**CO Lab Assignment-1**

**Objectives:**

To gain an understanding of the functioning of an ALU inside a processor by fabricating it in a logic simulator environment and experimenting with it.

**Exercises:**

1. Fabricate a simple 4-bit ALU capable performing the two operations- arithmetic addition and logical AND as shown in the diagram below in a logic simulator environment;
2. Apply all combinations of inputs and the commands as indicated in the table below and record the observed corresponding outputs.
3. Prepare a report containing the **Objectives**, **Exercise Details**, the **Observation Table** and the **Learnings**.

(See below for a sample of the report to be submitted)

A

B

**4-bit ALU**

CYin

4-bit Full Adder

4-bit AND Operator

Cmd

S

CYout

C

A, B – 4-bit input operands

C - 4-bit ALU output

CYin- Carry-in bit to the adder

CYout- Carry-out bit from the adder

Cmd- Command (0 for Add and 1 for AND)

S - Select Signal (ALU performs the operation as per command if S=1)

**Submission:**

1. Convert to pdf and rename the report using your own roll number and the assignment number. For example, if your roll number is CSB19001 and you are submitting Assignment 1, then the filename will be *CSB19001\_LA01.pdf*
2. Upload the report by the end of the same working day. Only if the assignment is submitted on time, the attendance will be recorded. In case of late submissions, the assignment will still be considered for evaluation but no attendance will be given.

**----------------------------------------------------------Sample of Report----------------------------------------------------**

**CO215, CO Lab 2021, Assignment 1**

**Roll number:**

**Name:**

**Objectives:** (same as given above)

**Exercises:** (same as given above)

**Details of work:** (include screenshots of the circuit diagram that you designed on the simulator and describe the details in your own words.)

**Observation Table:** (include the filled in observation table below)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **A** | **B** | **CYin** | **Cmd** | **S** |  | **C** | **CYout** | **Remarks** |
| 5 | 7 | 0 | 0 | 0 |  |  |  |  |
| 5 | 7 | 0 | 0 | 1 |  |  |  |  |
| 5 | 7 | 0 | 1 | 0 |  |  |  |  |
| 5 | 7 | 0 | 1 | 1 |  |  |  |  |
| 5 | 7 | 1 | 0 | 0 |  |  |  |  |
| 5 | 7 | 1 | 0 | 1 |  |  |  |  |
| 5 | 7 | 1 | 1 | 0 |  |  |  |  |
| 5 | 7 | 1 | 1 | 1 |  |  |  |  |
| 10 | 5 | 0 | 0 | 1 |  |  |  |  |
| 10 | 5 | 1 | 0 | 1 |  |  |  |  |
| 10 | 5 | 0 | 1 | 1 |  |  |  |  |
| 10 | 5 | 0 | 0 | 1 |  |  |  |  |
| 15 | 0 | 0 | 1 | 0 |  |  |  |  |
| 0 | 15 | 0 | 1 | 1 |  |  |  |  |
| 14 | 7 | 0 | 0 | 1 |  |  |  |  |
| 14 | 7 | 1 | 0 | 1 |  |  |  |  |
| 8 | 2 | 1 | 0 | 1 |  |  |  |  |
| 15 | 15 | 0 | 0 | 1 |  |  |  |  |
| 15 | 15 | 0 | 1 | 1 |  |  |  |  |
| 15 | 15 | 1 | 0 | 1 |  |  |  |  |
| 15 | 15 | 1 | 1 | 1 |  |  |  |  |

**Learnings:** (write in your own words what you have learned from the experiment)