COA LAB6

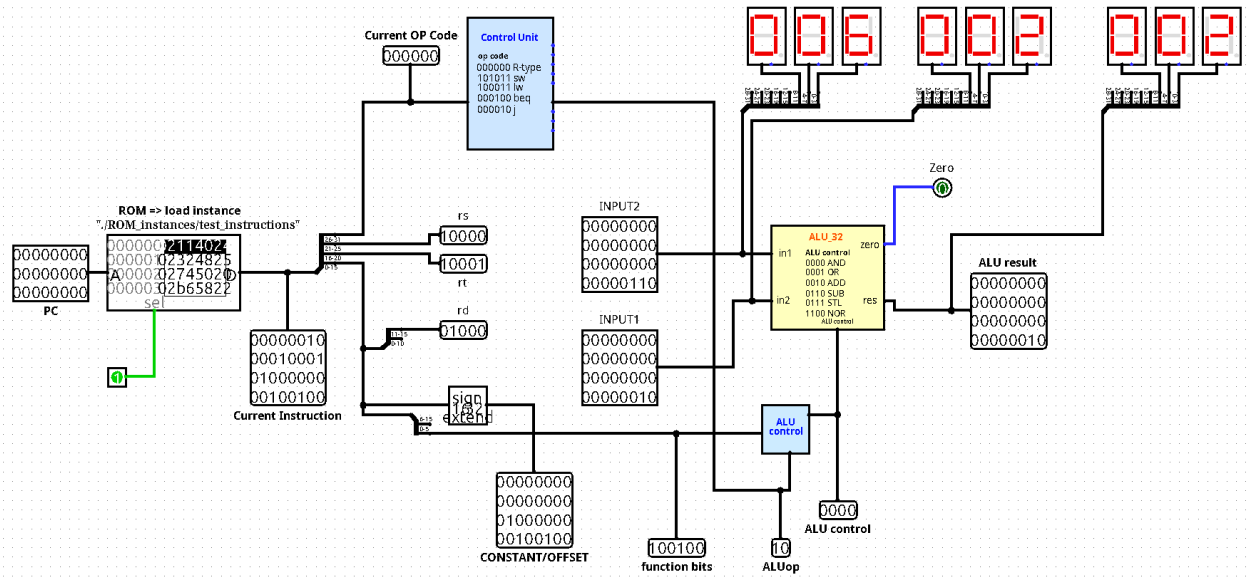
NAME : Shreekar
ROLL : B23CS1069

These are different instructions with their way of using ALU

R-type :

0. and $t0, $s0, $s1

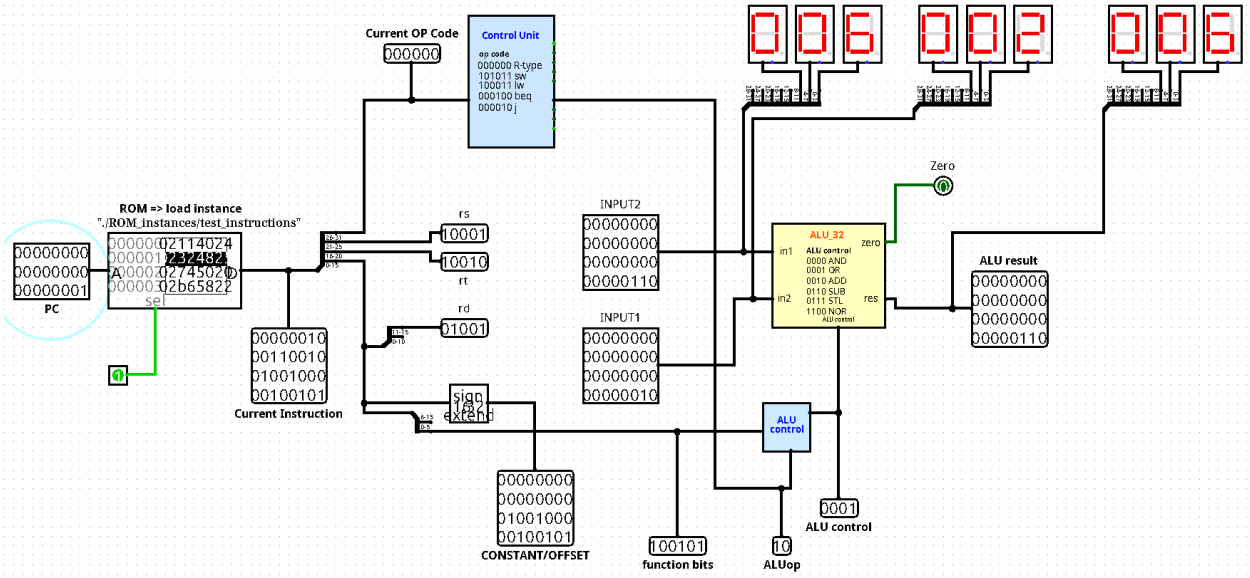
and: 000000 10000 10001 01000 00000 100100 : 02114024



