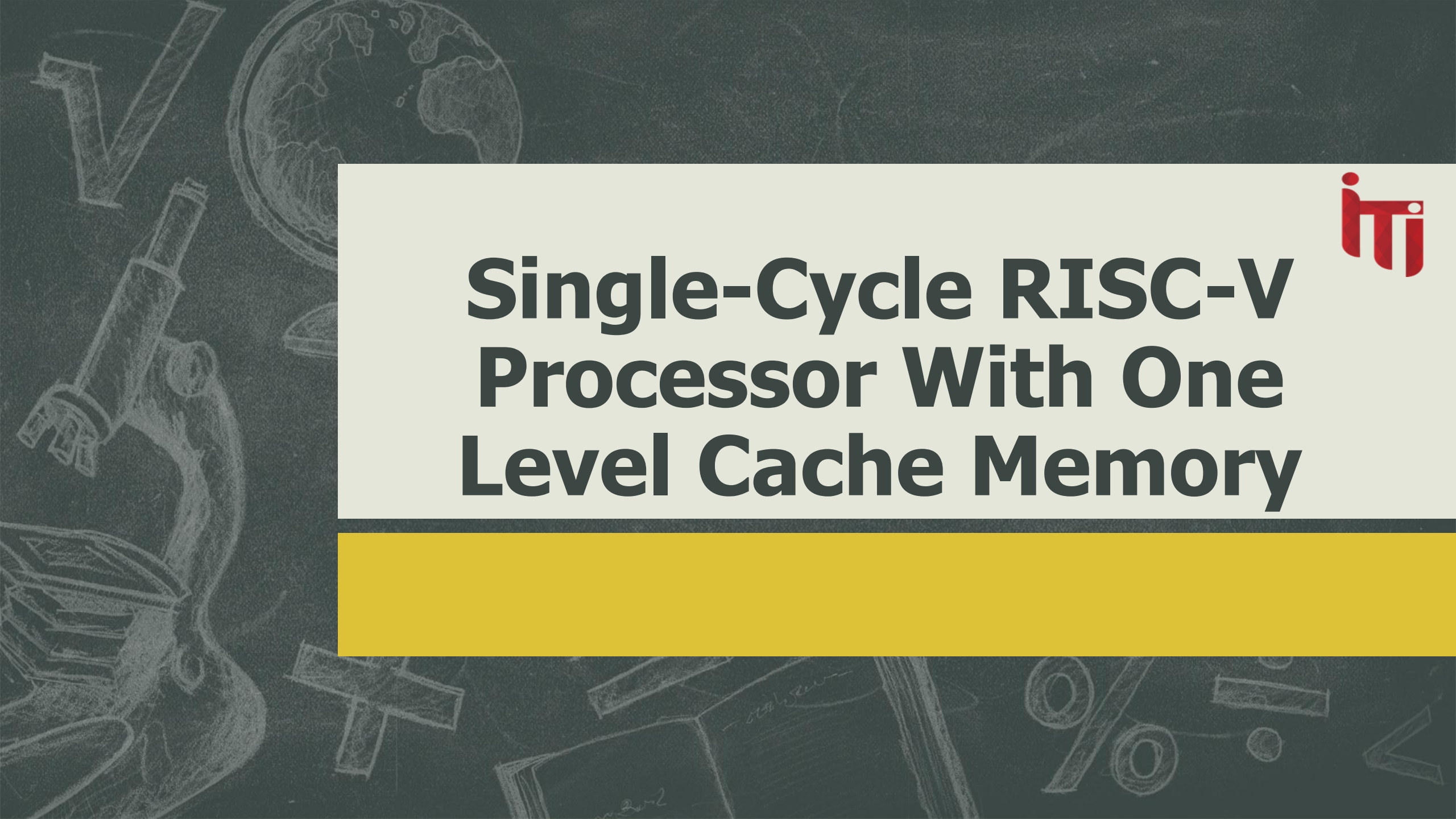


Single-Cycle RISC-V Processor With One Level Cache Memory

Introduction

RISC V is RISC Processor

RISC V Operates on 32- bit Data

RISC V has 32-bit 32 register in register file

RISC V Processor Microarchitecture

Processor Design Includes Main Modules:

Data Path

Control Unit

Then integrate it with Cache System

-Our Design Covers instructions:

Lw , Sw

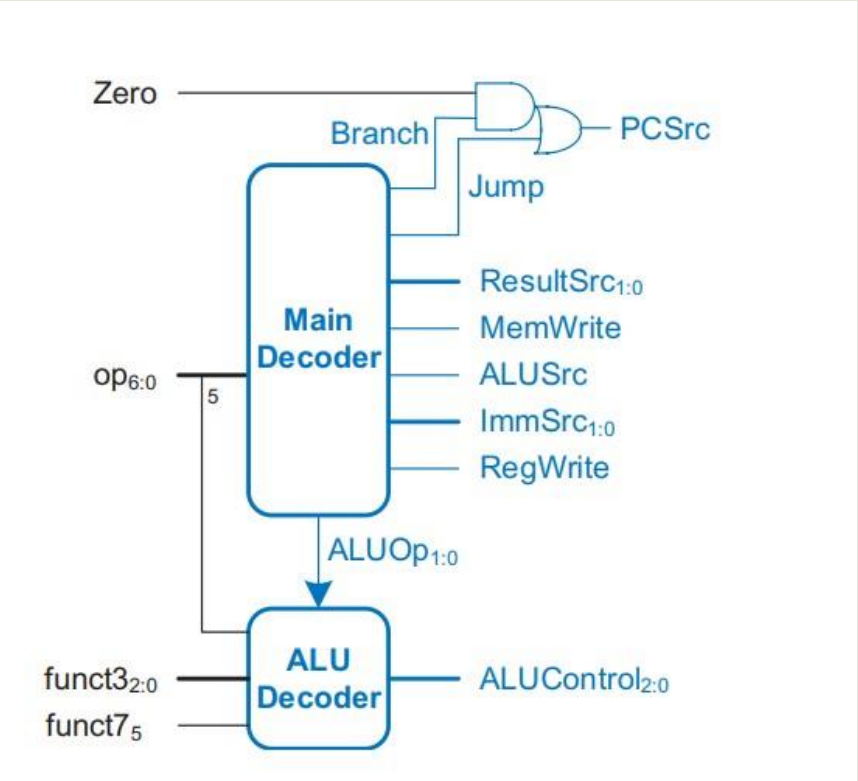
R-Type ,I-Type

Beq , jal

RISC V Processor Microarchitecture

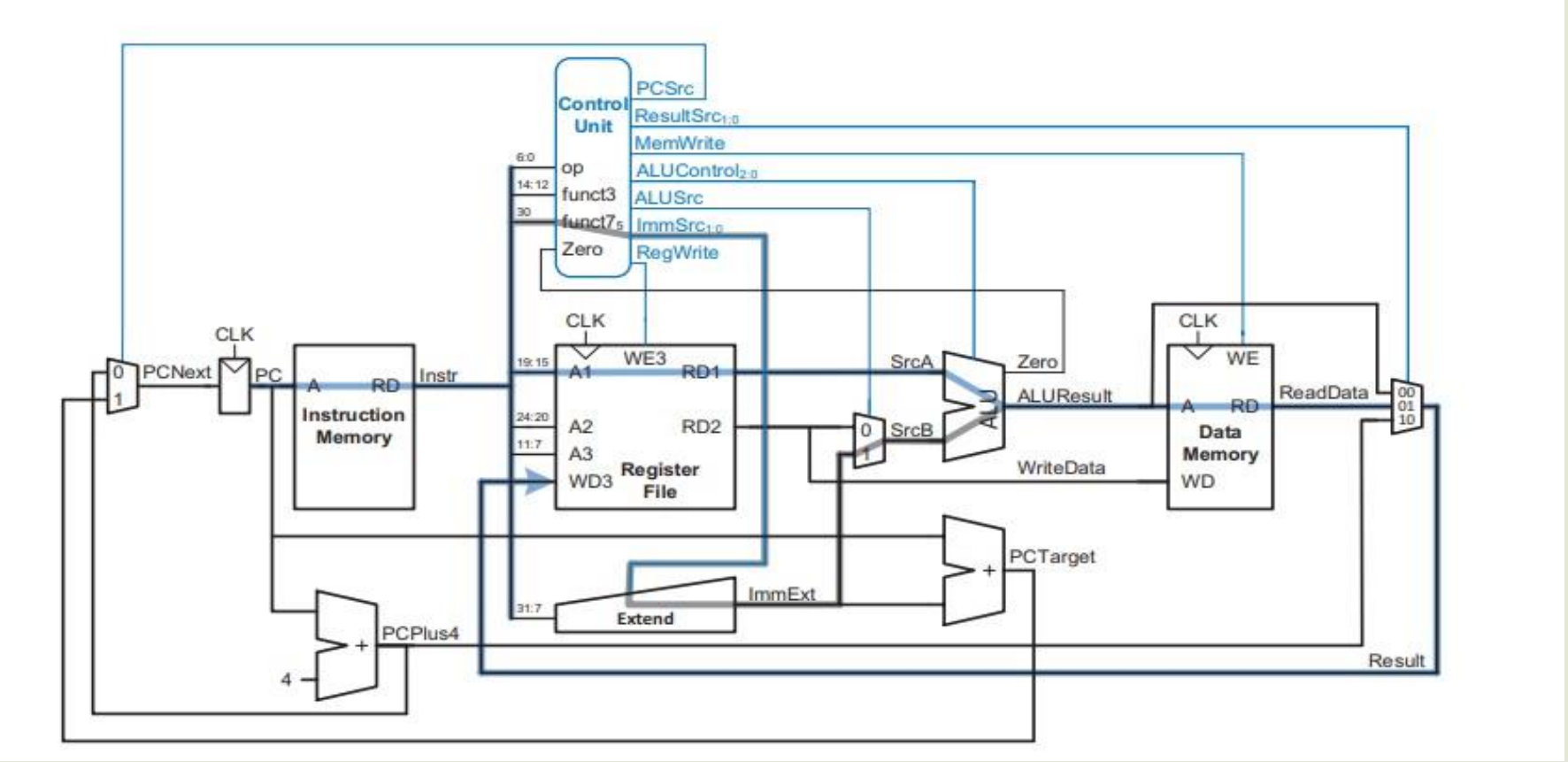
Control Unit:

Generates Control Signals.



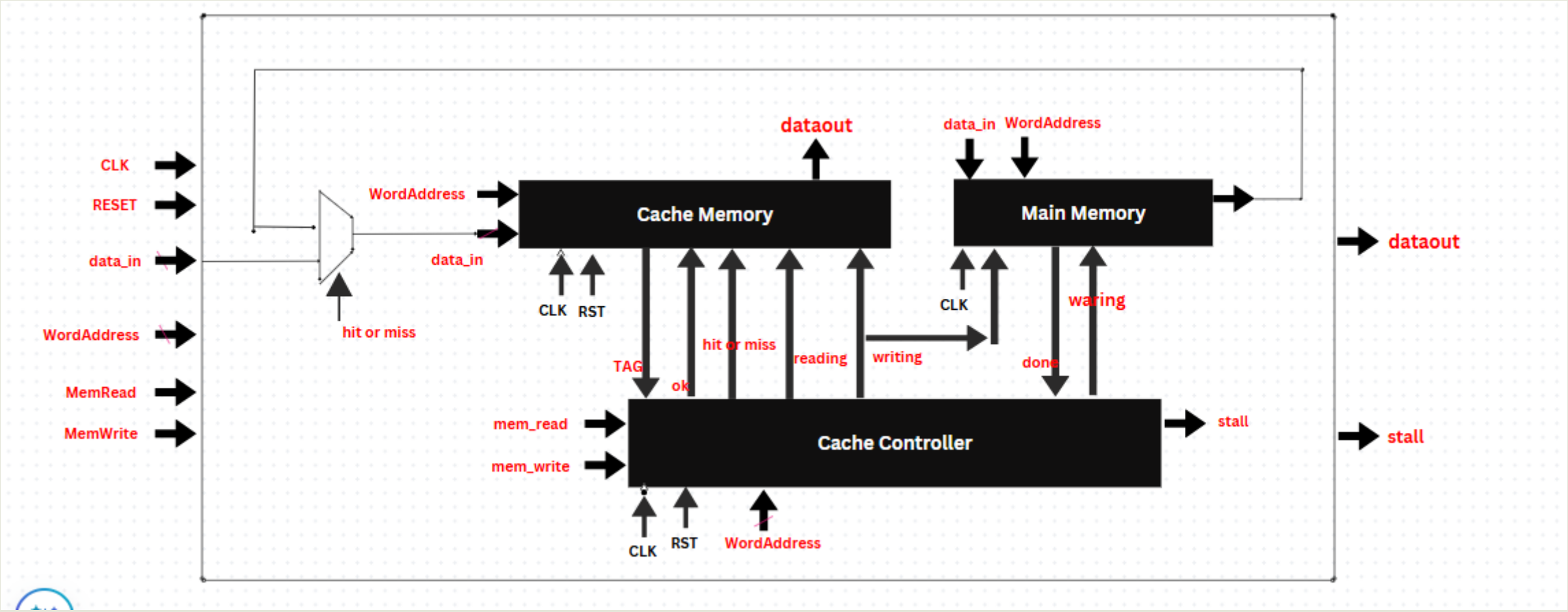
RISC V Processor Microarchitecture

Data Path:



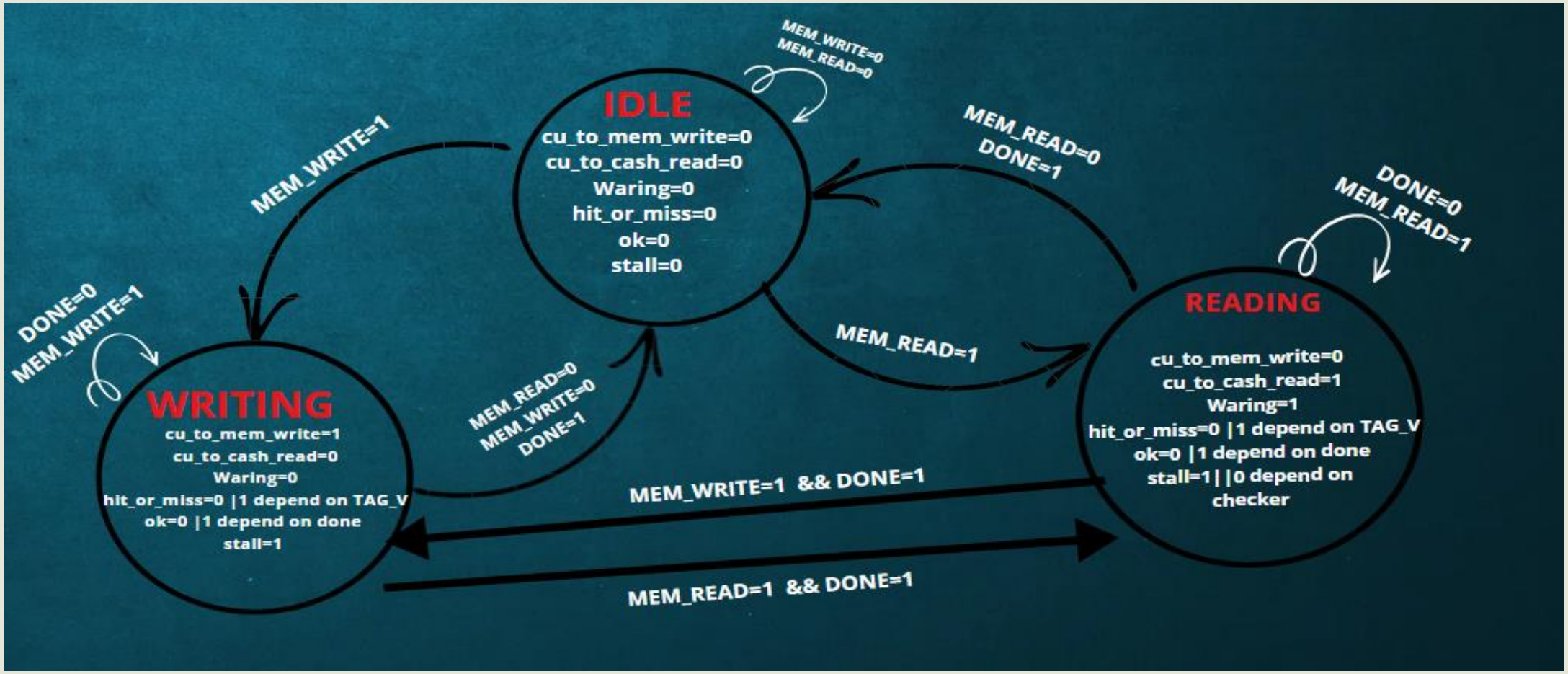
RISC V Processor Microarchitecture

Cache System:

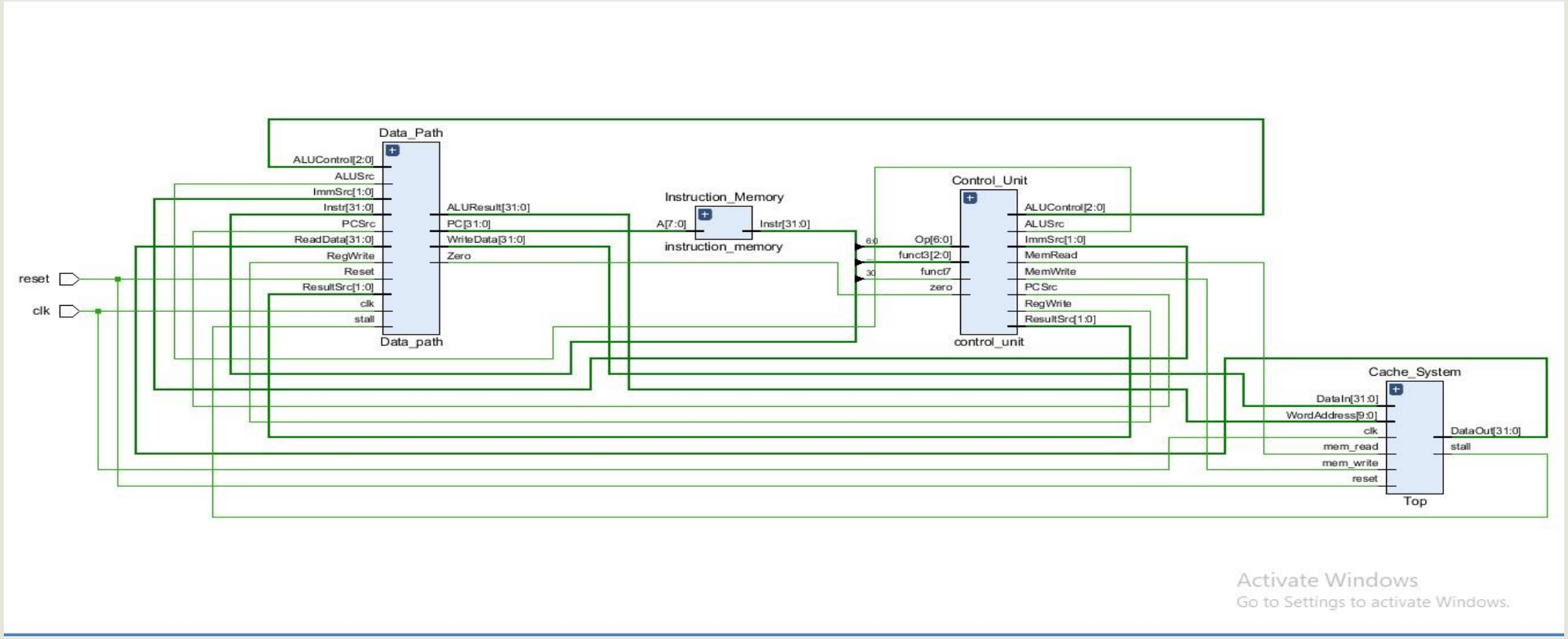


RISC V Processor Microarchitecture

FSM

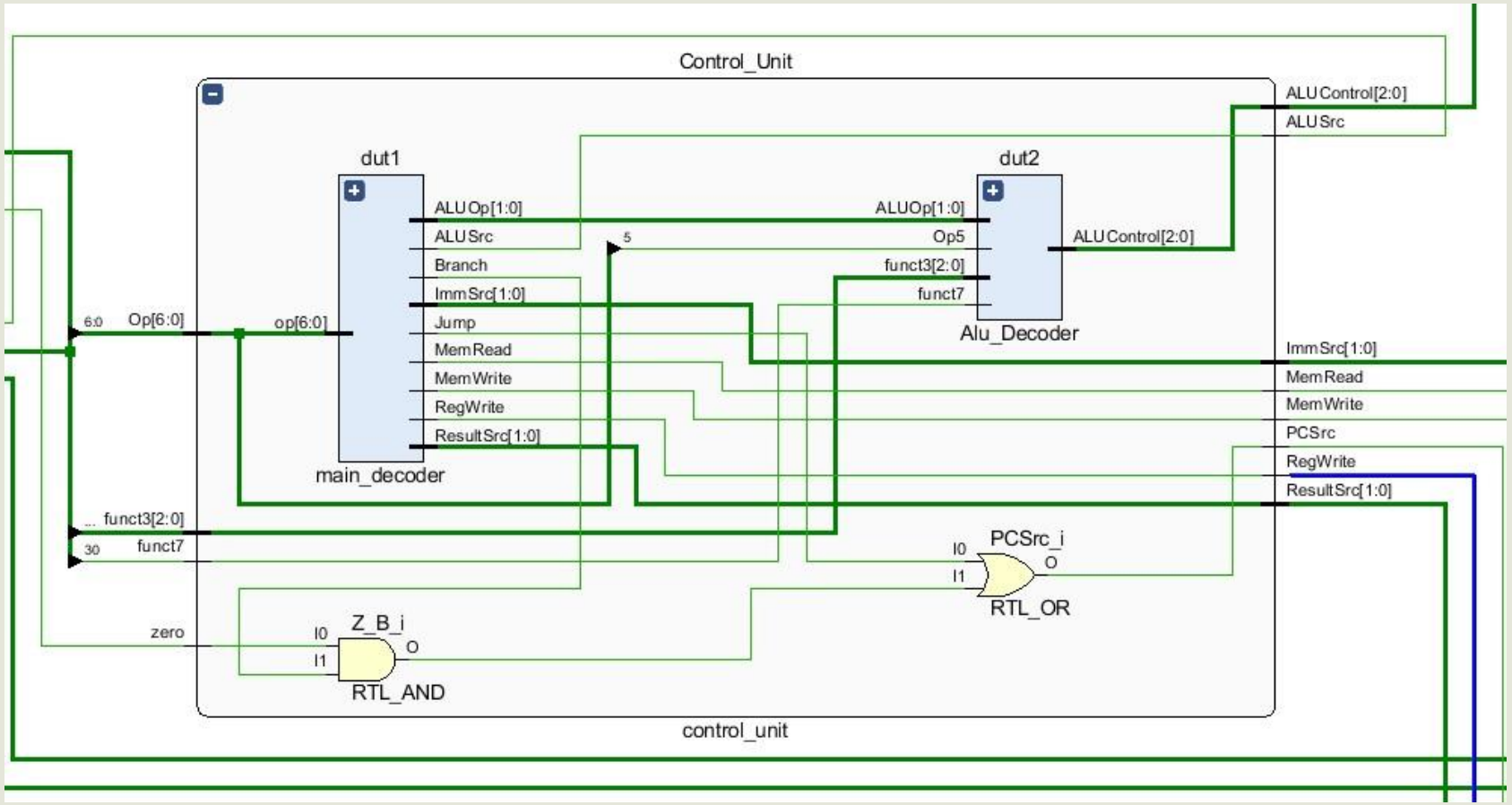


RISC V Schematic



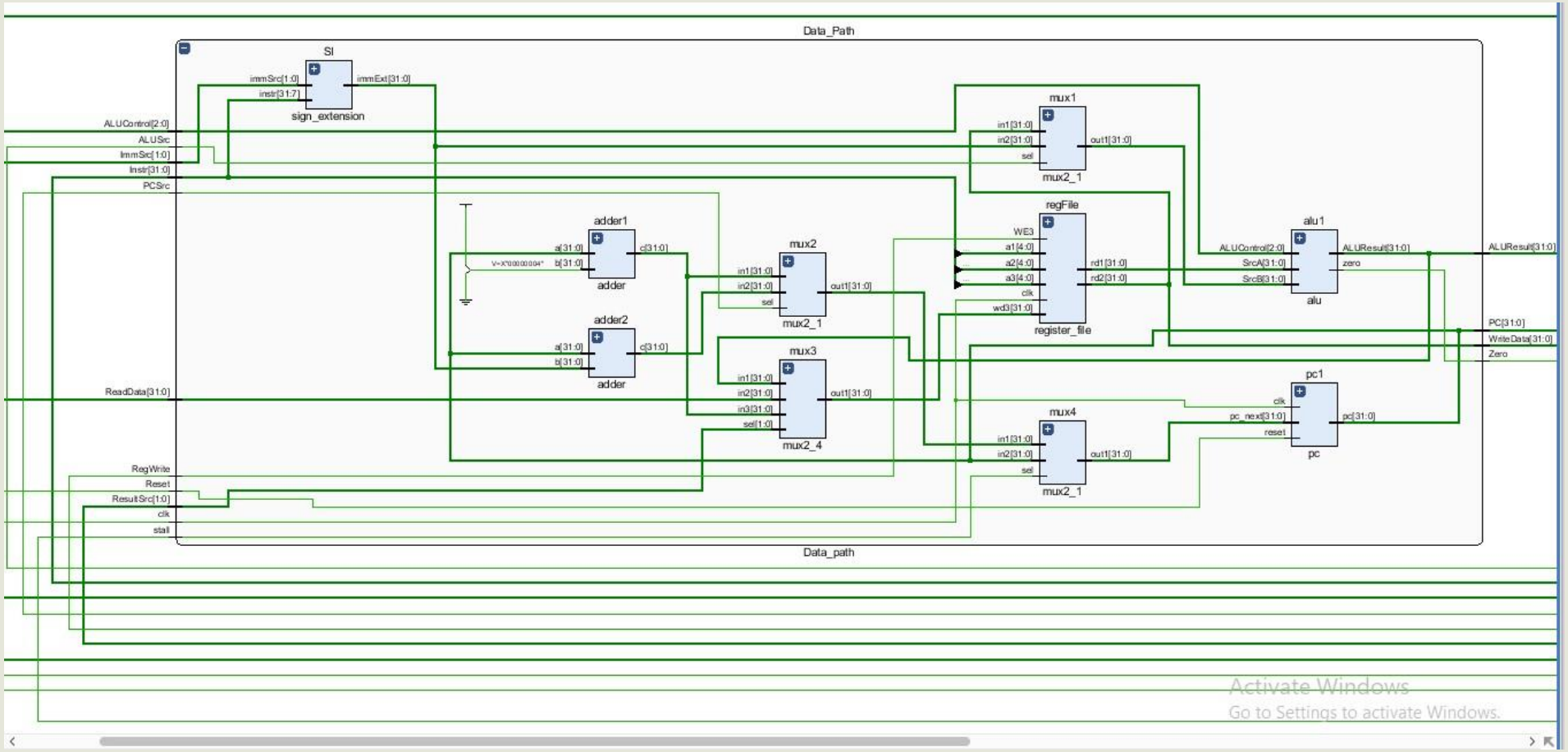
RISC V Schematic

Control Unit:



