

Computer Architecture CS322 Lab 8 Report

Name : Chandrawanshi Mangesh Shivaji

Roll Number : 1801CS16

Date : 06/11/2020

Task 1: Using blocks from lab 7 and other glue logic, implement single cycle processor RISC which could run instructions/test file given.

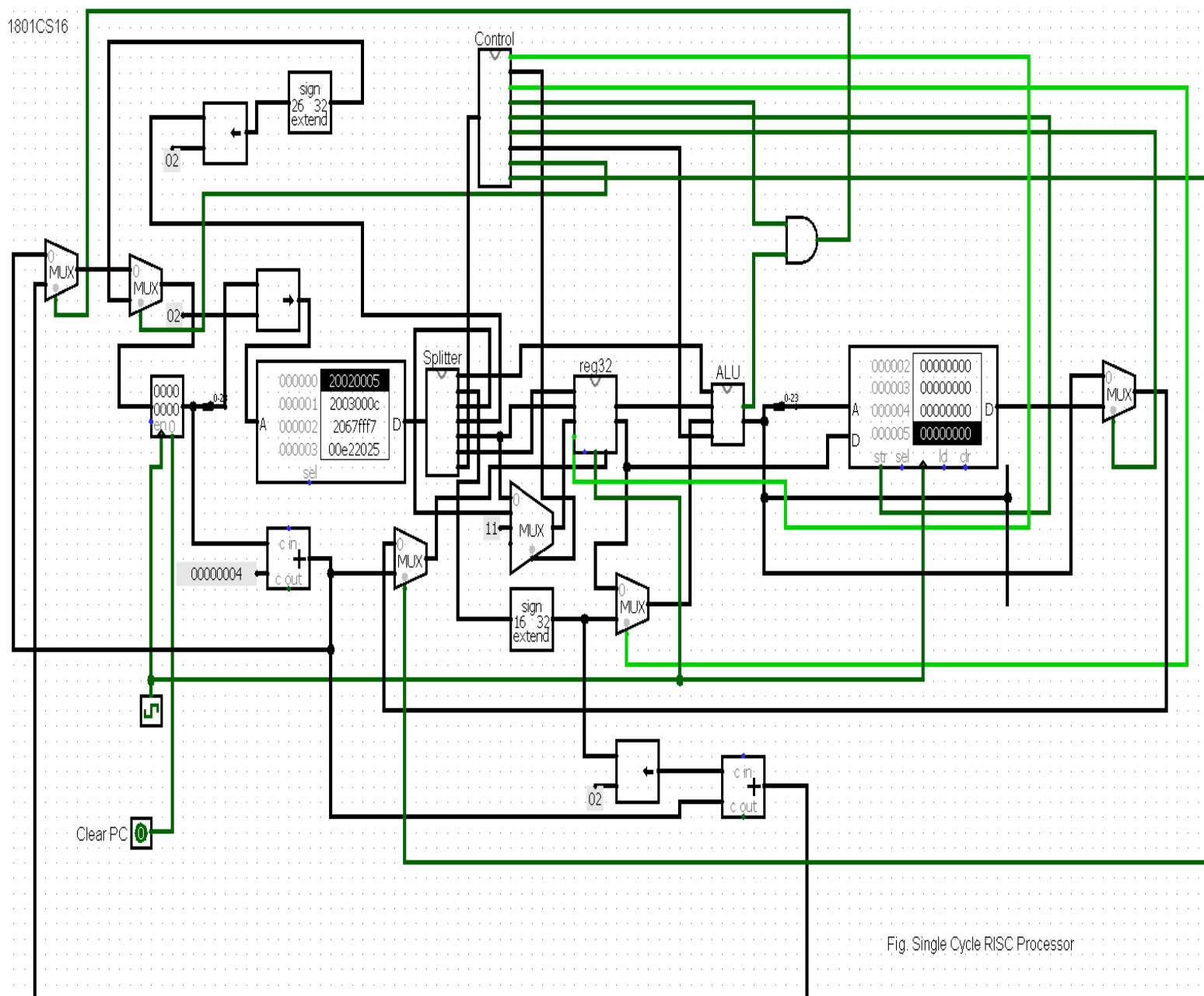
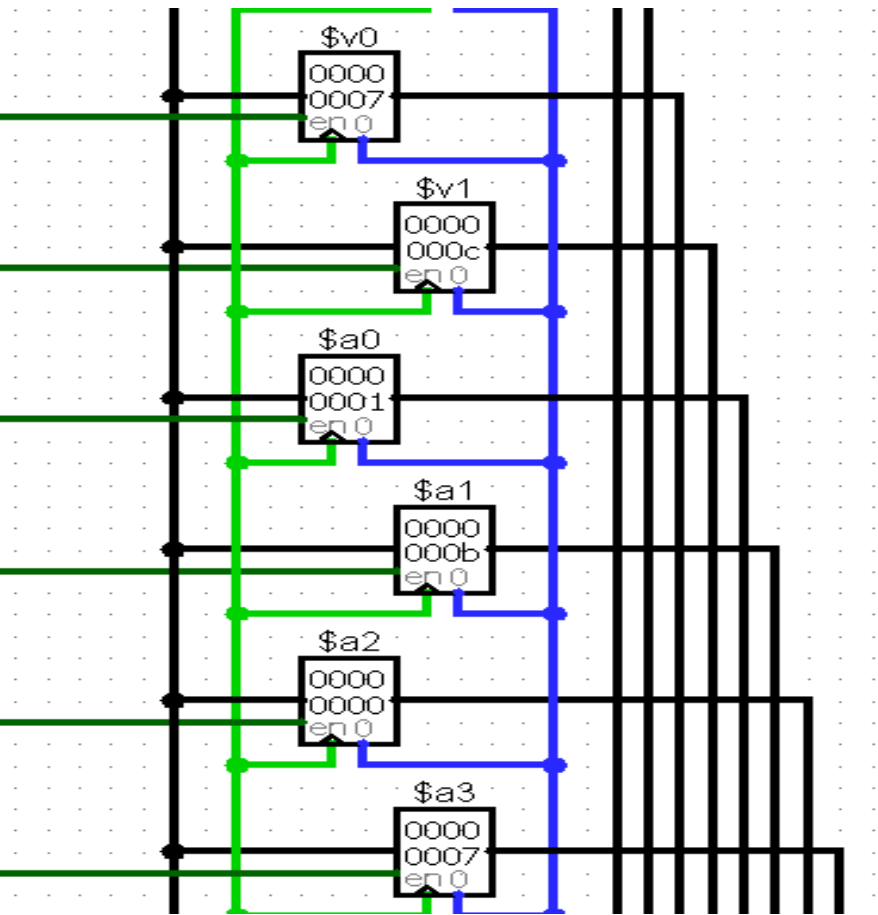


