School of Computing
Computer Science Program

CDA 3101

Introduction to Computer Logic

Assignment 4

Rubric

Student Name			
Assignment Name	**Assignment 4 : Adder / Subtractor**		
Checklist	**Available Points**	**Received Points**	**Information**
Printout of logic diagram (Addition Operation).	25		Logic diagram of circuit demonstrating an addition operation. Input and output bit-weights must be identified. Worked example proving displayed operation.
Printout of logic diagram (Subtraction Operation).	25		Logic diagram of circuit demonstrating a subtraction operation.. Input and output bit-weights must be identified. Worked example proving displayed operation.
Wiring diagram of designed circuit	25		Wiring diagram of circuit with gates with pin numbers. Inputs and outputs must be identified and associated with switches and LED's. All input and output bit-weights must be identified
Circuit understanding	*25*		Document explaining how negative numbers are displayed in this circuit. Provide examples.
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.

Assignment 4: Adder / Subtractor

The purpose of this assignment is to help the student become familiar with the design and operation of a simple Adder / Subtractor circuit.

Equipment needed:
> Chips: 74LS83 and other assorted TTL chips
> Logic Trainer
> Multisim Software

Pre-lab:

A)   Using two 4-Bit Binary Full Adder chips (7483) and any other necessary support logic, design an Adder / Subtractor for two 8-bit numbers as discussed in class. The subtractor circuitry will create a 2's complement representation of the subtrahend as demonstrated during class lecture. Note the "bit-weights" in your design.

Using the Multisim Software:

A)   Implement the designed 8 bit Adder / Subtractor design using the Multisim software. The two 8 bit numbers are to be manually applied using inputs that are properly labeled with bit-weights. Outputs (indicator probes) should also be labeled as to their bit-weights. The circuit should be able to add or subtract by use of the control input, and the output should indicated the resultant positive or negative value. Make sure you understand how a negative number is displayed in this circuit.

B)   <u>**Printout two copies of your circuit**</u>. One copy will demonstrate two numbers being added and the second copy will demonstrate two numbers being subtracted. Inputs and outputs must be labeled as such and include bit weights. Include text on the diagram demonstrating the operation. (Ex: 00010110 + 00000011 = 00011001 Addition.) **Submit these documents for grading.**

C) This circuit may be constructed using hardware in the future; therefore, use the CAD software (Multisim) to create a wiring schematic for a *4 bit version* of this circuit. Note that all gates must have pin numbers displayed. Enable "*footprint pin names*" in page properties to accomplish this. **Print this wiring diagram and submit for grading.**

D) On a separate document, explain how a negative number is displayed in this circuit. Provide examples. **Submit this document for grading as well.**

Notes:
   a) No waveforms will be required for this experiment.
   b) Submit all documents ("pdf ") through Canvas. Scan to "pdf " any handwritten work and include with submitted material.
   c) You must also submit the Multisim circuit that was used to create the required documents for this assignment.