1. Here PC is index of word or instruction which should come in “Current Instruction”
2. INPUT1 and INPUT2 are A and B (32 bits input)
3. Blue components are control units
4. Yellow component is ALU
5. HEX number Display is used to make human readable values for A, B and result.
6. Now there are Few examples for instruction and their ALU use
7. After Example I will show circuit diagram for abstract component

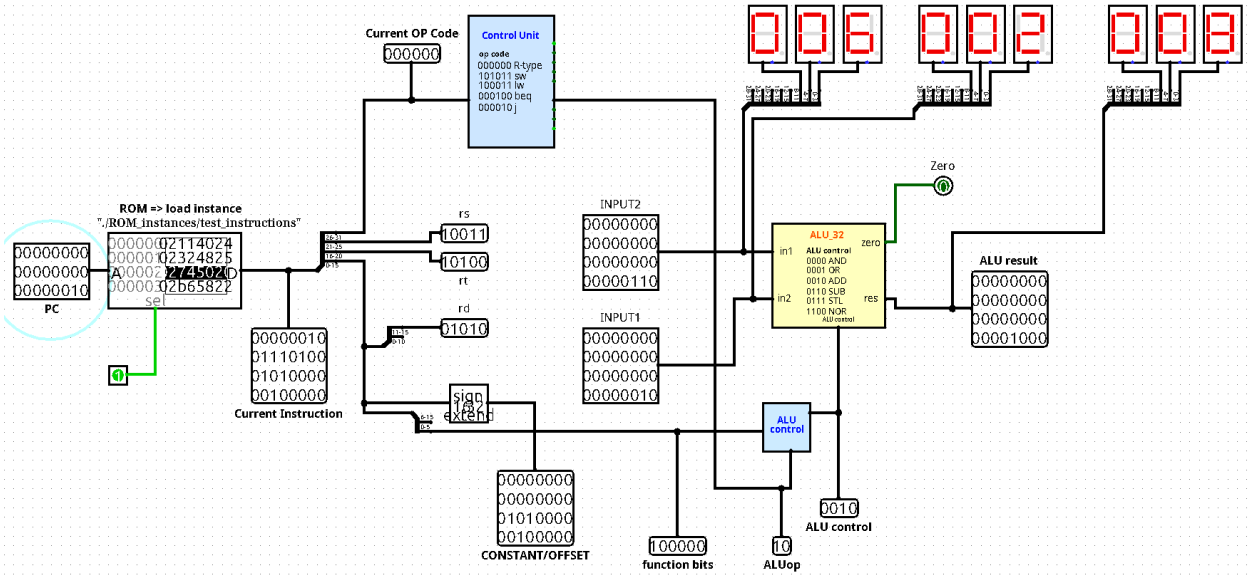
1. or $t1, $s1, $s2

or : 000000 10001 10010 01001 00000 100101 : 02324825



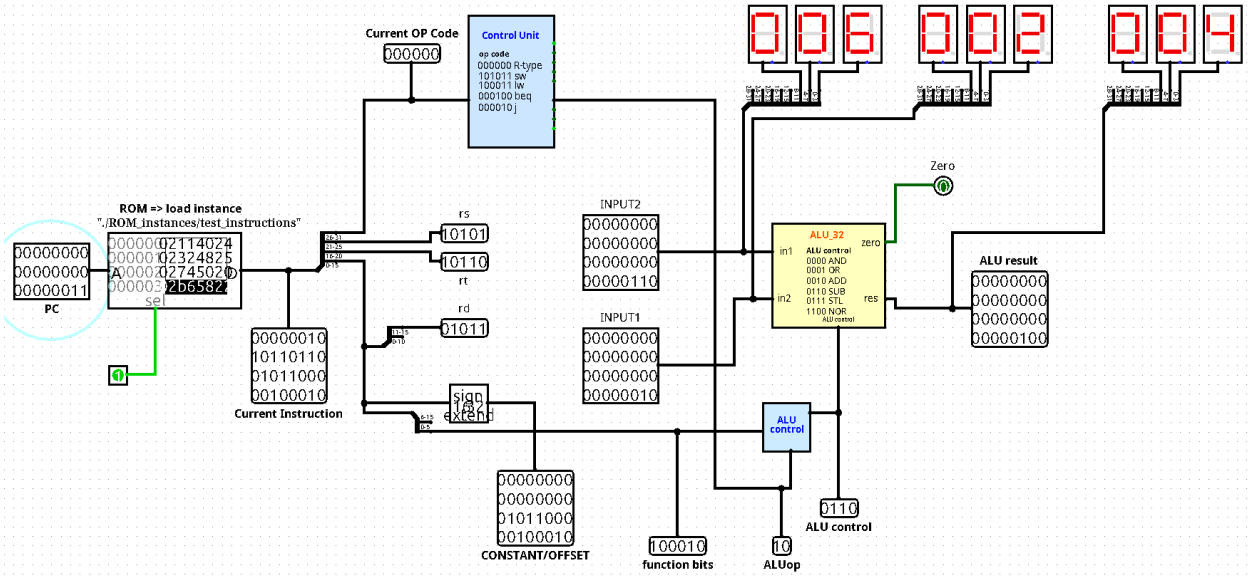
2. add $t2, $s3, $s4

add: 000000 10011 10100 01010 00000 100000 : 02745020



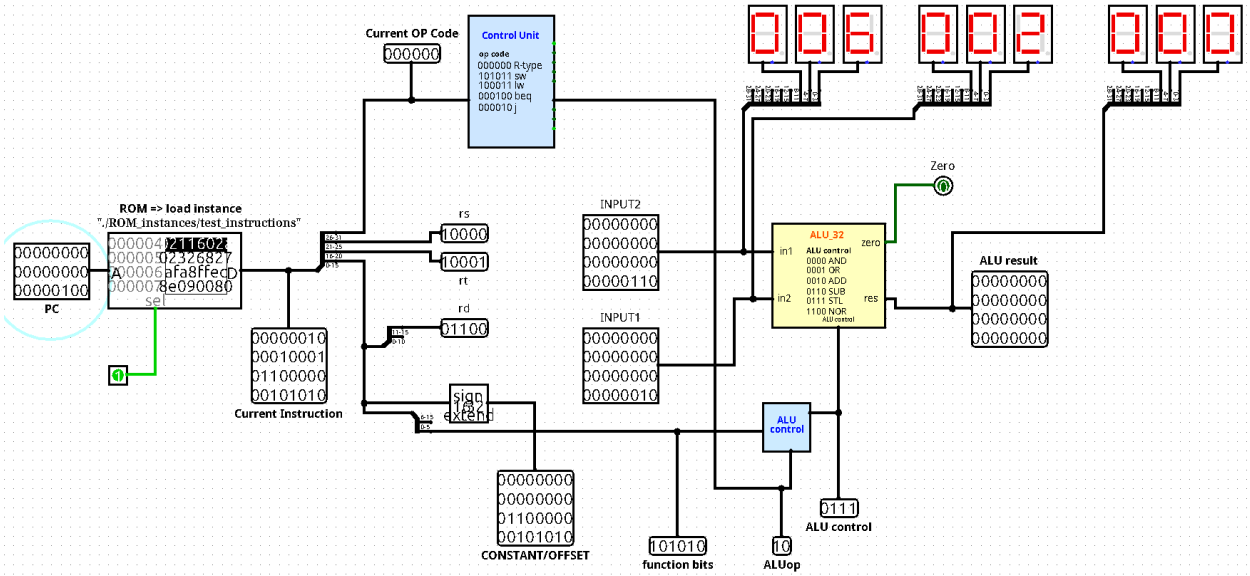
