previously derived truth tables to prove that your circuit is working correctly. Print this circuit to a "pdf" file using procedures within Multisim. Note that print screens (screenshots) will not be accepted. **Submit this document for grading.**

B) Implement both reduced functions using only AND, NAND, OR, NOR, and NOT gates. Again, use the derived truth table to prove that your circuit is working correctly. Print this circuit to a "pdf" file using procedures within Multisim. Note that print screens (screenshots) will not be accepted. **Submit this document for grading.**

C) Feed both circuits of each function with the same inputs (clocks or word generator). Also feed a logic analyzer with theses inputs and both outputs. Note that the outputs should track if the circuits are designed and implemented correctly.

D) Print your resultant waveform diagrams using the Grapher View. **Submit these documents for grading.**

E) Include all work showing the reduction of the original equation using Boolean Theorems. **Include this work with the other documents for final grading.**

Grading:

A) 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.