COMP30080 – Assignment 5

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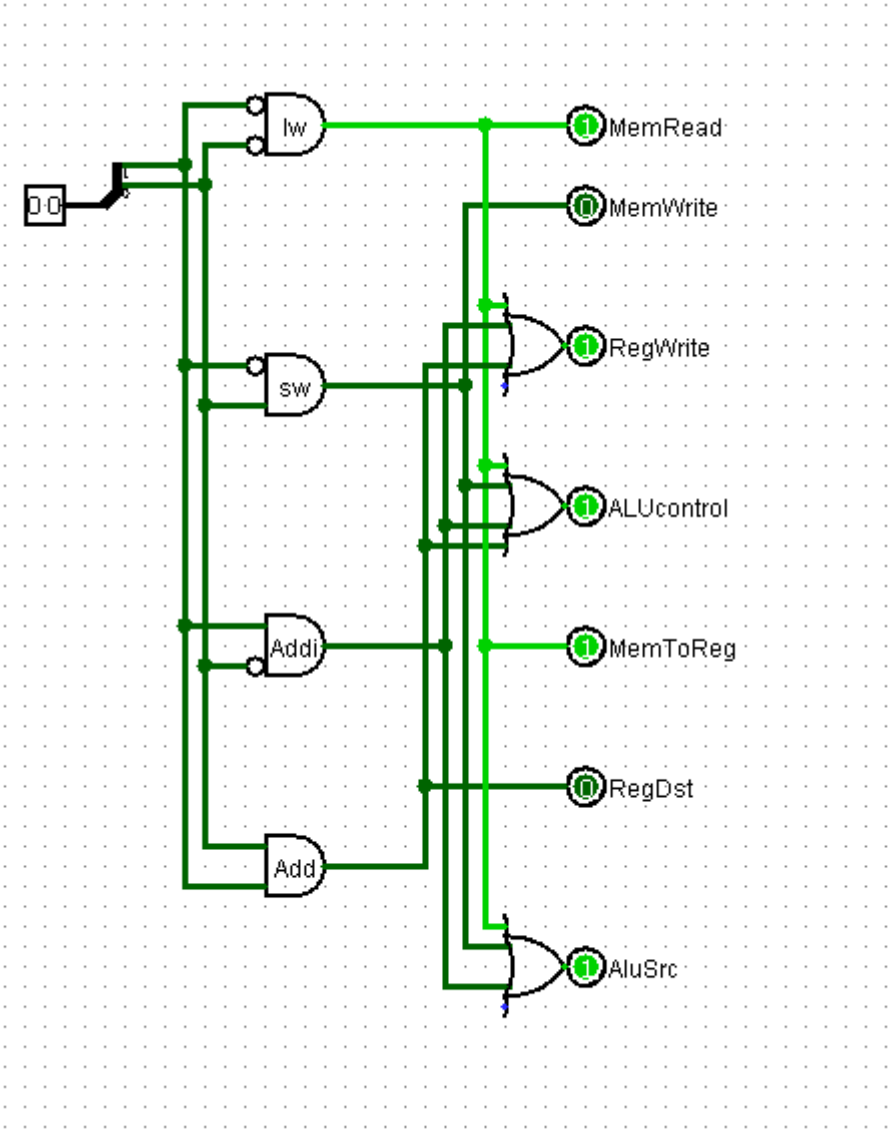
Part 1:

Truth Table for the Control Unit of the Processor:

Operation	MemRead	MemWrite	RegWrite	ALUControl	MemToReg	RegDst	ALUSRC
Lw 00	1	0	1	01	1	0	1
Sw 01	0	1	0	01	0	0	1
Add 11	0	0	1	01	0	1	0
Addi 10	0	0	1	01	0	0	1

Control Circuit Implementation (representation of Truth Table):