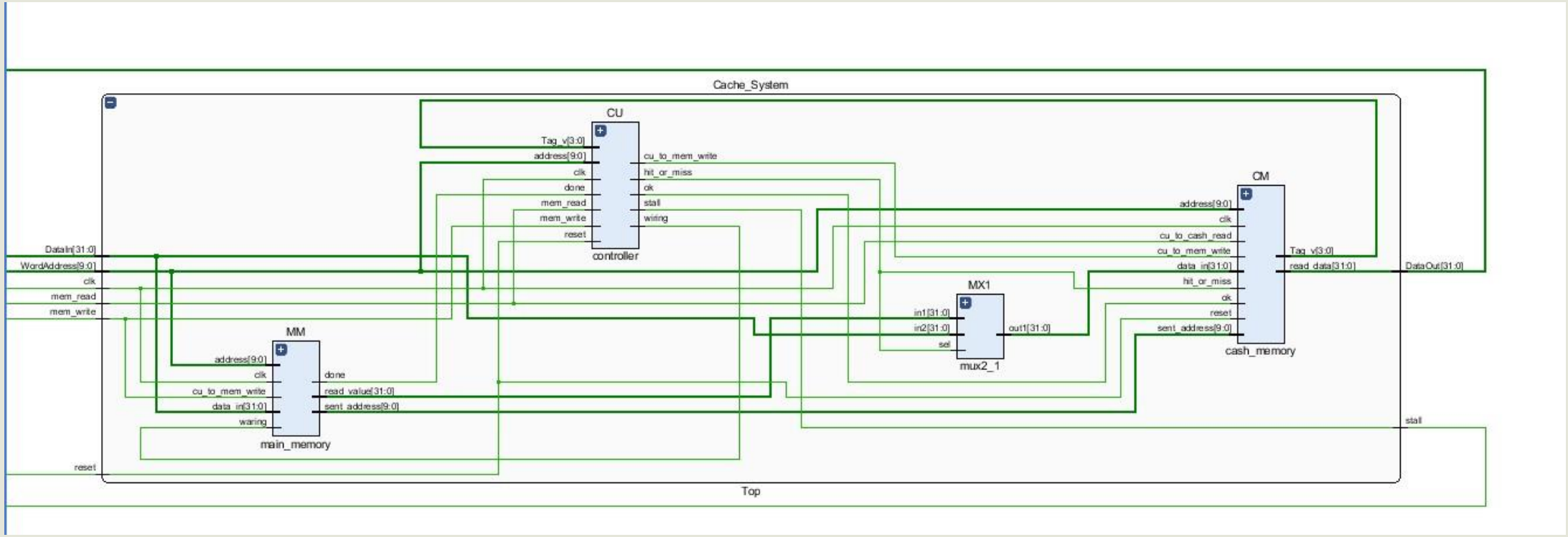
RISC V Schematic

Data Path:



RISC V Schematic

Cache System:



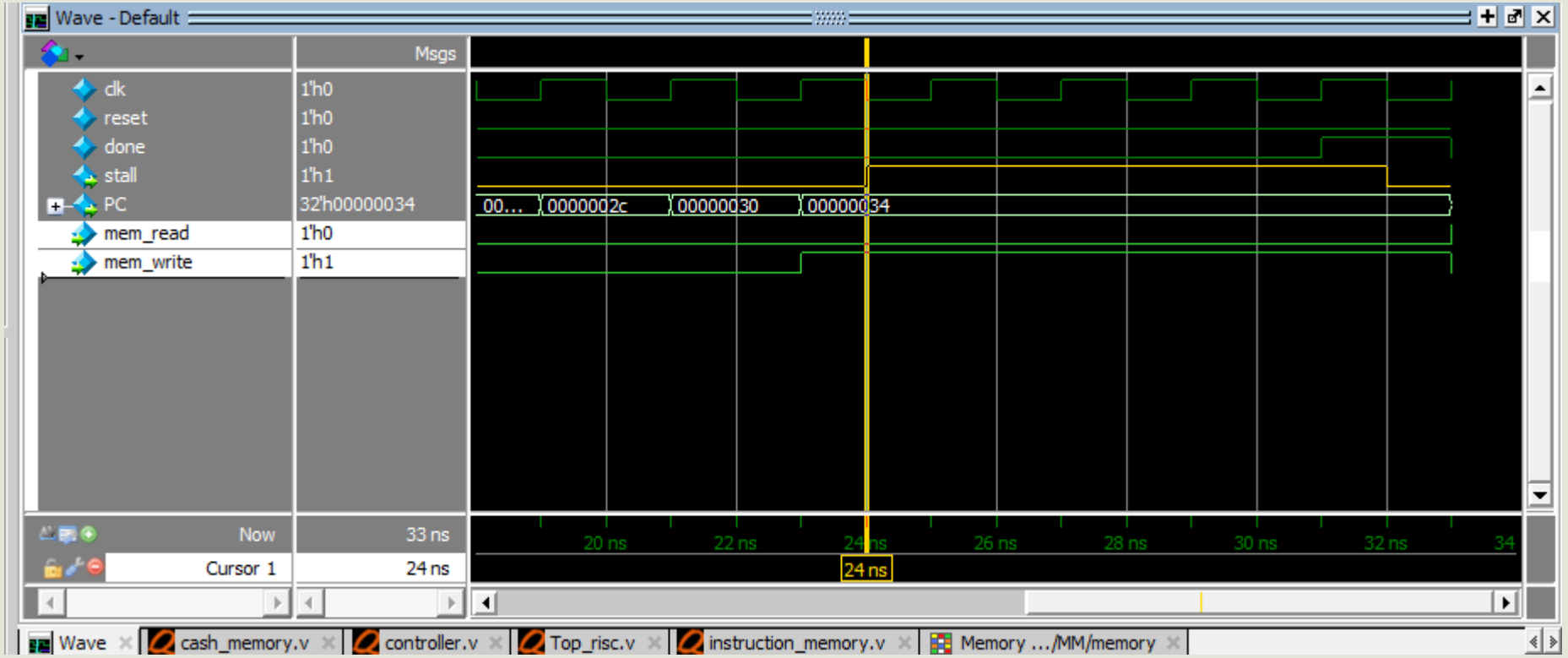
RISC V Test Program

The Program writes the value 25 to address 100

```
# If successful, it should write the value 25 to address 100
#       RISC-V Assembly         Description                 Address   Machine Code
main:   addi x2, x0, 5          # x2 = 5                    0         00500113
        addi x3, x0, 12         # x3 = 12                   4         00C00193
        addi x7, x3, -9         # x7 = (12 - 9) = 3         8         FF718393
        or   x4, x7, x2         # x4 = (3 OR 5) = 7         C         0023E233
        and  x5, x3, x4         # x5 = (12 AND 7) = 4       10        0041F2B3
        add  x5, x5, x4         # x5 = 4 + 7 = 11           14        004282B3
        beq  x5, x7, end        # shouldn't be taken        18        02728863
        slt  x4, x3, x4         # x4 = (12 < 7) = 0         1C        0041A233
        beq  x4, x0, around     # should be taken           20        00020463
        addi x5, x0, 0          # shouldn't execute         24        00000293
around: slt  x4, x7, x2         # x4 = (3 < 5) = 1          28        0023A233
        add  x7, x4, x5         # x7 = (1 + 11) = 12        2C        005203B3
        sub  x7, x7, x2         # x7 = (12 - 5) = 7         30        402383B3
        sw   x7, 84(x3)         # [96] = 7                  34        0471AA23
        lw   x2, 96(x0)         # x2 = [96] = 7             38        06002103
        add  x9, x2, x5         # x9 = (7 + 11) = 18        3C        005104B3
        jal  x3, end            # jump to end, x3 = 0x44    40        008001EF
        addi x2, x0, 1          # shouldn't execute         44        00100113
end:    add  x2, x2, x9         # x2 = (7 + 18) = 25        48        00910133
        sw   x2, 0x20(x3)       # [100] = 25                4C        0221A023
done:   beq  x2, x2, done       # infinite loop             50        00210063
```

Simulation Results

sw x7, 84(x3): Store 7 in location 96



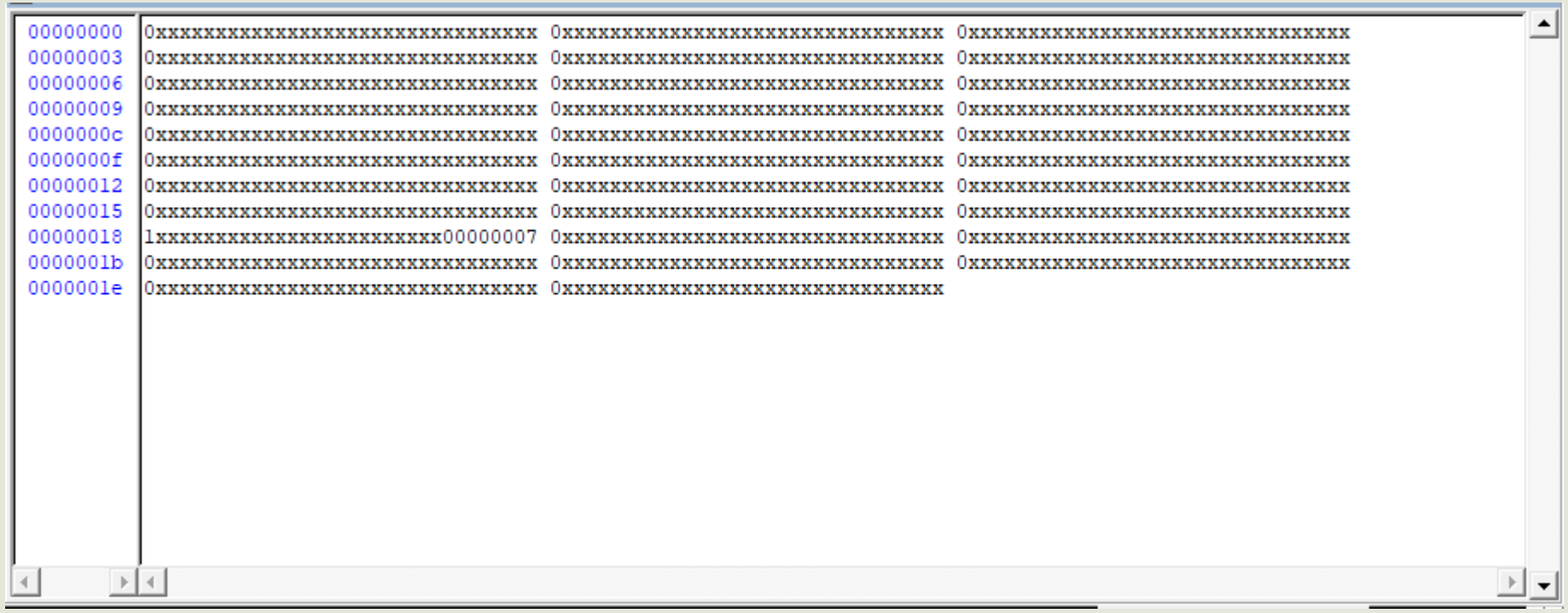
Simulation Results

sw x7, 84(x3) : Main Memory view

00000000	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000000c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000018	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000024	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000030	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000003c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000048	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000054	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000060	00000007 xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000006c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000078	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000084	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000090	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000009c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000a8	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000b4	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000c0	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000cc	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000d8	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000e4	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000f0	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx

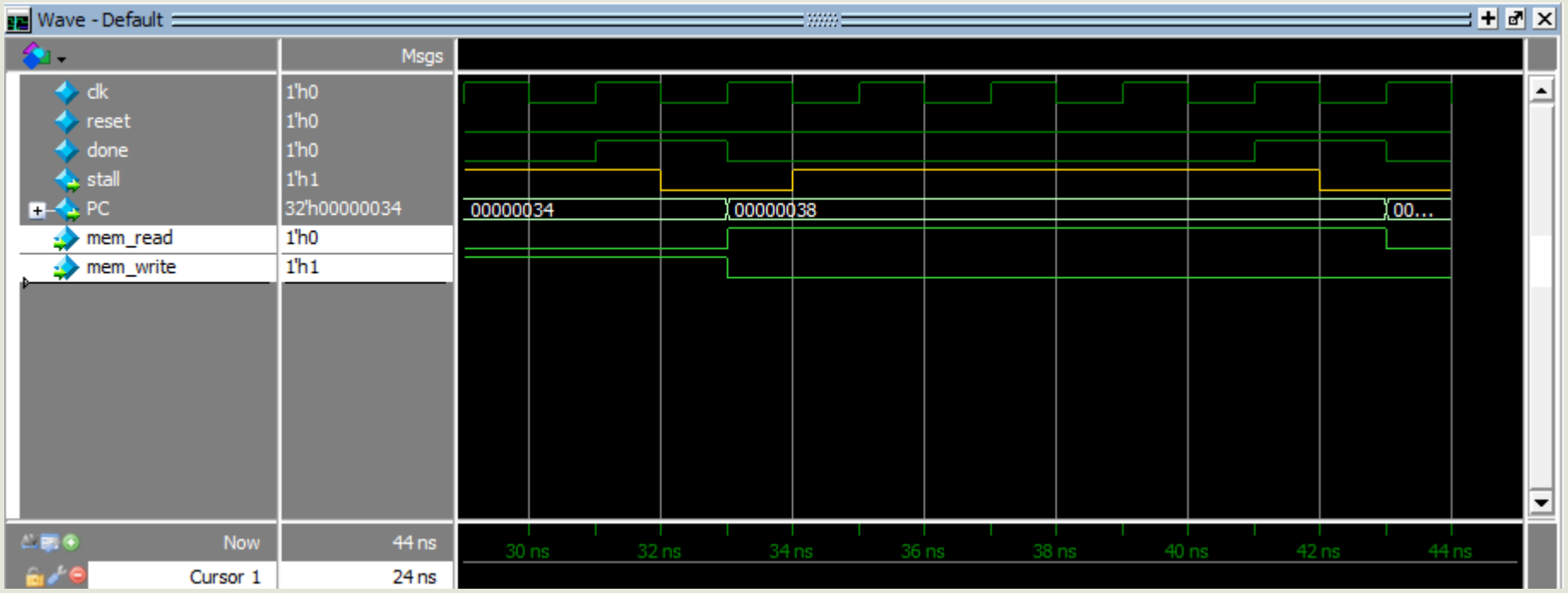
Simulation Results

sw x7, 84(x3) : Cache Memory View



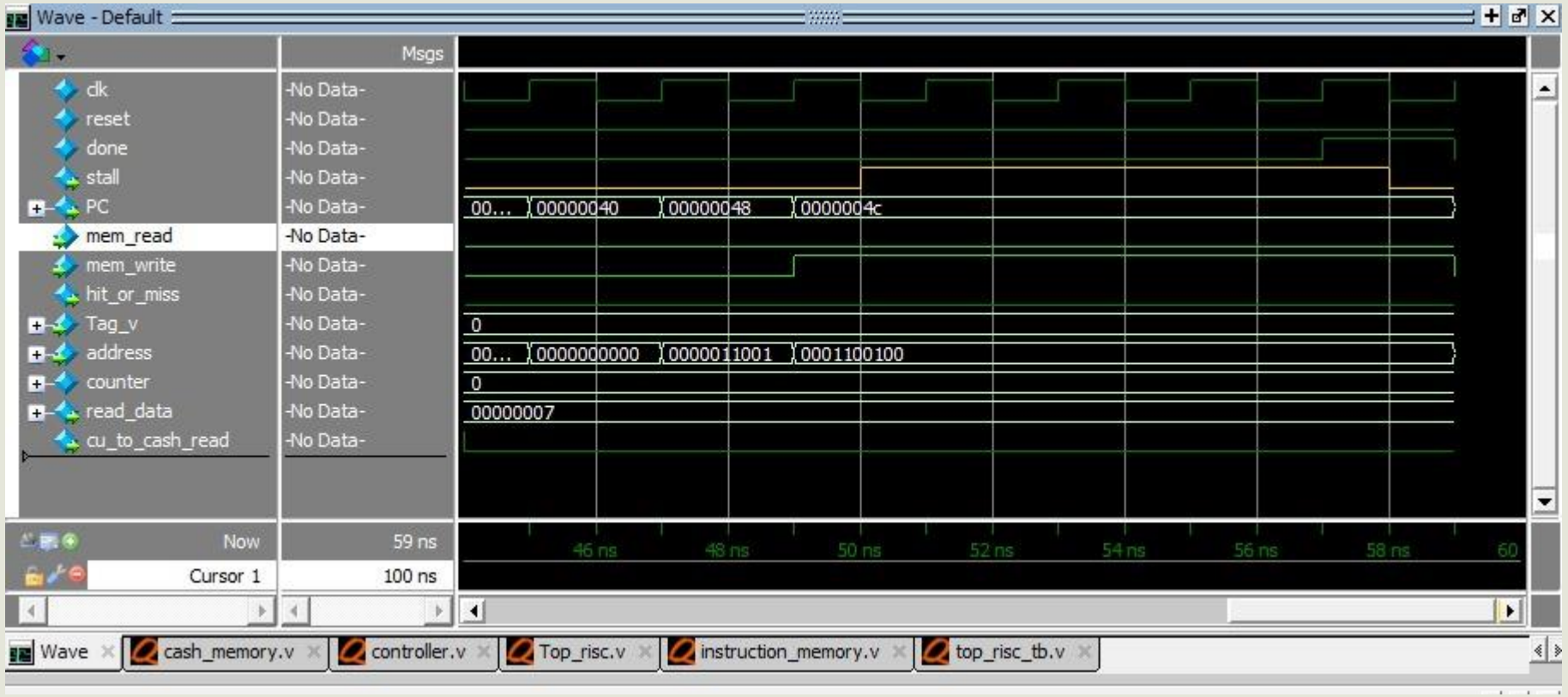
Simulation Results

lw x2, 96(x0): load from location 96 to register x2



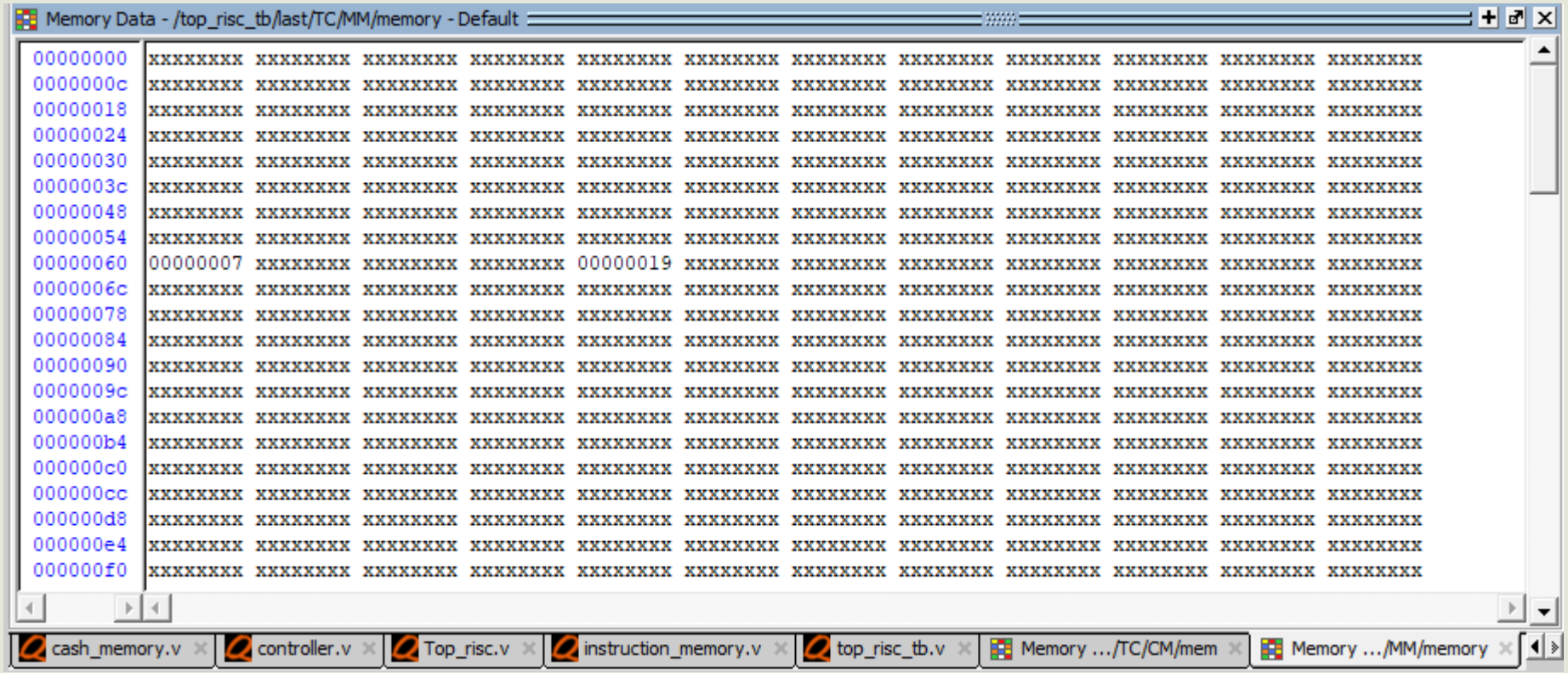
Simulation Results

sw x2, 0x20(x3)