3. sub $t3, $s5, $s6

sub: 000000 10101 10110 01011 00000 100010 : 02B65822



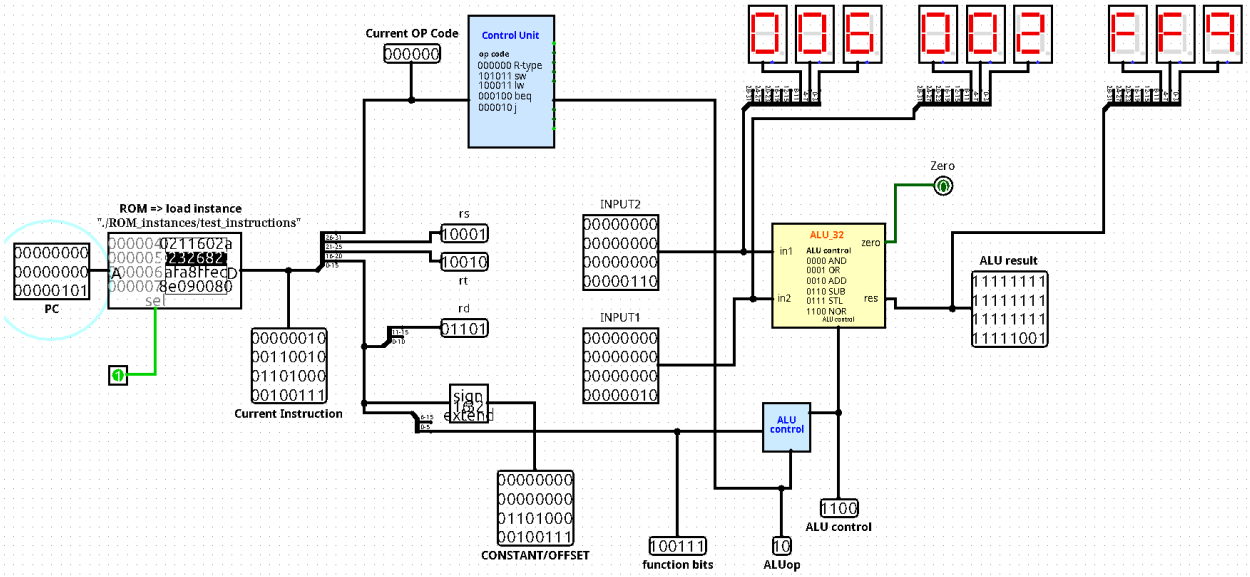
4. slt $t4, $s0, $s1

slt: 000000 10000 10001 01100 00000 101010 : 0211602A



5. nor $t5, $s1, $s2

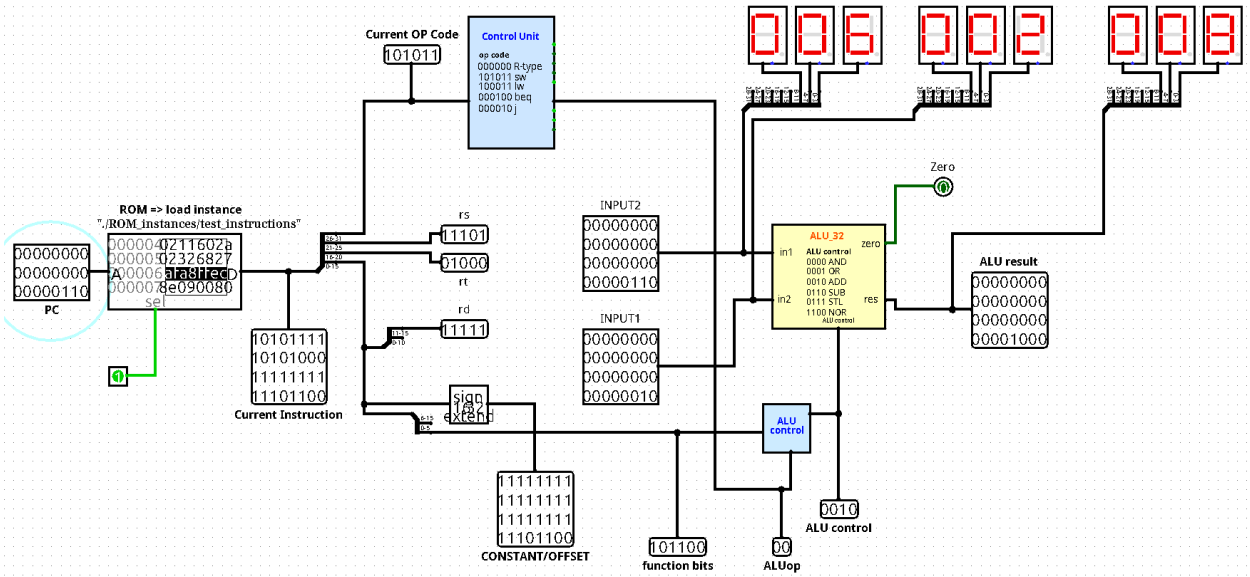
nor: 000000 10001 10010 01101 00000 100111 : 02326827