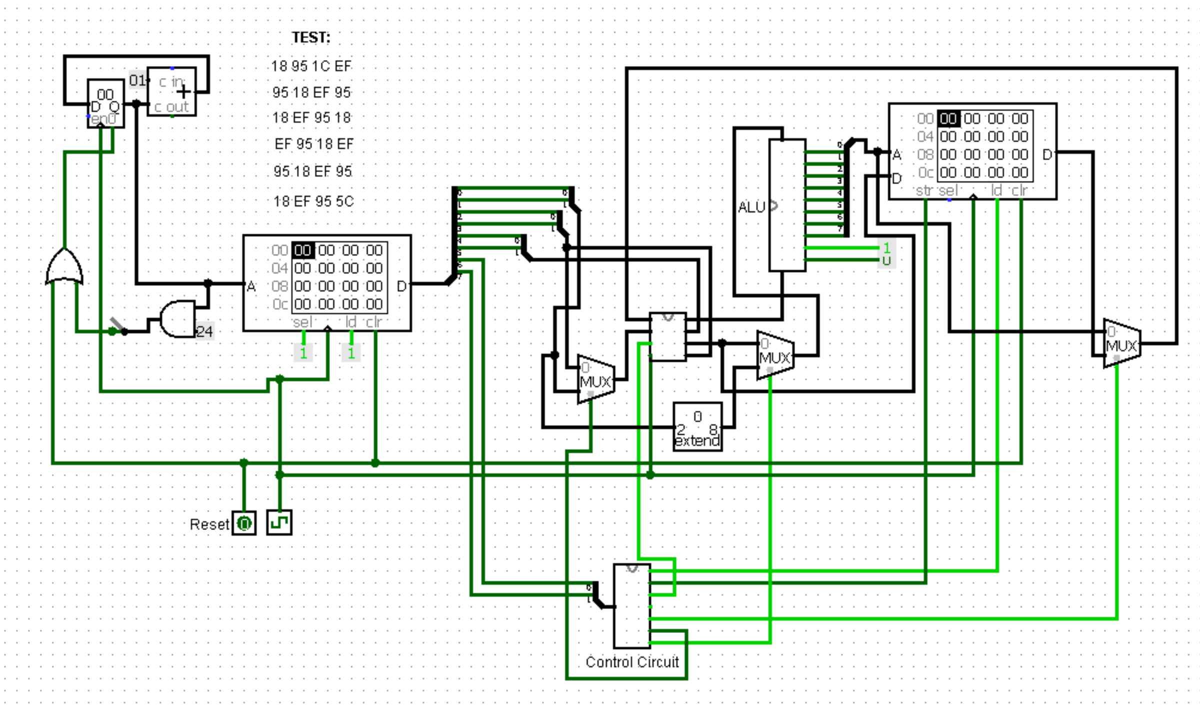
Part 2:

Structure of instructions:

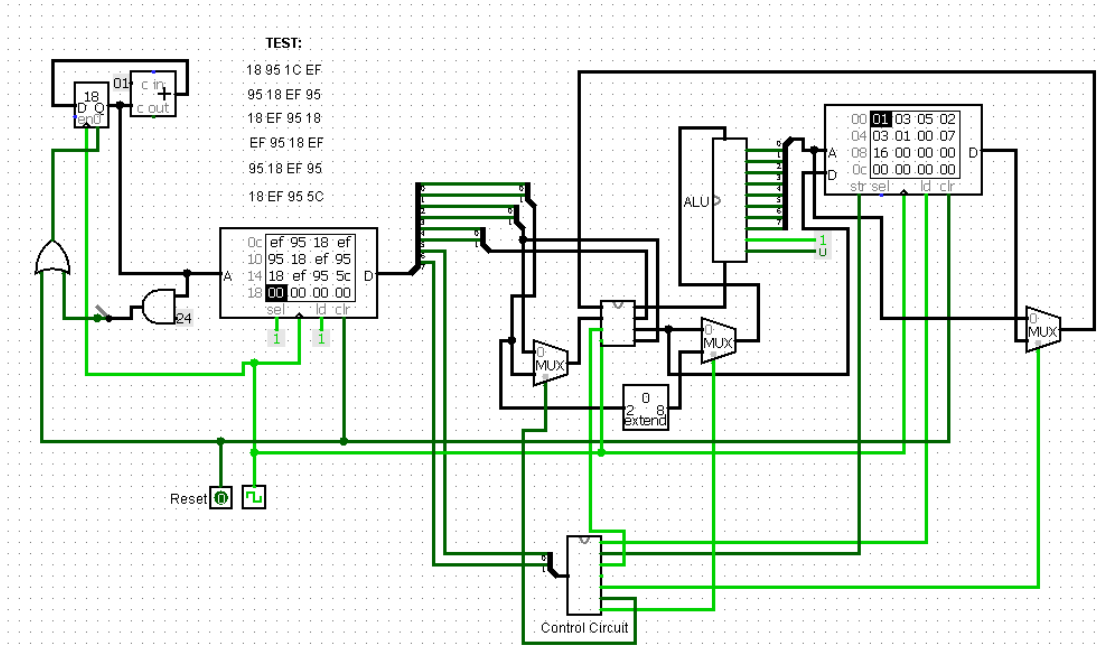
```
lw $t1, 0($t0)          # 00 01 10 01 = 0x18
addi $t0, $t0, 04       # 10 01 01 01 = 0x95  (01 added for circuit)
lw $t2, 0($t0)          # 00 01 11 00 = 0x1C
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95
lw $t1, 0($t0)          # 00 01 10 01 = 0x18
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95
lw $t1, 0($t0)          # 00 01 10 01 = 0x18
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95
lw $t1, 0($t0)          # 00 01 10 01 = 0x18
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95
lw $t1, 0($t0)          # 00 01 10 01 = 0x18
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95
lw $t1, 0($t0)          # 00 01 10 01 = 0x18
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95
lw $t1, 0($t0)          # 00 01 10 00 = 0x18
add $t2, $t1, $t2       # 11 10 11 11 = 0xEF
addi $t0, $t0, 04       # 10 01 01 01 = 0x95

sw $t2, 0($t0)          # 01 01 11 00 = 0x5C
```

