Homework 3
Arithmetic Logic Unit

In this homework, you will design a 32-bit Arithmetic Logic Unit (ALU) as detailed in **Section 5.2.4 of the reference book**. This ALU will play a crucial role in the ARM microprocessor that you will construct in later labs.

Your circuit should include the following module declaration:

```
module Homework_3(input logic [31:0] a, b,
input logic [1:0] ALUControl,
output logic [31:0] Result,
output logic [3:0] ALUFlags);
```

ALUControl 1:0	Function
00	Add
01	Subtract
10	AND
11	OR

Table 1: ALU Control Bits and Corresponding Functions

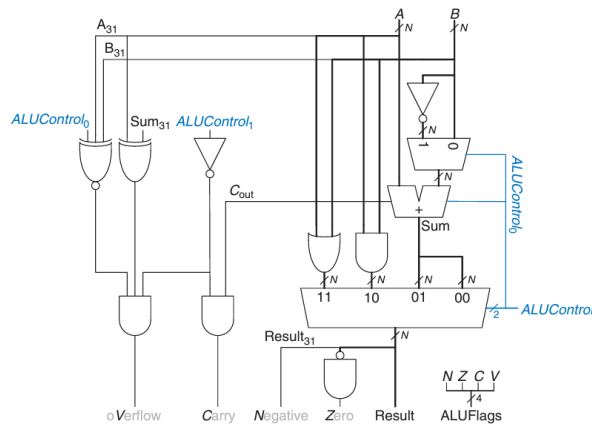| ALUFlags Bit	Meaning
3	Result is negative
2	Result is 0
1	The adder produces a carry out
0	The adder results in overflow

Table 2: ALU Flag Bits and Their Meaning

Figure 1: N-bit ALU with output flags. Figure 5.17 from your reference book

Before submitting to Inginious :

1. Test your implementation as you learned it in the lab, using a testbench.

2. Check that the name of your main module in your .sv file matches the module description on Inginious. Submit your entire design **including the module definition** on Inginious to be graded.

3. You get **three attempts** before you **start losing 10% of the grade** for each new **failed attempts**.