

# Lab Assignment 1

ECE/CS 3700

Spring 2009

Assigned Mon (Jan 26) onwards, Due date: your respective lab sessions during the week 2/2 - 2/6.

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 and connecting 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 XST board. It has on-board switches, LEDs, among other peripherals, whose pins are connected (mapped) to some of the jumper/connectors. The Xess manuals and the 74XX IC data-sheets will all be helpful; the web-link to these reports is provided on the class web-page.

## I. THE FIRST ASSIGNMENT - WIRE WRAPPING SWITCHES AND LEDs

Do the following:

- Orient yourself with the XST board. Pay particular attention to: (i) the push-button switches named S5, S4, S3; and (ii) the bar-graph LED called D21.
- Consider switch S5 and the first LED in D21. You are asked to wire-wrap a connection between push-button S5 and the bar graph LED 1. The circuit must work as follows. When the button is not pressed, the LED must be ON. When the button is pressed, the LED must go OFF. The way this switch works is when not pressed, it is already pulled up to the supply ( $V_{cc}$ ) via a resistor. When pressed, the switch makes a connection to ground (hence pulling down the voltage to the LED and turning it off).
- **But how will you connect the switch to the LED?** For this purpose, you will have to study the Xess manual, also linked on the web-page ([http://www.xess.com/manuals/xst-manual-v2\\_0\\_0.pdf](http://www.xess.com/manuals/xst-manual-v2_0_0.pdf)). Refer to page 12 schematic, and then to page 13, Pin Listings # 1. Note that the net

barled<1>

is located at pin 68 of the J4 connectors. The schematic for this is shown on pages 27 and 28 of the manual. Similarly, the switch S5 is connected to pin 23 on J4. Therefore, you need to wire wrap a connection from pin 23 (S5) to pin 68 (Bar LED 1). Now connect the power supply and observe the LED switching OFF and ON when the push button is pressed and not pressed.

- The TAs will demonstrate wire wrapping and the above experiment to you, 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 SOP form representation.
- Using a minimum number of 74XX ICs (AND, OR, NOT, NAND, NOR, etc.) implement the function.
- Connect the S3-S5 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 reduction and a block-diagram of your design (something like Fig. 3.22 in the text-book).

Neatness of your wire-wrapping, optimal design, cleanliness, all contribute to your grade! So, have fun.