**Introduction.**

The objective of this lab experiment consists of developing computer aided design, simulation, testing and schematic entry skills using WinLogiLab software tool.

This lab is to design a 2-bit binary full adder with 4 inputs and 6 outputs, where outputs C2 is when C value is low and C3 when C is high and are values of the adder.

**PRE-LAB**

The pre-lab will be handed in to the instructor at the beginning of the lab.

**Task 1**

Manually design a truth table for a 2-bit binary full adder. Consider that the truth table will have 4 input

**Task 2**

Use WinlogiLab to derive all NAND gate realizations. Capture the logical schematic into a file and hard copy.

**Task 3**

Use WinlogiLab ***DigitalSim*** to draw and simulate the design to validate its functionality. Capture the simulation circuit schematic and simulation session to file and hard copy.

**Task 4**

Using the ***WireDiagm*** on WinlogiLab, draw the physical circuit diagram of the all NAND realization. The 7400, 7410 and the 7420 NAND ICs will be used. Save the circuit diagram to a file and hard copy.

**Task 5**

Draw the physical schematics for the complete circuit using the WinLogiLab ***WireDiagm*** utility. The schematic will consist of

* All inputs to generate input signals (A, B, C, and D).
* The logic circuitry to control the output when C2 is low and when C3 is high.
* A-bit binary interface in BCD to output a 7-segment display as well as a 1- bit binary output to indicate the operation of the adder.

**LAB PROCEDURE**

**Task 1**

Construct the logic sub- circuit that accepts all 4-inputs and generate the outputs when C2 is Low or when C2 is High.

**Task 2**

Experimentally verify the truth table of the 2-bit binary full adder.

**Task 3**

Construct the logic sub-circuit that generates the 4 BCD-format outputs of the full adder. Interface these outputs to the 4 input of the 7-segment display device on the ETS-7000 trainer.

**Task 4**

Experimentally verify the correctness of the overall circuit.

**LIST OF COMPONETS**

Quantities of listed components may vary.

1+ 7400 2-input NAND IC

1+ 7404 Inverter IC

1+ 7410 3-input NAND IC

1+ 7420 4-input NAND IC

**EQUIPMENT TO BE USED**

ETS-7000 Digital Trainer Mixed Signal Scope.