Simulation Results

sw x2, 0x20(x3) : Main Memory view 0x19 Stored in in Location 0x64



Other Test Program

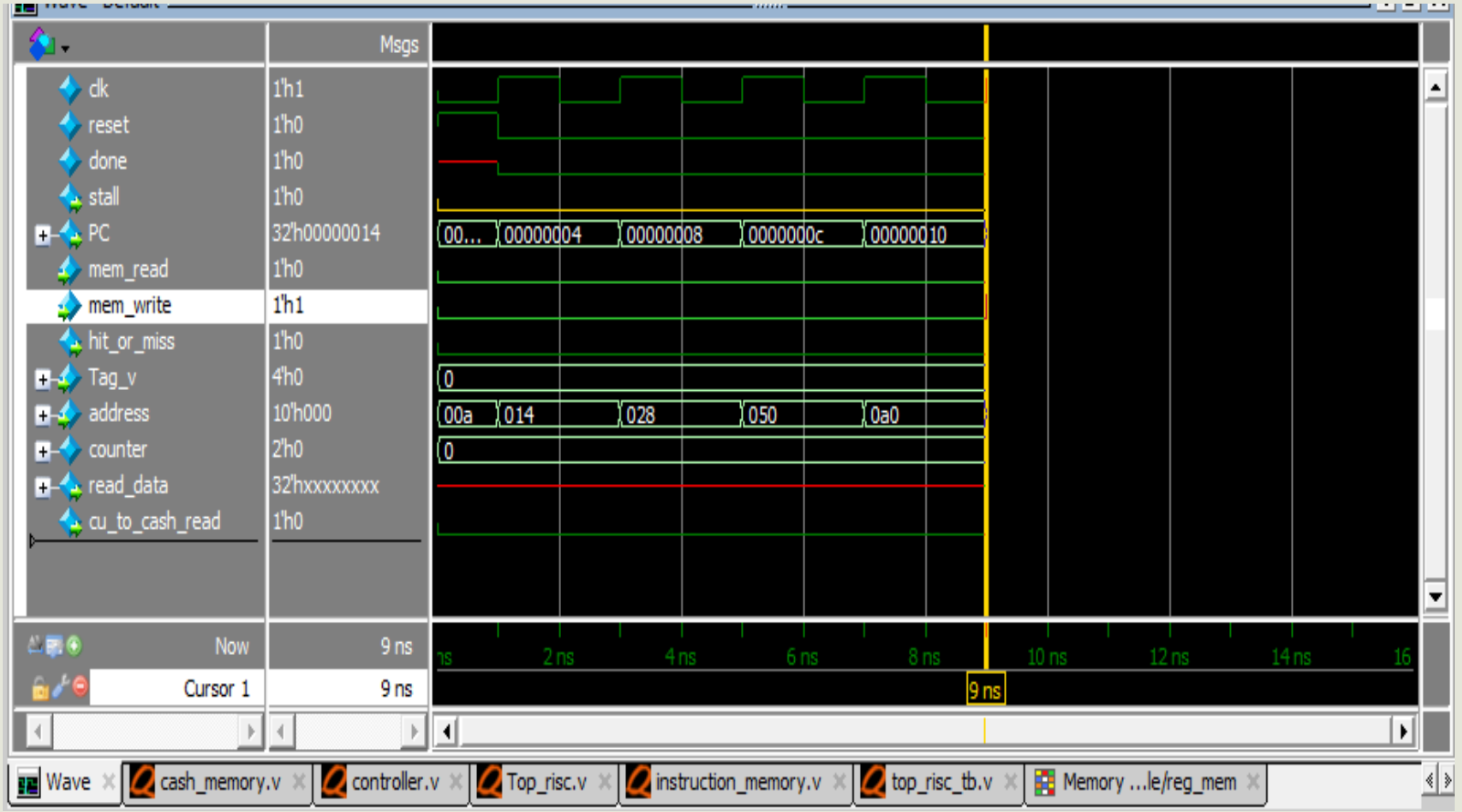
addi x1, x0, 10

addi x2, x0, 20

addi x3, x0, 40

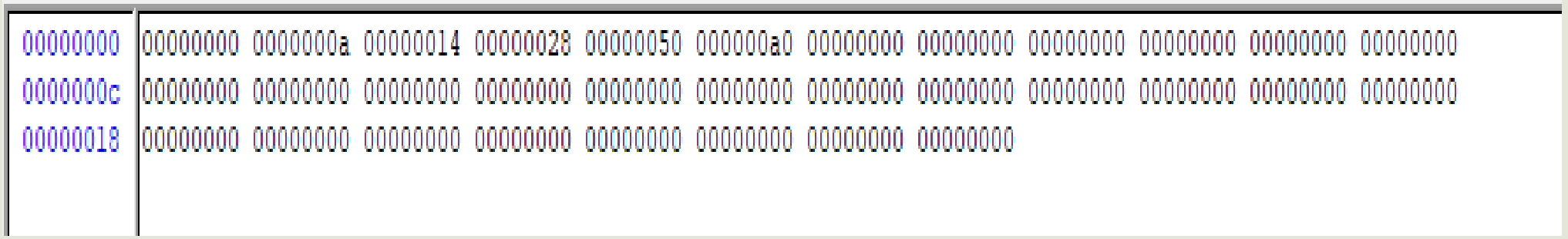
addi x4, x0, 80

addi x5, x0, 160



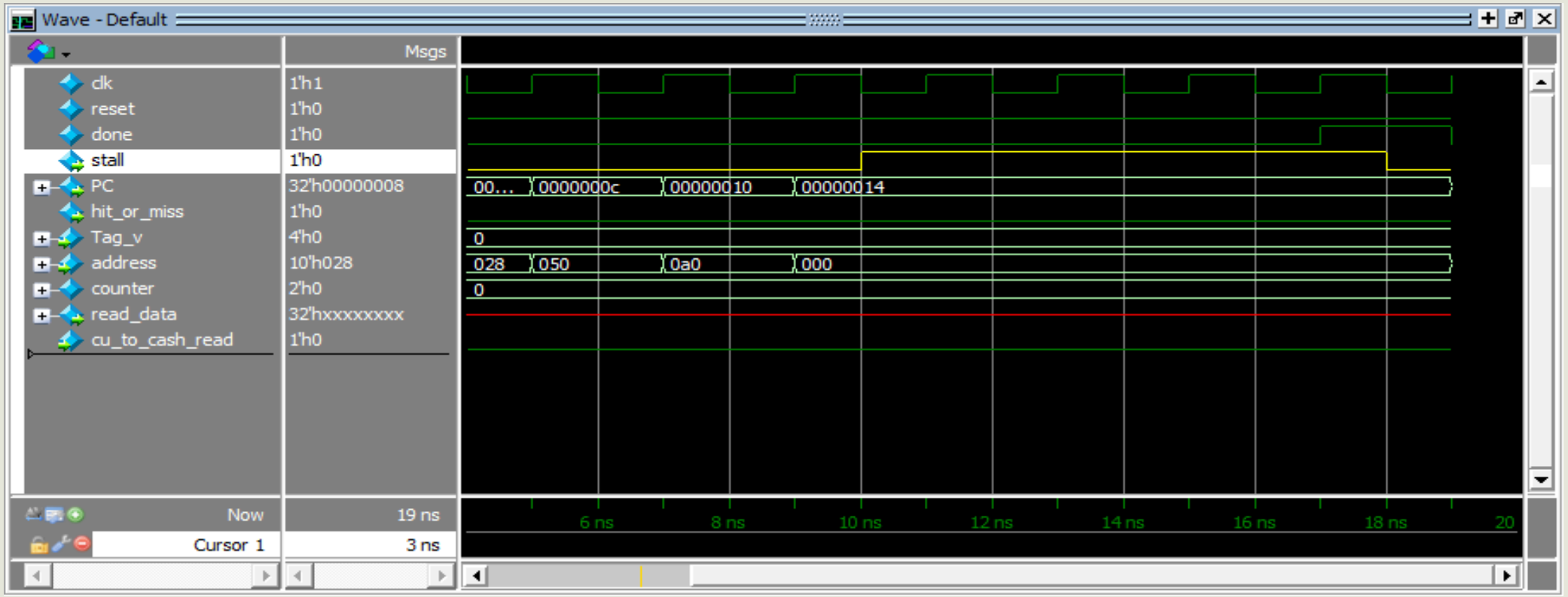
Simulation Results

Store 10,20,40,80,160 in register file



Simulation Results

sw x1, 0(x0)



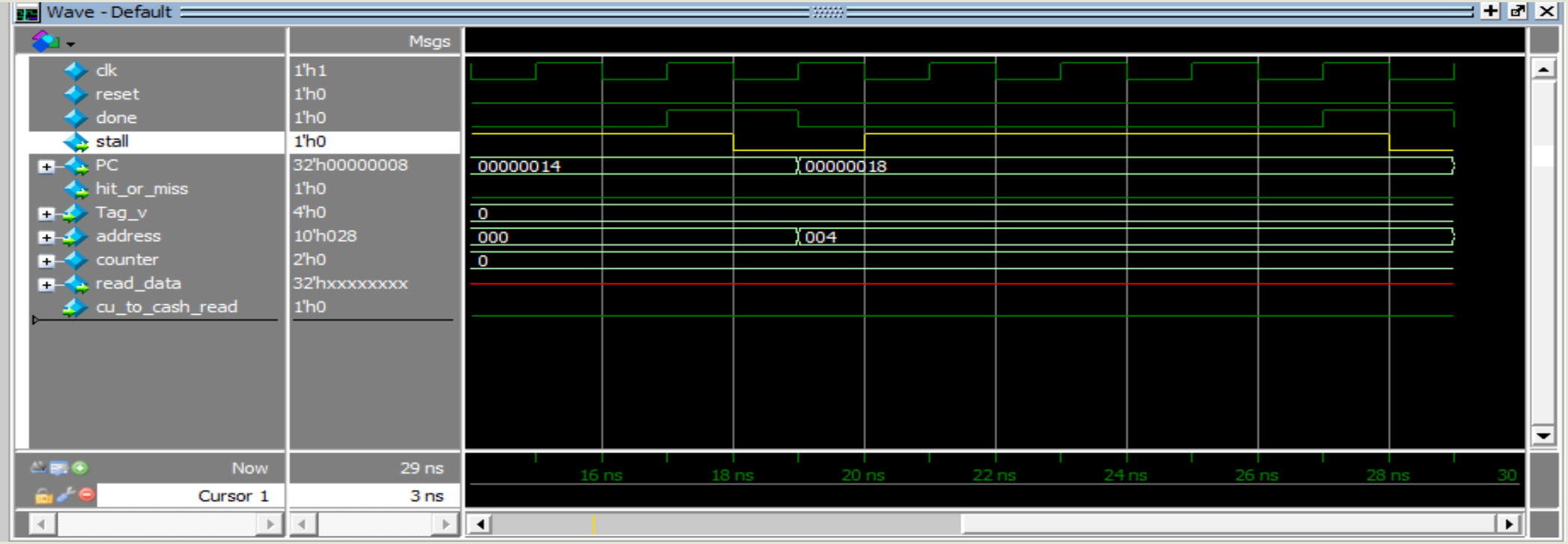
Simulation Results

Store 10 in location 0x00000000

00000000	0000000a xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000000c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000018	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000024	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000030	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000003c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000048	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000054	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000060	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000006c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000078	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000084	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
00000090	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
0000009c	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000a8	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000b4	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000c0	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000cc	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000d8	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000e4	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx
000000f0	xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx xxxxxxxx

Simulation Results

sw x2, 4(x0)



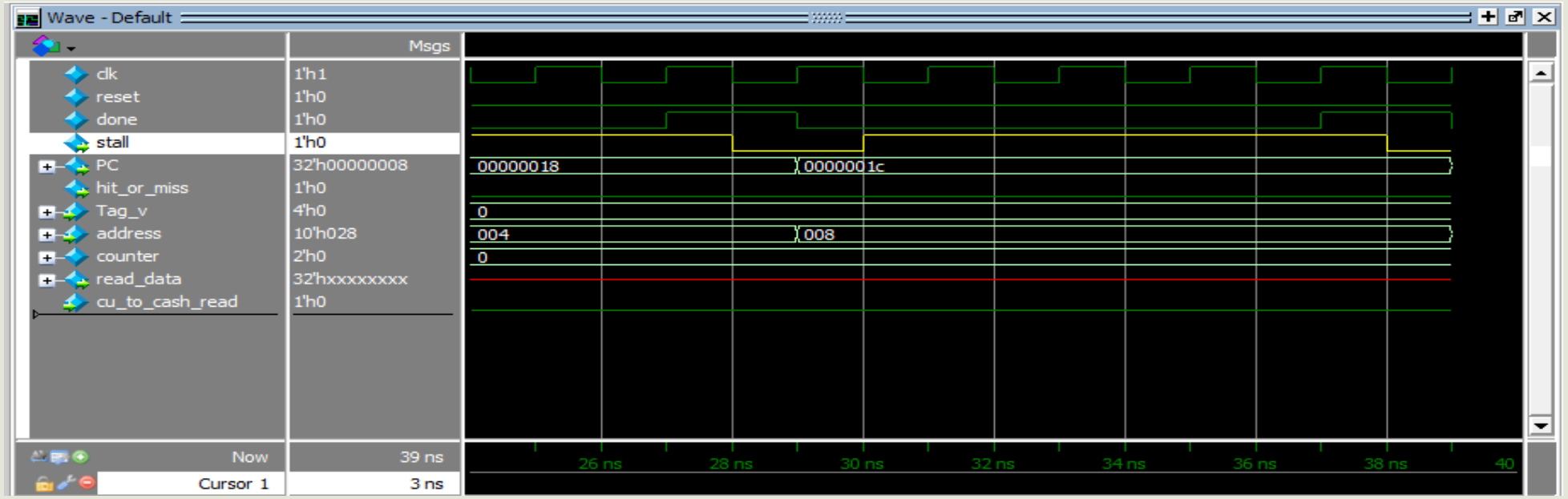
Simulation Results

Store 20 in location 0x00000004

00000000	0000000a	xxxxxxxx	xxxxxxxx	xxxxxxxx	00000014	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000000c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000018	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000024	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000030	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000003c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000048	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000054	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000060	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000006c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000078	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000084	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000090	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000009c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000a8	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000b4	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000c0	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000cc	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000d8	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000e4	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000f0	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx

Simulation Results

sw x3, 8(x0)



