

# Digital Logic Design Lab #3

## Objectives

Apply Sum of Products (Minterms), Product of Sums (Maxterms) and function minimization to digital logic design, implementation and verification.

## Preparation

Complete the following steps before starting to work on the experiments in this lab:

- 1) Complete lecture and assignment in Boolean Algebra, Functions and Minimization Chapter
- 2) Complete Lab 2 and associated report

## Experiment #1. Intersection Control Signal System

A three way intersection is in need of a traffic signal control system and you have been assigned the task to design and implement the system. Each direction has only one lane and one signal control light (green and red) per Lane. Further, you have been asked to give only one lane go or green sign at a time.

Complete the following steps:

- 1) Sketch of the intersection with variables identified and respective values defined. Clearly describe any additional assumptions or rules you have added.
- 2) Truth Table for the Signal Control System based on input/output defined in previous part.
- 3) Using Sum of Products (Minterms) approach and Logic gates available on class website, design the light control system using the LEDs for the traffic light. Document your work including output expressions, schematics, truth table (do not minimize).
- 4) Using Product of Sums (Maxterms) approach and Logic gate available on class website, design the light control system using the LEDs for the traffic light. Document your work including output expressions, schematics, truth table (do not minimize).
- 5) Compare the SOP and POS designs and explain which one is the optimum design that you recommend for implementation and why.
- 6) Minimize, Implement and test your recommended design from previous part using TinkerCAD.

## **Report Requirements**

This lab and associated report must be completed individually. All reports must be computer printed (formulas and diagrams may be hand drawn) and at minimum:

### **For each experiment include:**

- Clear problem statement; specify items given and to be found.
- Answer experiment questions
- Resulting circuit schematics, simulation results, and other relevant information from the experiment.

### **For the whole report include:**

- A Cover sheet with your name, class, lab and completion date.
- A Lessons Learned section which summarizes your learning from this lab.
- A New Experiment section that has description of a new experiment and the experiment's results. Experiment should be related to material covered in class but not similar to one of the experiments in this lab.