Lab 04 - SOP/POS and KMaps

In this lab, you’ve learned how to apply KMaps, Sum Of Products and Products of sums to simplify digital logic equations. Then, you’ve proven out that they work using an implemented design on your Basys3 boards.

# Rubric

| **Item** | **Description** | **Value** |
| --- | --- | --- |
| Summary Answers | Your writings about what you learned in this lab. | 25% |
| Question 1 | Your answers to the question | 25% |
| Question 2 | Your answers to the question | 25% |
| Question 3 | Your answers to the question | 25% |

# Lab Summary

This lab solidified our learnings on k-maps, SOP, and POS. In this lab, we were tasked with minimizing and optimizing logic equations. We did that by using the truth table to write a KMAP, then grouping all minterms, we created an SOP equation. After ensuring that was correct, we created a POS equation by taking the complement of the SOP equation. Finally, we coded the equations into their respective files and ran all tests and did some manual testing to ensure that everything was correct and working accordingly.

# Lab Questions

## 1 - Why are the groups of 1’s (or 0’s) that we select in the KMap able to go across edges?

The gray code arrangement and periodic structure of K maps allow them to be flexible in how groups of 1’s are selected. By doing this, logic is still maintained and the boolean algebra equation will still be accurate.

## 2 - Why are the names Sum of Products and Products of Sums?

Sum of products refers to the minterms, where individual variables are multiplied together in sections then all added up, creating a sum of the products. Product of sums refers to maxterms, where variables are added together in sections instead, then multiplied all up, creating a product of the sums.

## 3 - Open the test.v file – how are we able to check that the signals match using XOR?

The (led[0] ^ led[1] != 0) operation checks if the outputs are different. This is because the xor logic outputs to 0 if the outputs are the same.

# Code Submission

Upload a .zip of all your code or a public repository on GitHub.