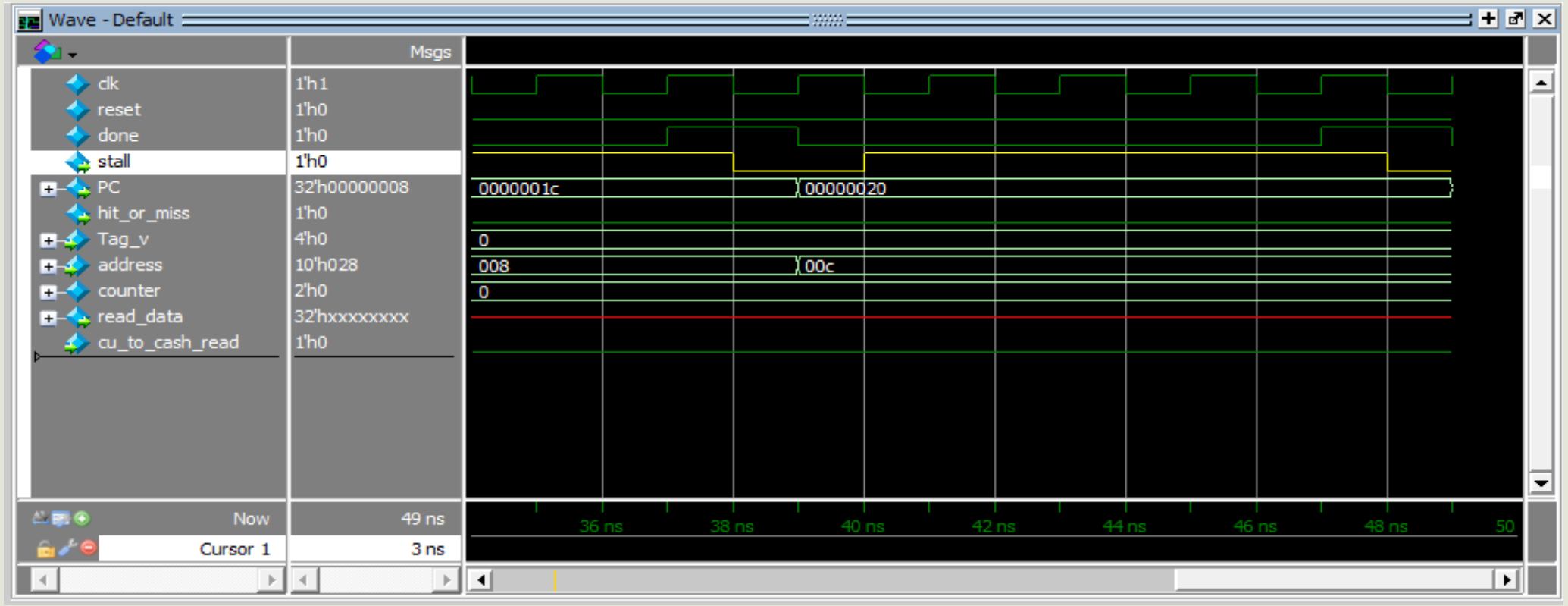
Simulation Results

Store 40 in location 0x00000008

00000000	0000000a	xxxxxxxx	xxxxxxxx	xxxxxxxx	00000014	xxxxxxxx	xxxxxxxx	xxxxxxxx	00000028	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000000c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000018	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000024	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000030	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000003c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000048	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000054	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000060	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000006c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000078	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000084	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000090	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000009c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000a8	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000b4	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000c0	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000cc	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000d8	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000e4	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000f0	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx

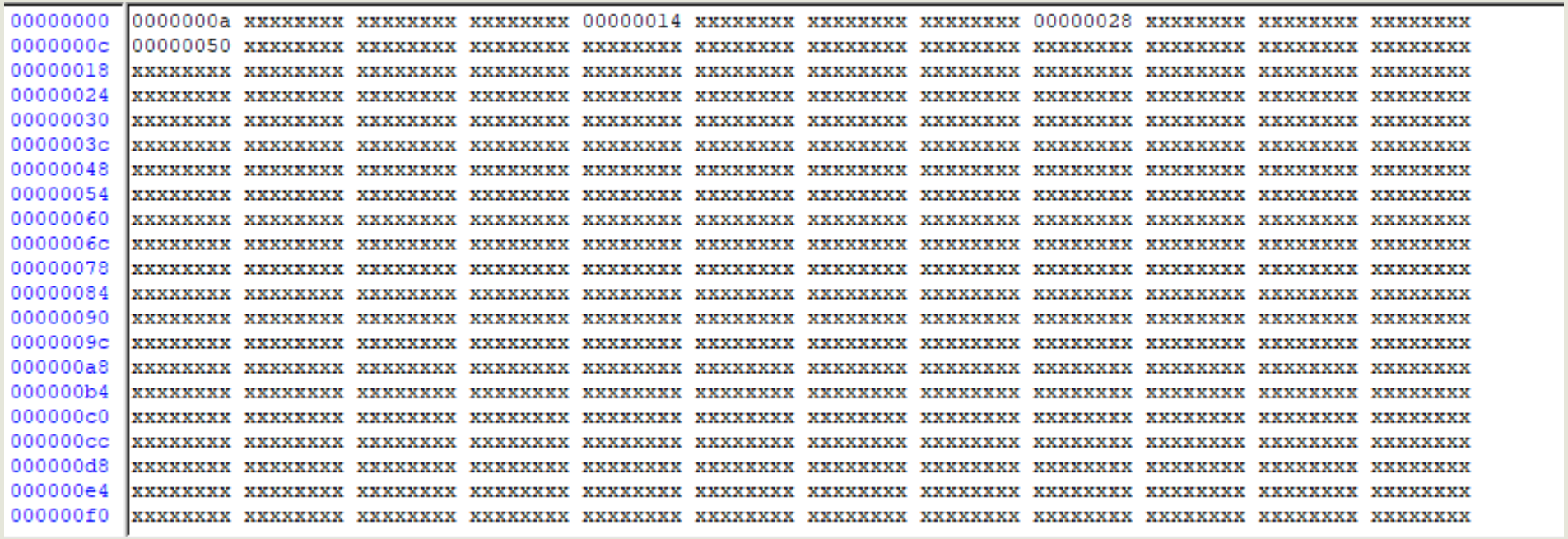
Simulation Results

sw x4, 12(x0)



Simulation Results

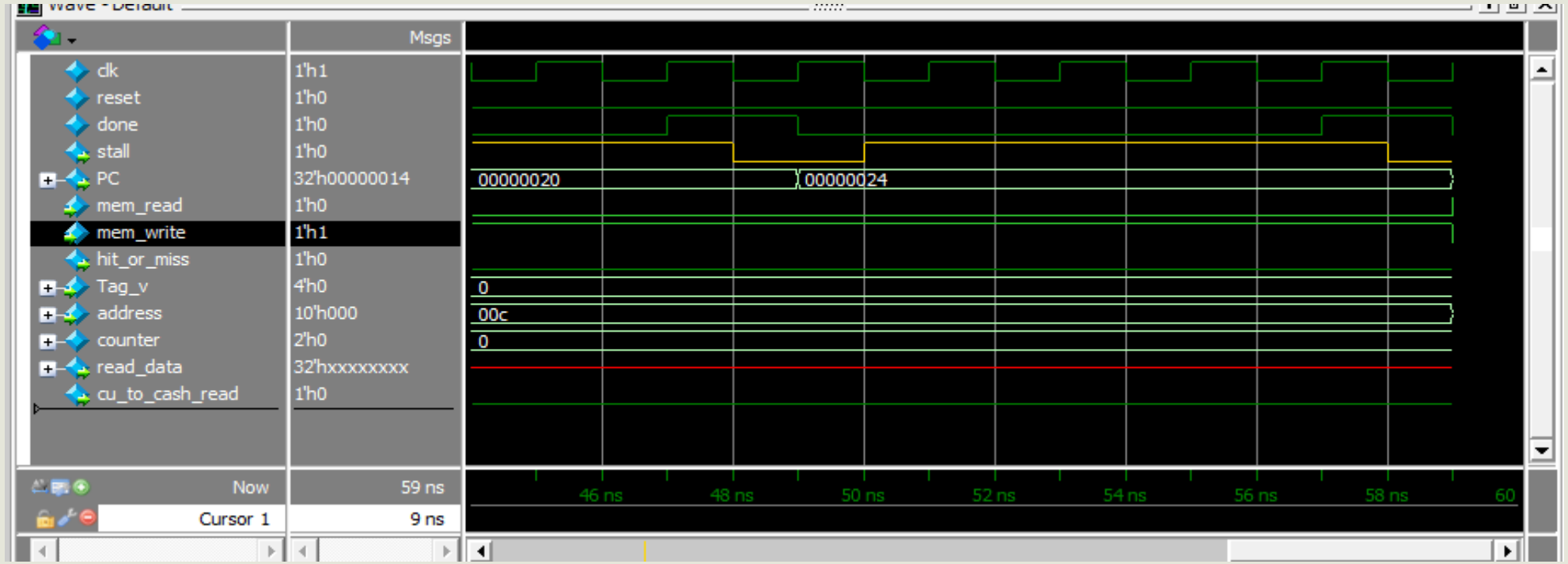
Store 0x80 in location 0x0000000c



00000000	0000000a	xxxxxxxx	xxxxxxxx	xxxxxxxx	00000014	xxxxxxxx	xxxxxxxx	xxxxxxxx	00000028	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000000c	00000050	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000018	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000024	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000030	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000003c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000048	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000054	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000060	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000006c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000078	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000084	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
00000090	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
0000009c	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000a8	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000b4	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000c0	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000cc	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000d8	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000e4	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx
000000f0	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx	xxxxxxxx

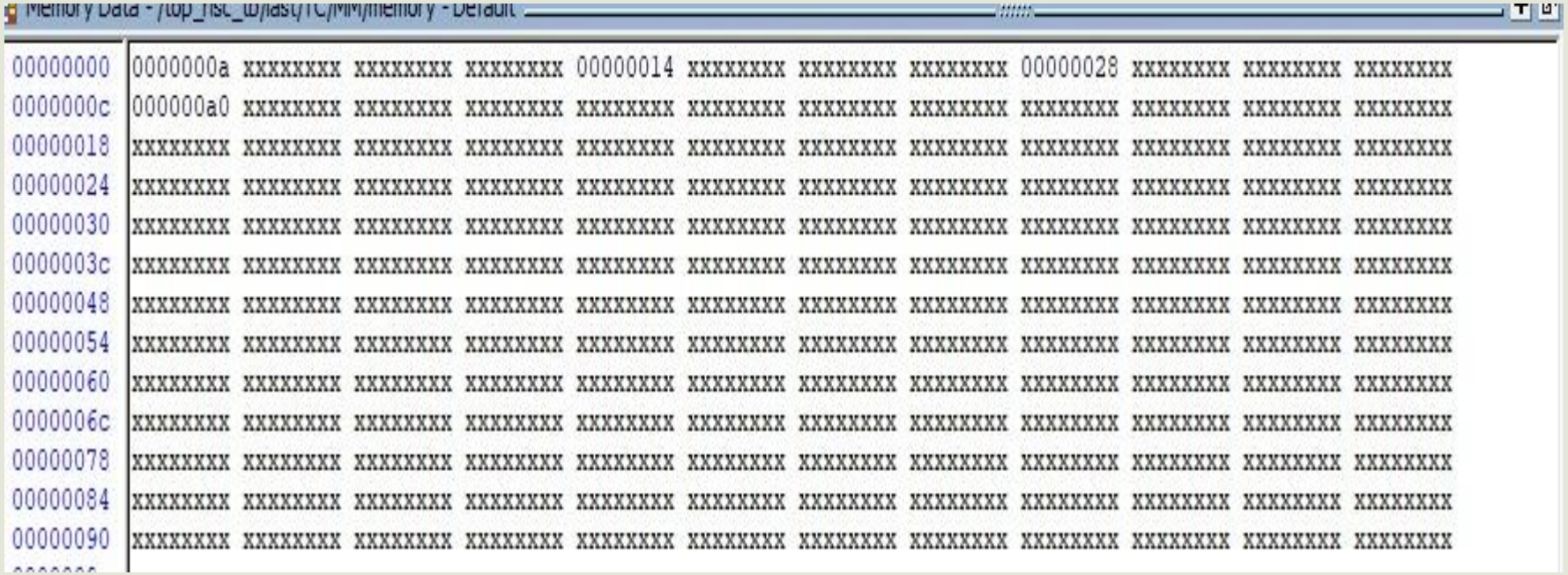
Simulation Results

sw x5, 12(x0)



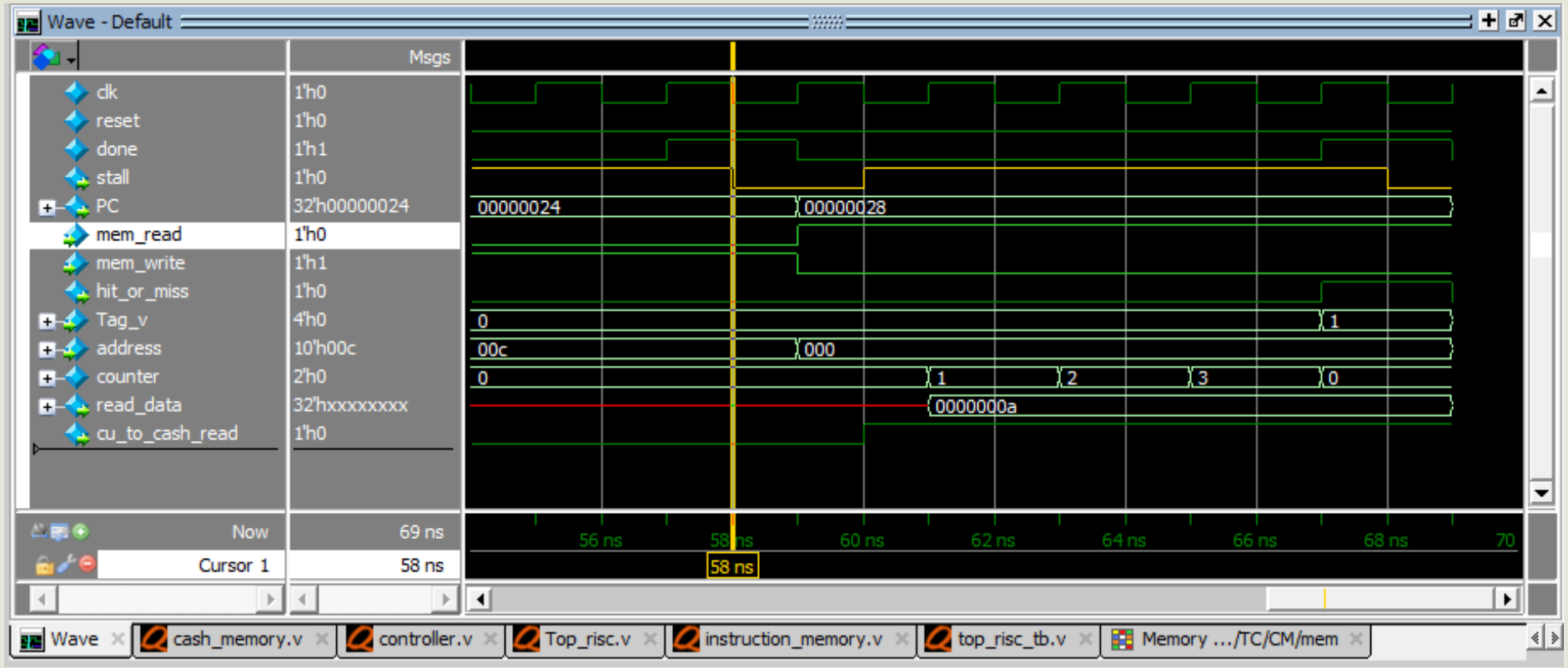
Simulation Results

Store 0x160 in location 0x0000000c



Simulation Results

lw x10, 0(x0)



