

EECS 140: Prelab 09

Arithmetic Logic Unit

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Date submitted: 05/01/2022

1. (Research on your own) What two different sets of operations can an ALU do?

The two different operations that ALU can do is arithmetic, logical, bitwise, and shift.

Arithmetic operations are addition, subtraction, multiplication, and division. The logical operations consist of comparing one object to another and determined whether it is greater than, less than, greater than or equal to, less than or equal too, or equal to. Bitwise operations include AND, OR, XOR, AND, NOR. Shift operations can do boolean subtraction and division, where it can manipulate individual bits.

2. (Research on your own) What's the best use for an ALU inside a CPU pipeline: Instruction Fetch (IF), Instruction Decode (ID), Execute (EX), Memory Access (MEM), or Memory Write Back (WB)?

The best use case for an ALU inside of a CPU pipeline is Execute (EX)

3. (Current Lab) Which operations are we programming in our ALU?

We are performing addition, subtraction, multiplication, division, AND, OR

4. What previously implemented components are we using to create our ALU?

The components are memory, specifically storage registers, operational logic and sequencing logic, which is a combinational circuit that performs arithmetic and bitwise operations inside of the ALU.

5. A bitwise operator affects each pair of significant bits in the operands. The bitwise OR operation result for decimals 610 (01102) OR 510 (01012) is 710 (01112). What is the bitwise AND operation result for decimals 510 AND 910?

A	B	Bitwise AND
0	0	0
0	1	0
1	0	0
1	1	1

$$5_{10} = 0101_2$$

$$9_{10} = 1001_2$$

$$0101_2 \text{ Bitwise AND } 1001_2 = 0001_2$$

$$5_{10} \text{ Bitwise AND } 9_{10} = 1_{10}$$