I-type :

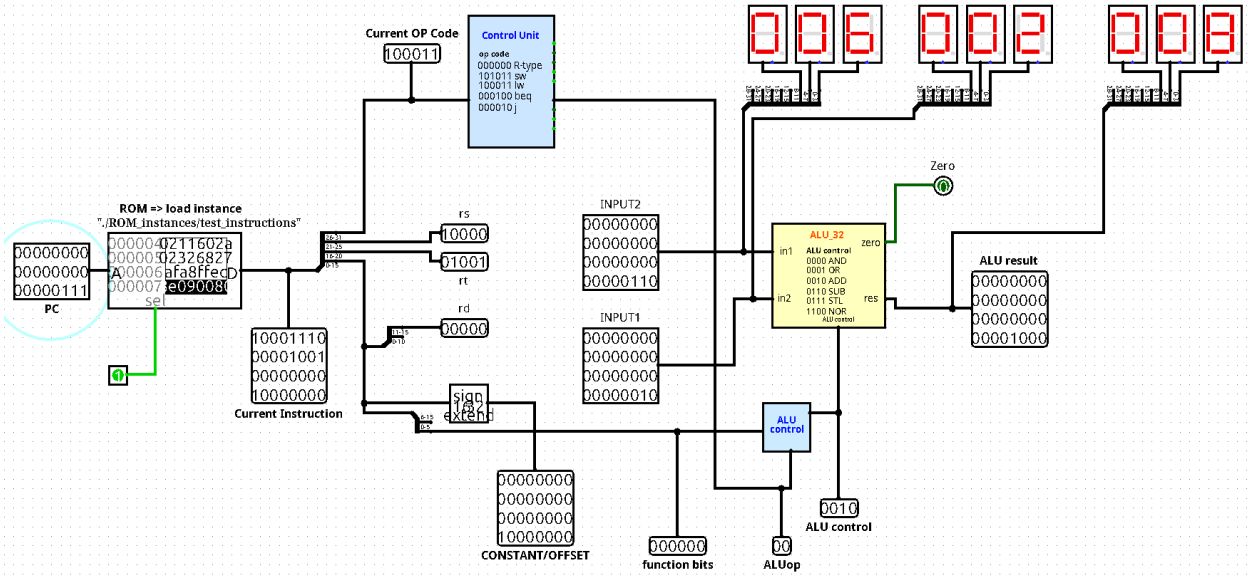
6. sw $t0, -20($sp)

