

Lab Assignment 1

ECE/CS 3700 - Fundamentals of Digital System Design
Spring 2018

Assigned Tuesday Jan 16 onwards, Due date: your respective lab sessions during the week Tuesday Jan 30 to Monday Feb 5. Those who attend lab sessions on Tuesdays will check off their design and submit the report by Jan 30, whereas those who attend labs on Mondays should do it by Monday Feb 5.

In this lab assignment, you will get some experience with wire wrapping, interconnecting logic circuits, making use of switches and LEDs, etc. The Lab is in two parts. In the first part, you will practise wire wrapping some switches with LEDs and observe their operation. In the second part, you will implement a Boolean function (optimized SOP forms) using the 74XX ICs, connect them to the switches and LEDs, and excite the entire truth table of the function.

Note: First of all, you need to get introduced to the Lab kit, particularly the NEXYS board and the VmodWW wire-wrapping board. See the documents uploaded on the class website, under the “Lab Assignments” heading. The NEXYS manuals and the 74XX IC data-sheets will all be helpful; a link to these reports is provided on the class web-page. My former TA, Paymon Saebi, had prepared a special KIT INTRO document for you which is also uploaded on the class website.

I. THE FIRST ASSIGNMENT - WIRE WRAPPING SWITCHES AND LEDs

Do the following:

- Orient yourself with respect to the lab kits, the ICs, switches, LEDs, the NEXYS and the wire-wrap board. Pay particular attention to: (i) the push-button switches, (ii) the LEDs, (iii) the power supply and ground connections, and (iv) the ICs.
- Read through the lab kit intro document while paying particular attention to the sections that describe the operation of the switches and LEDs.
- First you will try to connect an LED to a switch and operate this circuit by turning the LED ON and OFF.
- The TAs will demonstrate wire wrapping and the above experiment to you in the lab, to get you moving.

Once you are done with the above, and have gained enough confidence to play with the kit (and to not fry it), you will perform the following experiment.

II. THE SECOND ASSIGNMENT - IMPLEMENTING A BOOLEAN FUNCTION

In this experiment, you are asked to implement a Boolean function, which is defined as follows:

$$F = \Sigma m(1, 3, 4, 6, 7)$$

- Represent the truth table of the above function.
- Derive a minimal sum-of-product (SOP) form representation of the function.

- Using a **minimum number of 74XX ICs** (AND, OR, NOT, NAND, NOR, etc.) implement the function.
- Connect the switches as inputs to the gates and connect the output to an LED.
- Demonstrate the correct functioning of your design to the TAs.
- Submit a report depicting your truth table, its reduced/minimal sum-of-product (SOP) form, and a gate-level block-diagram of your design. Please use a text-editor and a drawing package to prepare your lab report; don't just scan and upload a hand-written document.

Neatness of your wire-wrapping, optimal design, cleanliness, all contribute to your grade! Demo the functioning circuit to your TA, during your respective lab sessions Jan 30 to Feb 5. You should submit an electronic copy of your lab report on Canvas by your due date. During that week, Lab 1 is due and Lab 2 will be assigned.

Have fun.