Each instruction altered to 8 bit binary representation, then represented in hex format. These hex values were then stored in Program RAM.

Functional units from previous assignment integrated into single functional processor:



Examples with Student Numbers:
13523107:

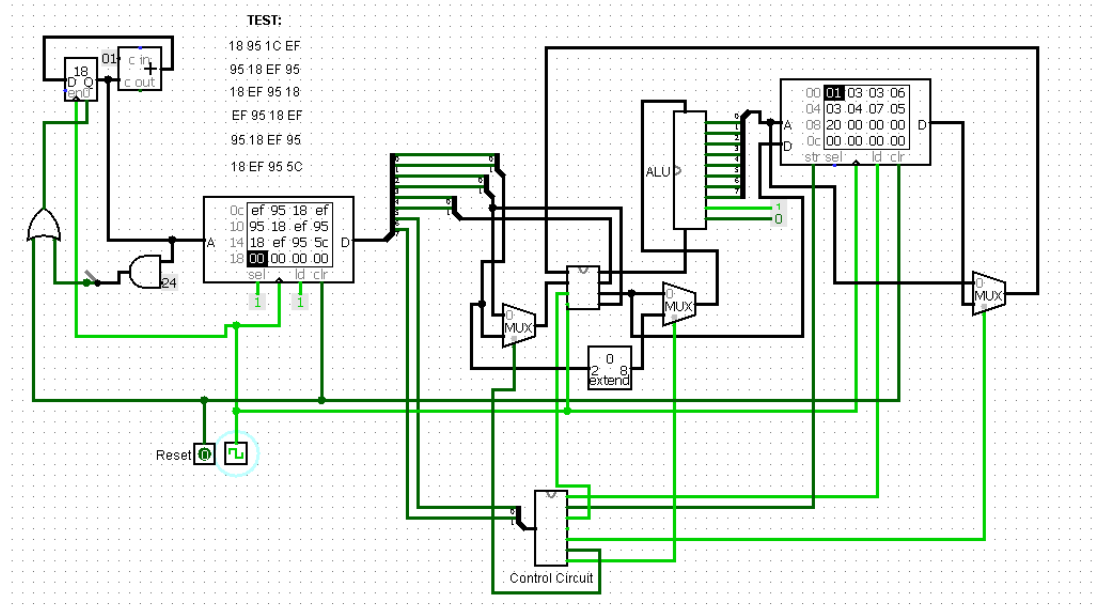


Gives result: 16 (22 when converted from hex to decimal)
Compared to MIPS:

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+12)	Value (+16)	Value (+20)	Value (+24)	Value (+28)
268500992	1	3	5	2	3	1	0	7
268501024	22	0	0	0	0	0	0	0

13363475:



Gives result: 20 (32 when converted from hex to decimal)
Compared to MIPS:

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+12)	Value (+16)	Value (+20)	Value (
268500992	1	3	3	6	3	4	
268501024	32	0	0	0	0	0	