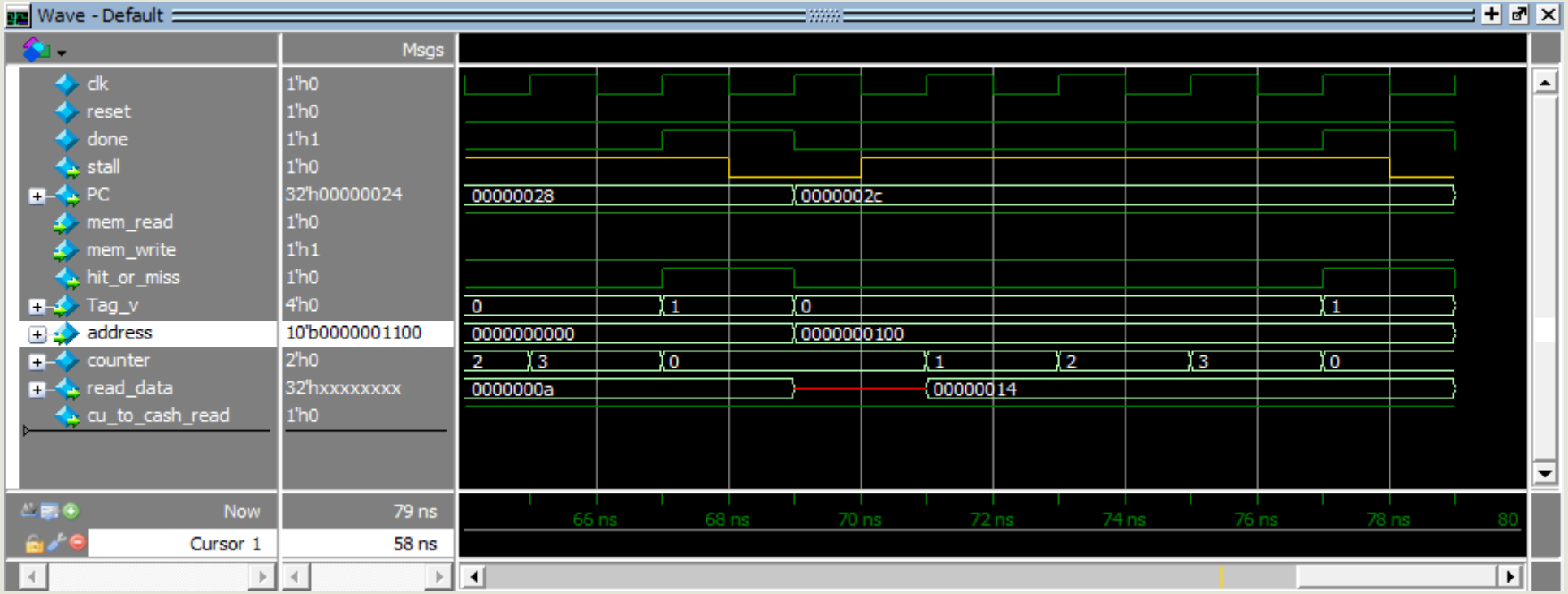
Simulation Results

Store block 1 in cache memory then read the value 10

00000000	1xxxxxxxxxxxxxxxxxxxxxxx0000000a	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000003	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000006	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000009	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000000c	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000000f	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000012	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000015	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000018	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000001b	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000001e	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	

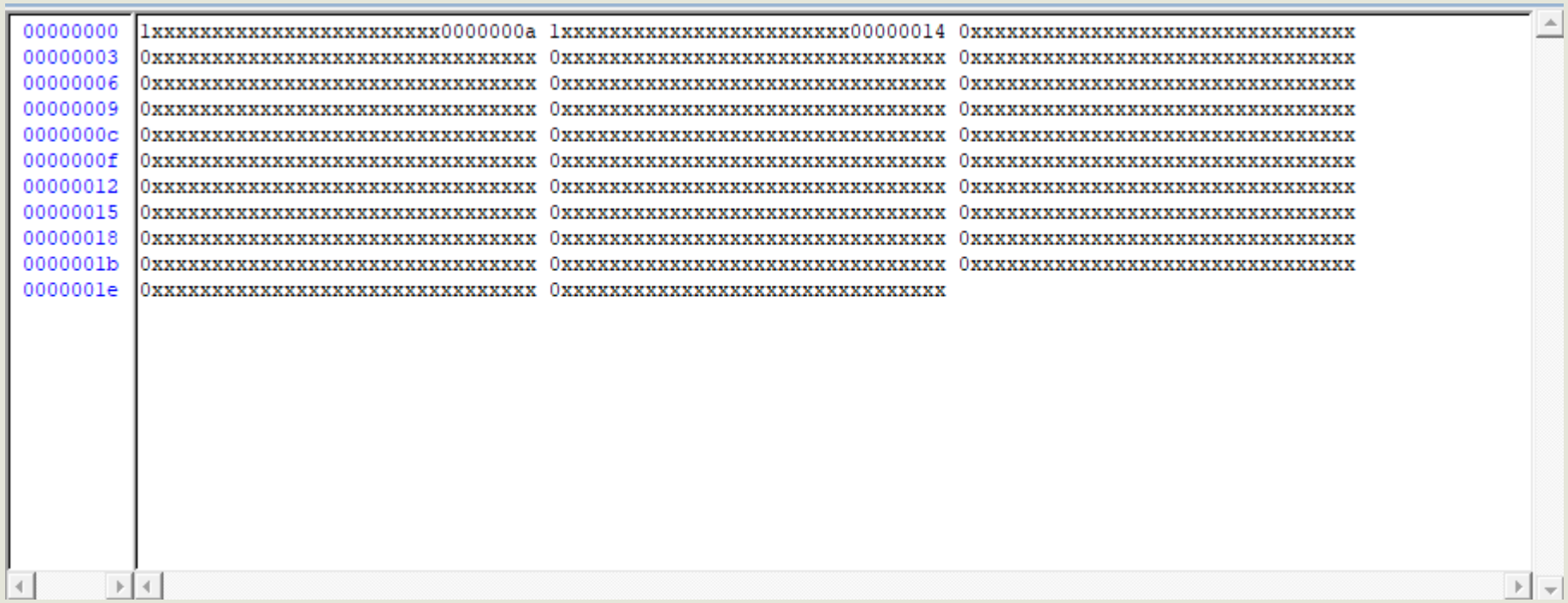
Simulation Results

lw x11, 4(x0)



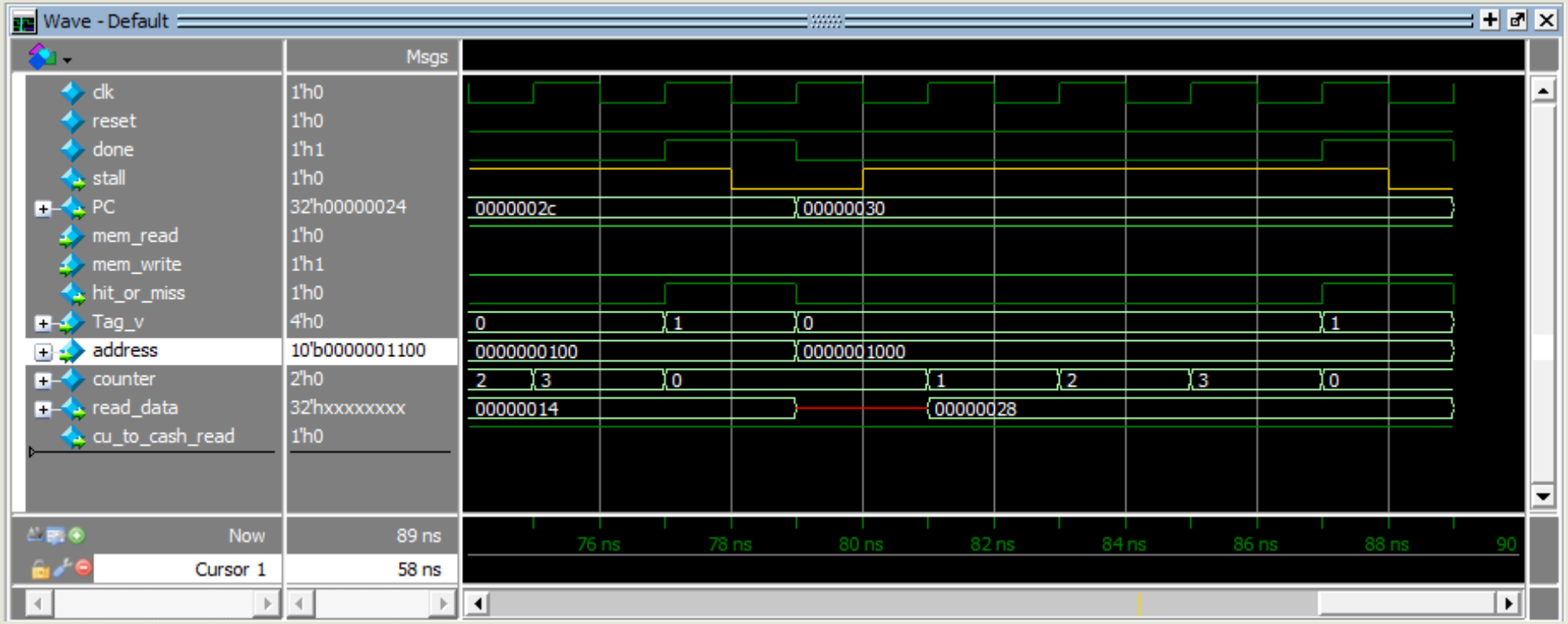
Simulation Results

Store block 2 in cache memory then read the value 20



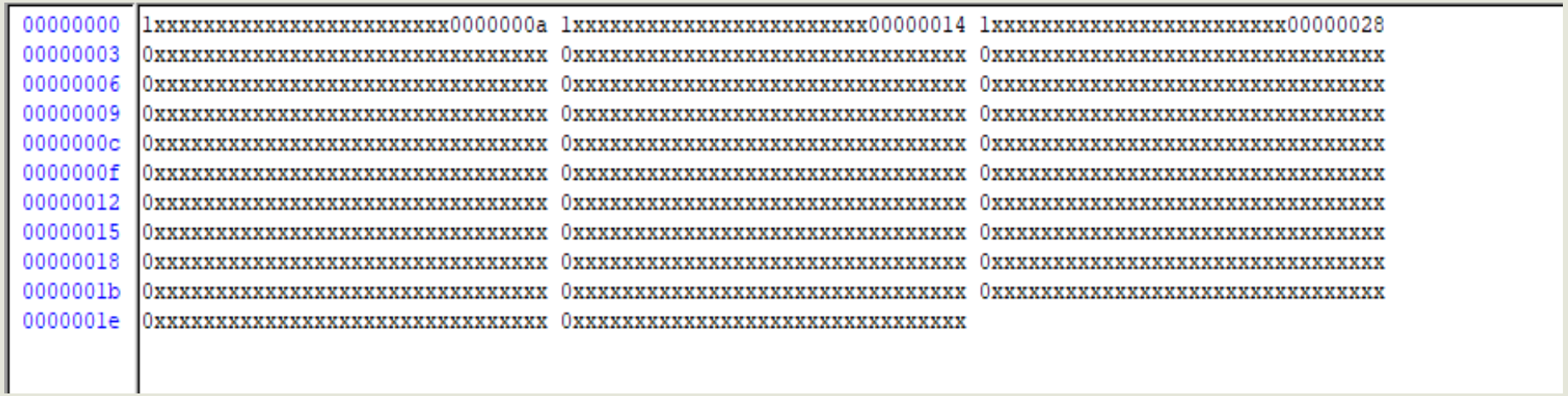
Simulation Results

lw x12, 8(x0)