sw : 101011 11101 01000 1111111111101100 : AFA8FFEC



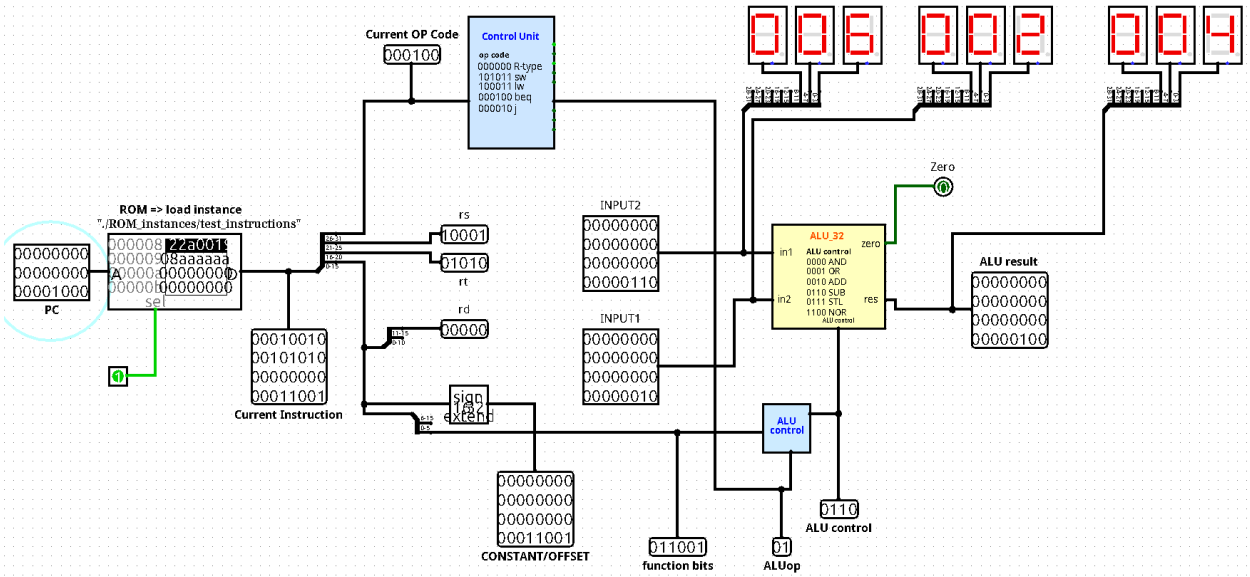
7. **lw $t1, 128($s0)**

lw : 100011 10000 01001 0000000010000000 : 8E090080



8. **beq $s1, $t2, 25**

beq: 000100 10001 01010 0000000000011001 : 122A0019



J-type :

