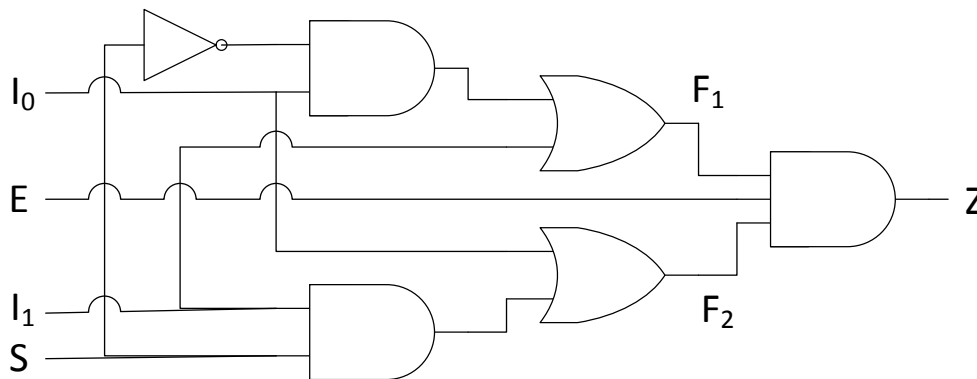## Project 1: Combinational Circuit Analysis

Objectives

Analyze a given combinational logic circuit to determine the input/output relationship of the function. Using schematic capture design tools, implement the logic circuit with an FPGA board. Test the circuit to verify its operation.

Specific Instructions

Given the circuit diagram below:

1. Write an algebraic expression of the output as a function of the input signals.
2. Fill in the truth table to determine the input/output relationship of the function.
3. Implement the circuit in hardware, using the Xilinx design tools and the Spartan3E FPGA on the BASYS Board.
    a. Draw the schematic using standard gates from the symbol library.
    b. Constrain the design with the following pin assignments:

I/O Name	Location	BASYS	BASYS 2
E	SW3	P24	B4
S	SW2	P29	K3
I1	SW1	P36	L3
I0	SW0	P38	P11
Z	LD0	P15	M5

    c. Generate a programming file (.bit) for the FPGA.
    d. Download the design onto the BASYS Board using the Adept tool.
4. Test the circuit on the BASYS Board using the input switches and output LED.
5. Demonstrate the correct operation of your circuit to your professor and obtain his initials on your cover sheet.

6. Write a project report containing the following:
   a. Cover sheet with project name/number, date, and authors names.
   b. Objective section describing what was to be accomplished.
   c. Discussion section showing your Boolean equation, truth table, and circuit schematic.
   d. Results and conclusions.

Truth Table

E	S	I_1	I_0	F_1	F_2	Z
0	0	0	0			
0	0	0	1			
0	0	1	0			
0	0	1	1			
0	1	0	0			
0	1	0	1			
0	1	1	0			
0	1	1	1			
1	0	0	0			
1	0	0	1			
1	0	1	0			
1	0	1	1			
1	1	0	0			
1	1	0	1			
1	1	1	0			
1	1	1	1			