Simulation Results

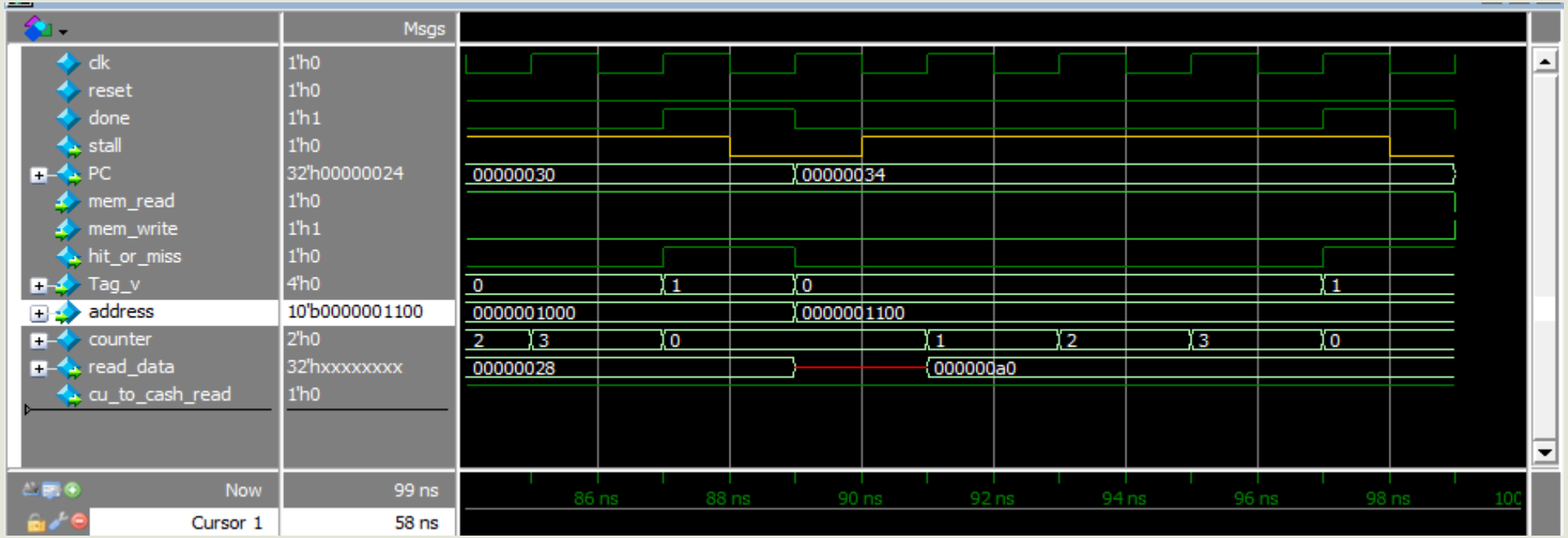
Store block 3 in cache memory then read the value 40



00000000	1xxxxxxxxxxxxxxxxxxxxxxx0000000a	1xxxxxxxxxxxxxxxxxxxxxxx00000014	1xxxxxxxxxxxxxxxxxxxxxxx00000028
00000003	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000006	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000009	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000000c	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000000f	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000012	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000015	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
00000018	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000001b	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
0000001e	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	0xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	

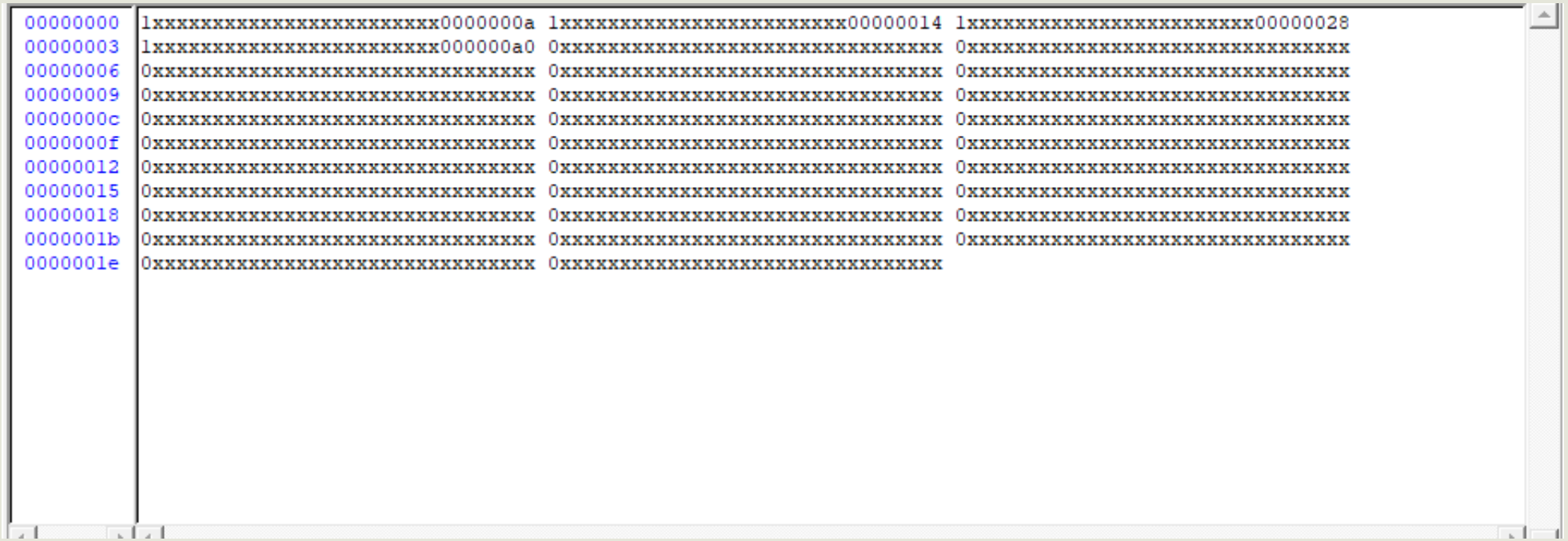
Simulation Results

lw x13, 12(x0)



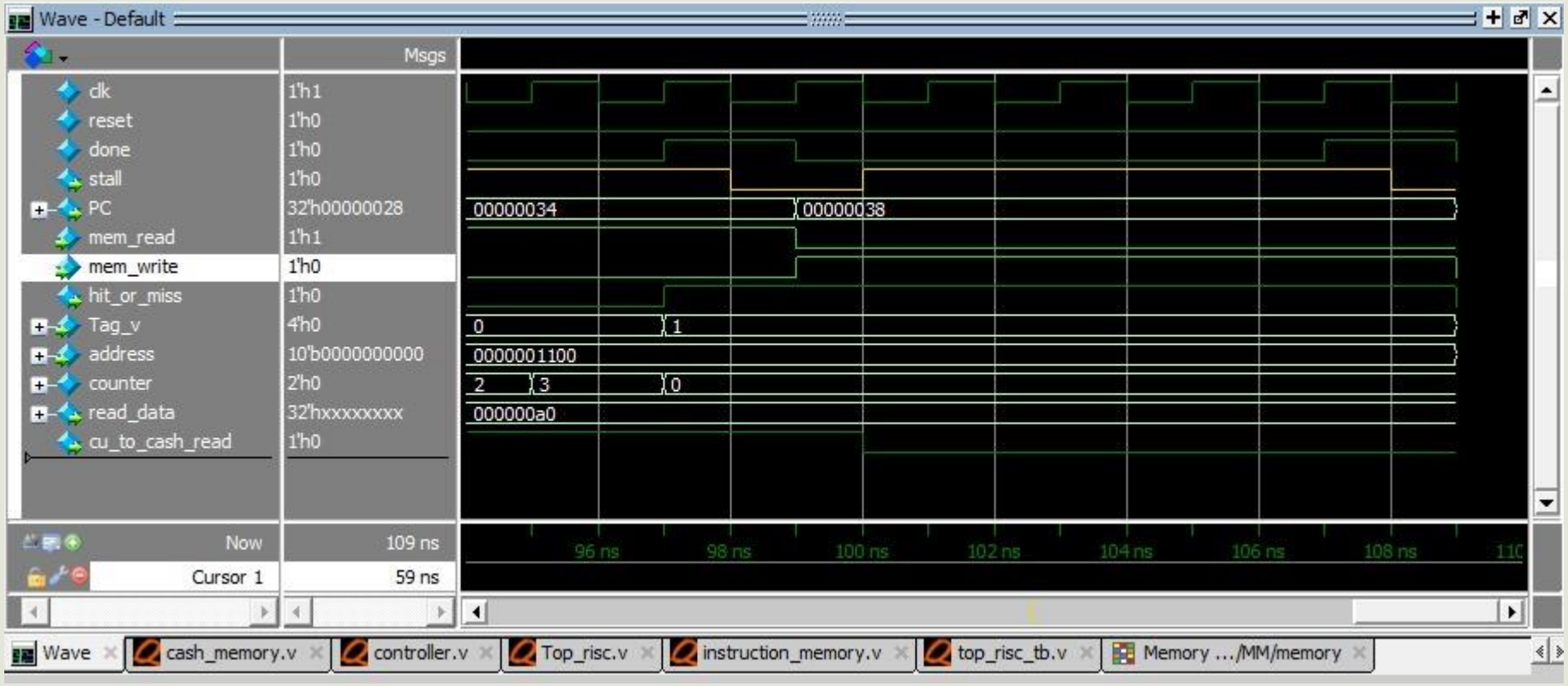
Simulation Results

Store block 4 in cache memory then read the value 160



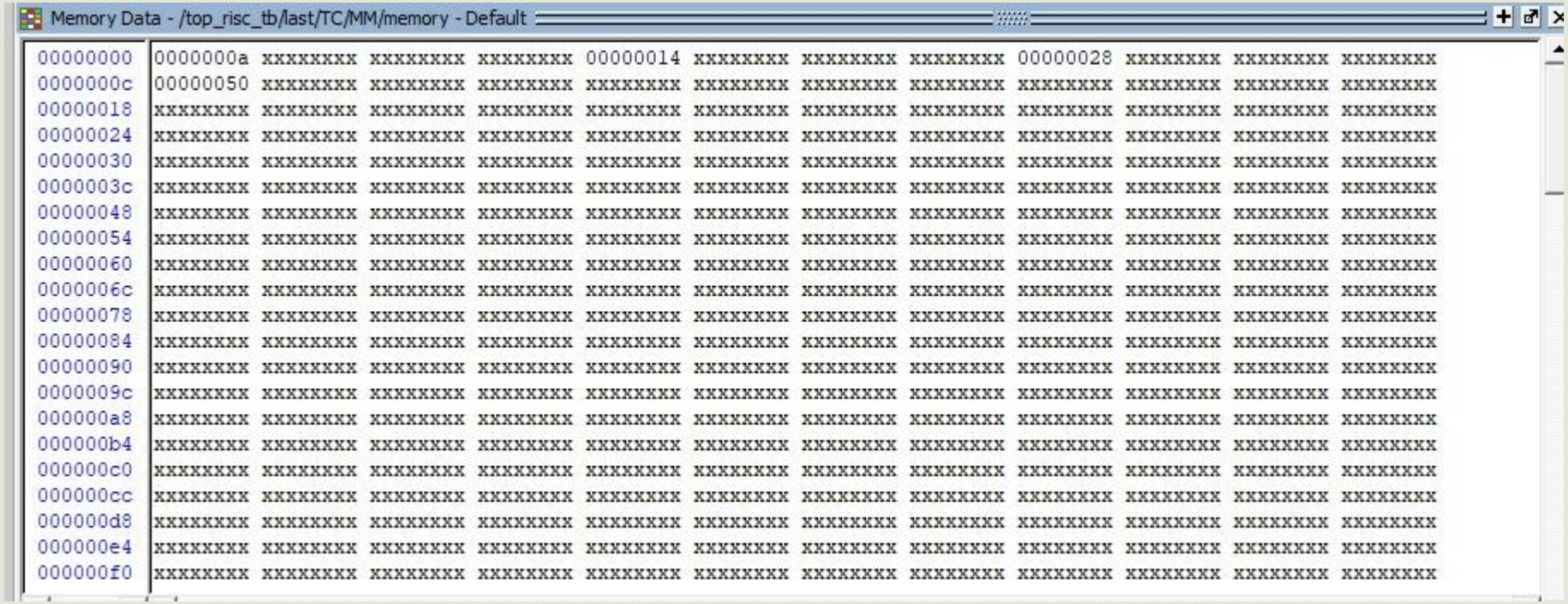
Simulation Results

sw x4, 12(x0)



Simulation Results

sw x4, 12(x0)



Time’s Up!!!

Any Questions ?

Thank You

Special Thanks to our instructors & Supervisor

.Eng Ahamed El-Gammal

.Eng Fayza Hamada

.Eng Ahmed El-Gayar