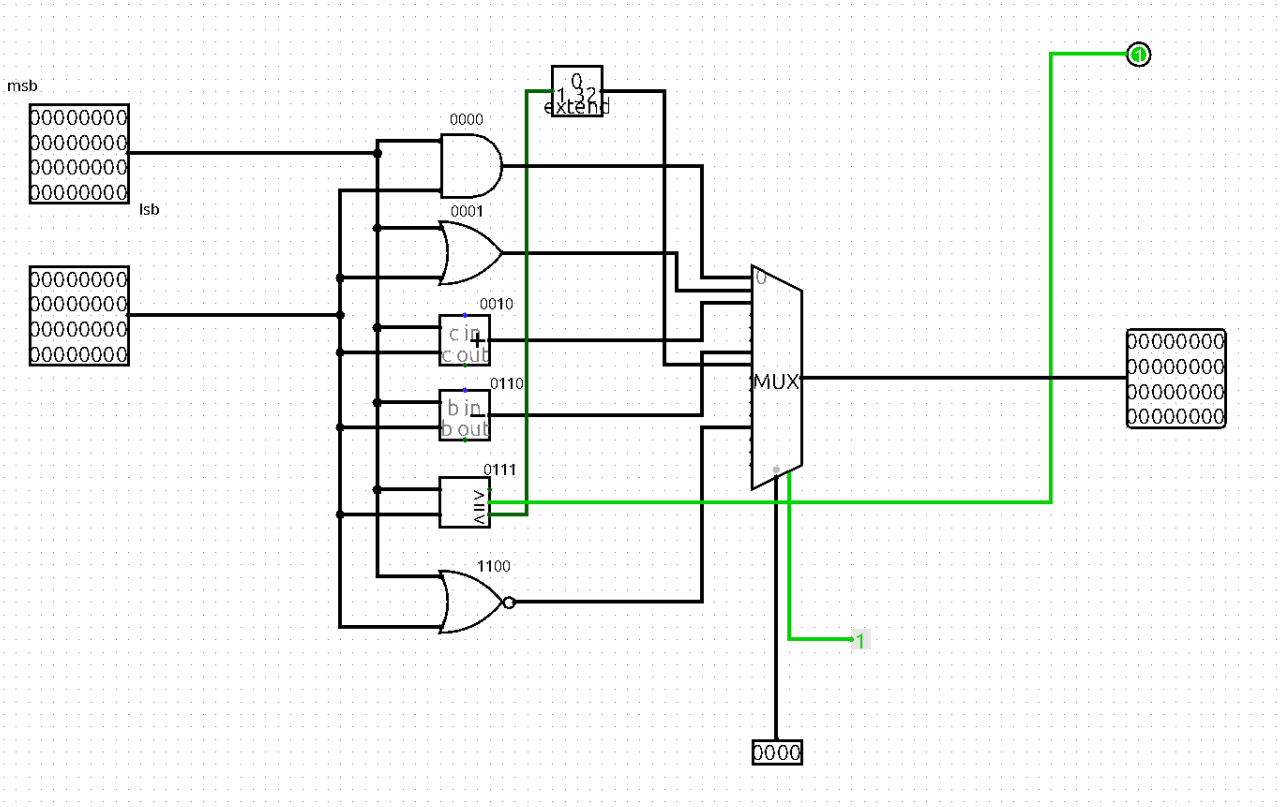
9. **j 0x02AAAAA**

j: 000010 00101010101010101010101010 : 08AAAAAA

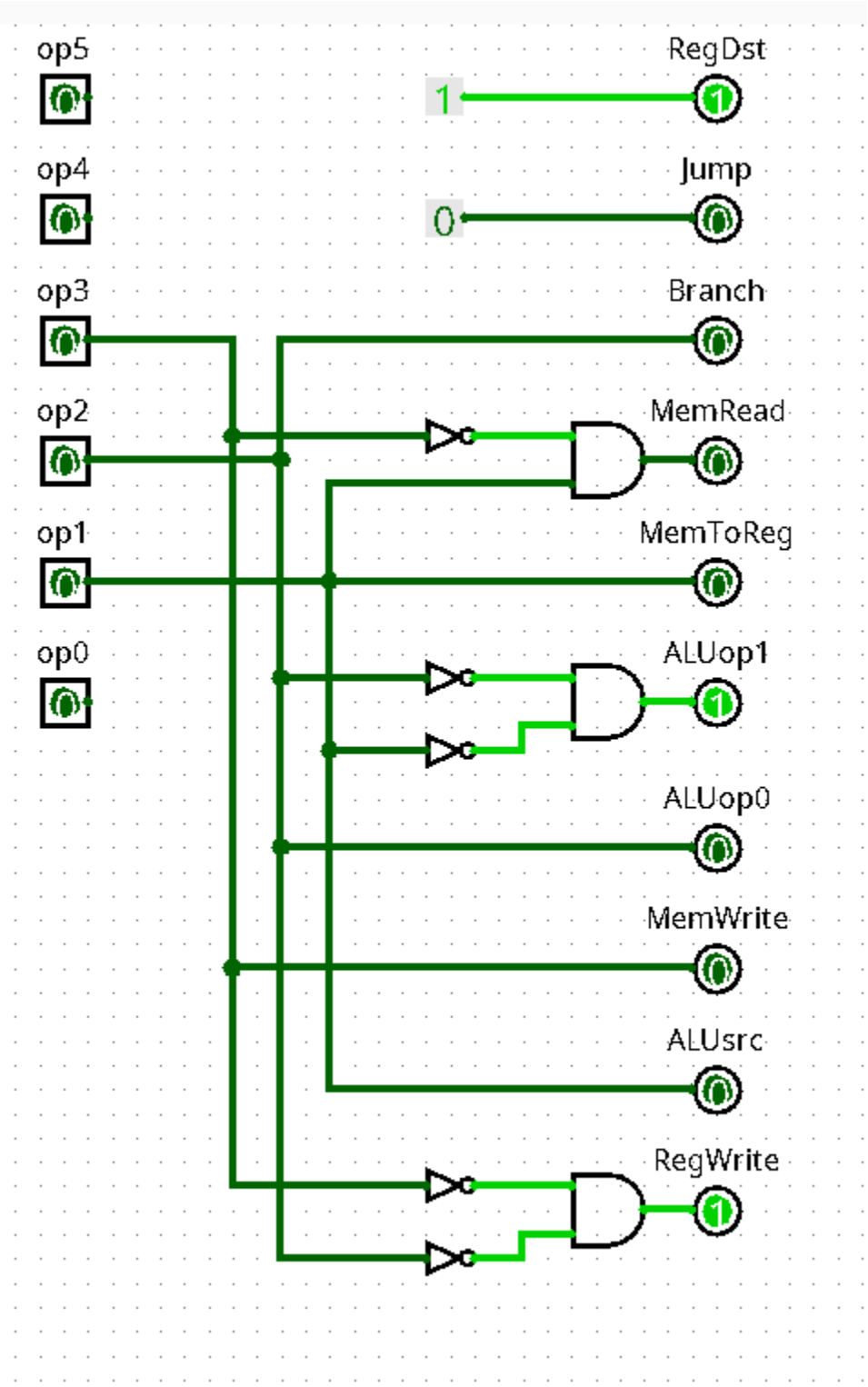
****ALU is NOT USED**

Inside the Components :

