

1.2.4 ALU

2. We should need to determine overflow on specific operations which is mentioned below.

ALU CONTROL [3:0] = $\begin{array}{l} 0010 \\ 0011 \\ 0100 \\ 0101 \\ 0110 \\ 0111 \end{array}$

if we placed them on the K-map

z w \Rightarrow ALU-CONTROL [3, 2, 1, 0]			
x y	z	w	t
0 0	0	1	3
0 1	0	0	1
1 0	4	7	6
1 1	1	1	1
	12	13	15
	0	0	0
	8	9	11
	0	0	0

Overflow occurs when $C_{out} \neq C_{in}$

which means $\frac{1}{C_{in}=0} + \frac{0}{C_{in}=1} \leftarrow C_{in}=1$ $\Leftarrow x'z + x'y \Rightarrow x'(z+y) \Rightarrow \underline{\underline{ALU_3 \cdot (ALU_2 + ALU_1)}}$

$$C_{out}=1 \quad \frac{1}{1} \quad 0$$

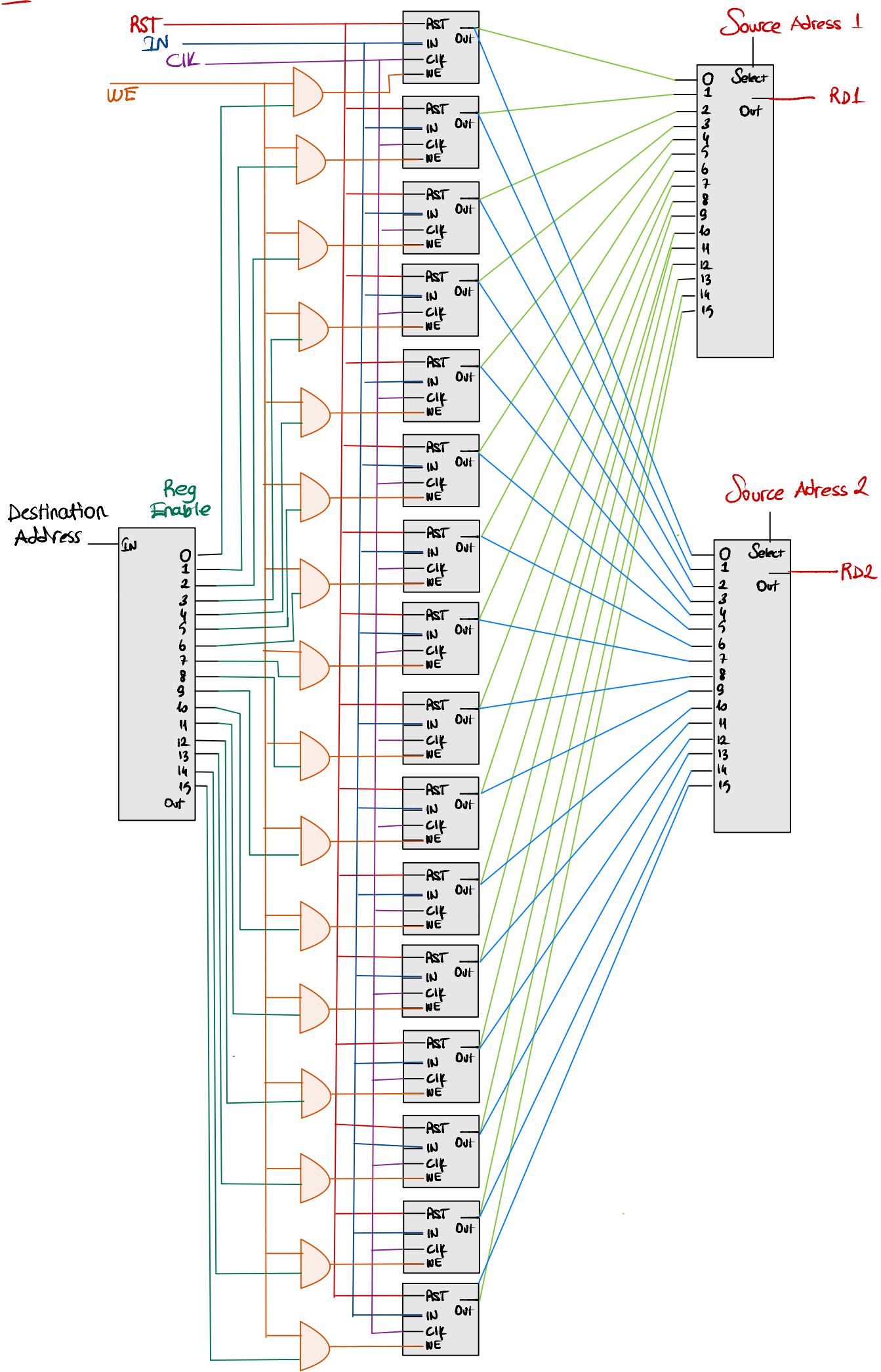
$$\frac{+ 0}{01} \quad C_{out}=0$$

when $A_{n-1} = B_{n-1}$

Pre Result $\neq A_{n-1}$

→ It is 1 bit bigger than SRC A and SRC B

1.3 REGISTER FILE



1.4 DataPath

- How many control pins for the control signals does your architecture have?

There are 3 input pins in my design which are ENABLE, OPCODE and Input-Data

- How many different control signals does your architecture use to perform the desired tasks?

There are lots of control signal in my design. These are mux, alu, shifter, we shout control signal. Also I connected ALU output to shifter input and shifter output to input port of the shifter-register. since I want to use shifter output I created this part with write enable and reset register and I connected it to 0 port of the mux-2.

- Can you reduce the number of control pins? Why not, or how?

Since I have lots of control signal, I embedded them to datapath. Therefore, I cannot reduce them anymore.

- Write down the sequence of the control signals for all operations. How many clock cycles do these operations take?

OP = 0

SELECT_L = 1
SELECT_2 = 1
ENABLE = 1
ALU_CTRL = 111

o alls

→

OP = 1

SELECT_L = 1
SELECT_2 = 1
WE_Shifter-reg = 1
ALU_CTRL = 1101 → B
Shifter Ctrl → 00
Shamt → 1

SELECT_L = 1
SELECT_2 = 0
WE_Shifter-reg = 1
ALU_CTRL = 1101 → B
Shifter Ctrl → 00
Shamt → 2
WE = 1

SELECT_L = 0
SELECT_2 = 0
WE_Shifter-reg = 0
ALU_CTRL = 0100 → B

↓
Empty

All, 0s ←

OP = 2

SELECT_L = 1
SELECT_2 = 1
WE_Shifter-reg = 1
ALU_CTRL = 1101 → B
Shifter Ctrl → 01
Shamt → 4

SELECT_L = 1
SELECT_2 = 0
WE_Shifter-reg = 1
ALU_CTRL = 1101 → B
Shifter Ctrl → 00
Shamt → 2
WE = 1

SELECT_L = 0
SELECT_2 = 0
WE_Shifter-reg = 0
ALU_CTRL = 0100 → B

↓
Empty

All, 0s ←