CCE1013 – Computer Logic I

Practical 2

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Design of a 1-bit Full Adder

Objectives

- To design, build and test a 1-bit Full Adder as a combinational logic circuit.

1. Before coming to the lab session

- Make sure you read this document thoroughly;
- Complete parts 2(a) and 2(b).

2. Developing a combinational circuit for a 1-bit Full Adder

The Boolean logic functions for a 1-bit Full Adder are:

$$S = (A \oplus B) \oplus C_{in}$$
$$C_{out} = A.B + C_{in}.(A \oplus B)$$

(a) Write down the truth table for the 1-bit Full Adder.

(b) Produce a schematic using logic gates which represents the Boolean logic function.

(c) Implement the schematic through an electric circuit.

You will need the following components:

- A breadboard
- A 5V DC Power Supply
- An 8-way DIP switch (of which only 3 inputs will be used for A, B and C_{in})
- Five 1 kΩ resistors (2 for the LEDs, 3 for each of the A, B and C_{in} DIP switch inputs)
- Two LEDs to indicate the outputs S and C_{out}
- A 7408 Quadruple 2-input AND gate IC
- A 7432 Quadruple 2-input OR gate IC
- A 7486 Quadruple 2-input Exclusive OR gate IC

Implement the inputs into your combinational logic circuit and the 8-way DIP switch in the same way as in Practical 1.

Once again, connect each of the outputs S and C_{out} to a resistor, which in turn is connected in series to a LED.

Switch ON the power supply, and verify that your circuit works as expected by trying all the combinations of the A, B and C_{in} input switches.

3. Deliverable

Complete parts 2(c) using EITHER Tinkercad OR physical components (subject to availability).

Your report should include:

- The truth table developed in part 2(a);
- The schematic from part 2(b);
- A photo (or screenshot) of the circuit developed in part 2(c);
- Photos (or screenshots) showing the result of each of the possible input combinations.

The deadline for the deliverable is 24th December 2020.