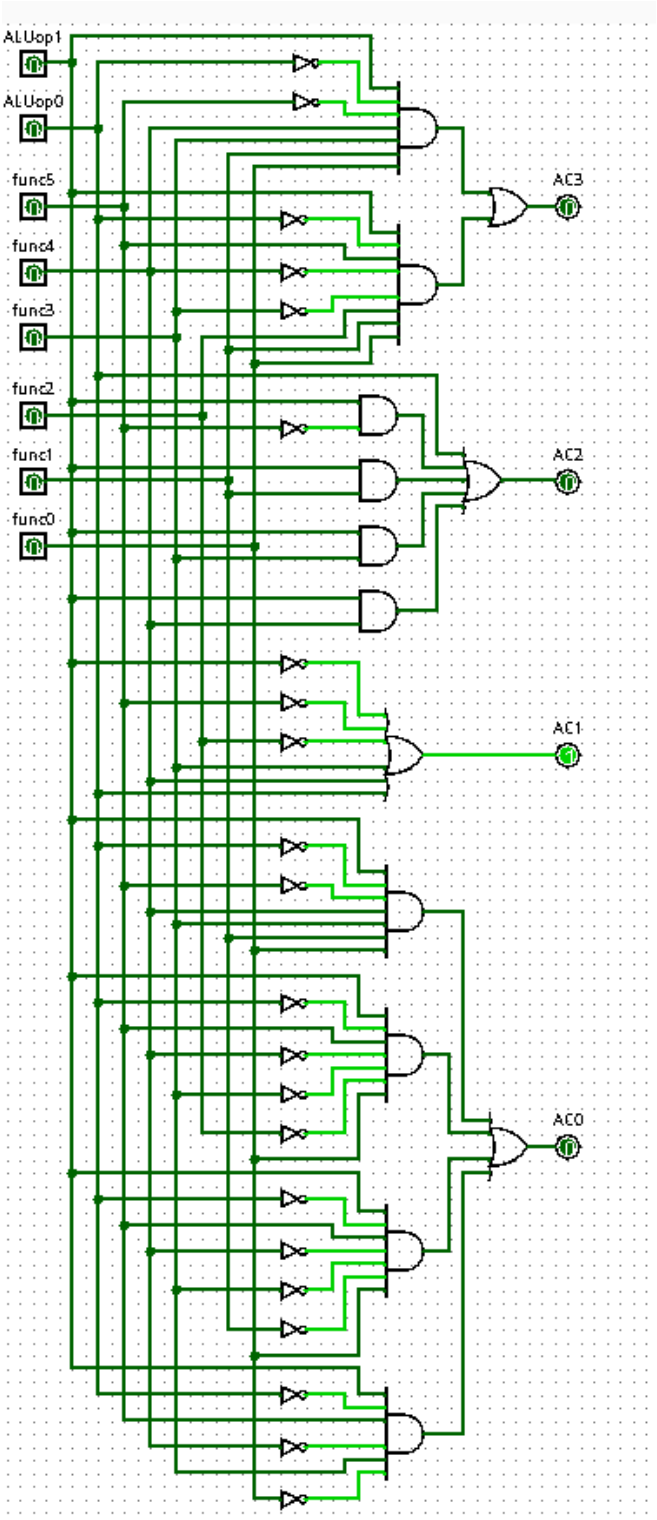
1. ALU :



2. Control Unit :



3. ALU Control Unit :



Reference : MIPS class notes

ALU control and operation

Instruction opcode	ALUOp	Instruction operation	Funct field	Desired ALU action	ALU control input
LW	00	load word	XXXXXX	add	0010
SW	00	store word	XXXXXX	add	0010
Branch equal	01	branch equal	XXXXXX	subtract	0110
R-type	10	add	100000	add	0010
R-type	10	subtract	100010	subtract	0110
R-type	10	AND	100100	AND	0000
R-type	10	OR	100101	OR	0001
R-type	10	set on less than	101010	set on less than	0111

Instruction	Opcode	RegDst	RegWrite	ALUsrc	MemWrite	MemRead	MemtoReg	Branch	Jump
Rtype	000000	1	1	0	0	0	0	0	0
Sw	101011	X	0	1	1	0	X	0	0
Lw	100011	0	1	1	0	1	1	0	0
Beq	000100	X	0	0	0	0	X	1	0
J	000010	X	0	X	0	0	X	X	1