Fig. Single Cycle RISC Processor

Logisim Circuit: single cycle processor RISC

Final State of used registers after executing all instructions in instructions file



Instruction Machine Codes

20020005
2003000c
2067fff7
00e22025
00642824
00a42820
10a7000a
0064202a
10800001
20050000
00e2202a
00853820
00e23822
ac670044
8c020050
08000011
20020001
ac020054

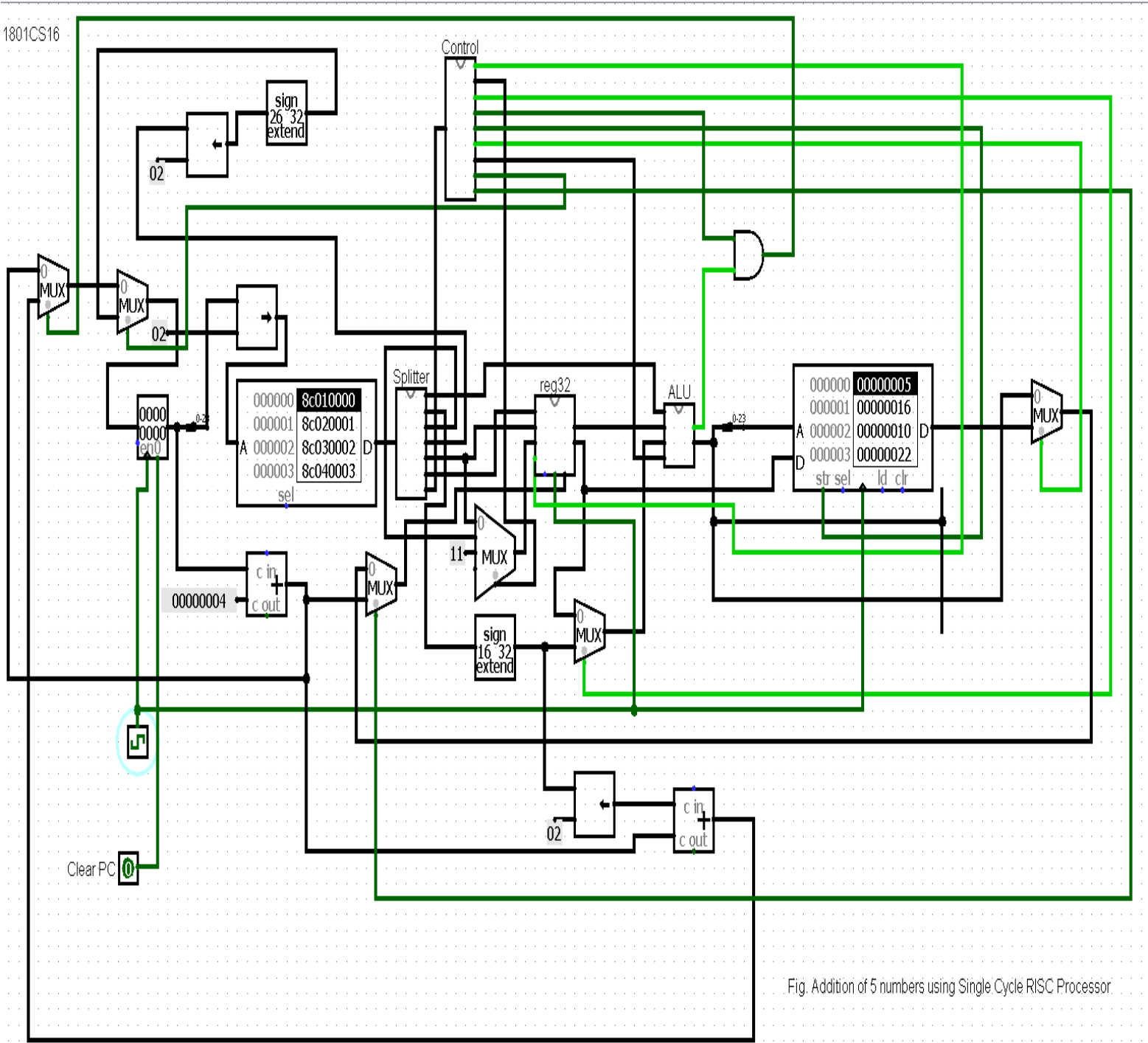
Final State of Data Memory after execution of all instructions in instructions file

000020 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
000030 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
000040 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
000050 00000007 00000000 00000000 00000000 00000007 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
000060 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
000070 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

Memory Address = 80 (50H)

Memory Address = 84 (54H)

Task 2: Write a program to add 5 numbers and store the result in data memory location X. (show the encoding process and machine language instruction with comments in the report). Also add screen shots of numbers in memory and result location in the report.



Logisim Circuit: Addition using single cycle processor RISC

Assembly Code with corresponding encoding

```
# Test the MIPS Processor Task 2
# Write a program to add 5 numbers and store the result in data memory location X
# First data (5(05H),22(16H),16(10H),34(22H),48(30H)) [all in decimal rep.] is stored in memory location 0 to 5 sequentially
# sum will be stored in register $6 and then at memory location 80 i.e. 50H

#      Assembly      Description      Address      Machine
lw $1,0($0)    # $1 = 5              0            8c010000
lw $2,1($0)    # $2 = 22             4            8c020001
lw $3,2($0)    # $3 = 16             8            8c030002
lw $4,3($0)    # $4 = 34             12           8c040003
lw $5,4($0)    # $5 = 48             16           8c050004
addi $6,$0,$0   # $6 = 0             20           20060000
add $6,$1,$2    # $6 <= 5 + 22 = 27  24           00223020
add $6,$6,$3    # $6 <= 27 + 16 = 43 28           00c33020
add $6,$6,$4    # $6 <= 43 + 34 = 77 32           00c43020
add $6,$6,$5    # $6 <= 77 + 48 = 125 36           00c53020
sw $6,80($0)    # write addr 80 = 125 40           ac060050

# mem addr 50H(80) => 7DH(125)
```

Final Data Memory after Execution of Addition

5 numbers to be added hex representation

```
000000  00000005 00000016 00000010 00000022 00000030
000010  00000000 00000000 00000000 00000000 00000000
000020  00000000 00000000 00000000 00000000 00000000
000030  00000000 00000000 00000000 00000000 00000000
000040  00000000 00000000 00000000 00000000 00000000
000050  0000007d 00000000 00000000 00000000 00000000
```

Sum = 7d (125 in decimal)

Final state of used registers

