

Ain Shams University
Faculty of Engineering
Computer and Systems Engineering Department

Pipelined-Mips Project

- The project is about implementing a pipelined MIPS processor using Verilog code
- Here are 2 programs we used to test our processor:
- Where the register files are loaded with values according to the following equation memory[i]=I.

1)

For the first test program, we used instructions that don't involve forwarding or hazard cases:

```
//
           Instructions:
                                                         Expected output
                                                                                 000000100011000110010000000100000
00400000: 02319020 ; <input:0> add $s2, $s1, $s1
                                                //
                                                        $s2=17+17=34
                                                                                 0000000000100111001000010000000
00400004: 00139080
                   ; <input:1> sll $s2, $s3, 2
                                                //
                                                        $s2=19*4=76
                    ; <input:2> and $s5, $s1, $s0
                                                                                 00000010001100001010100000100100
00400008: 0230a824
                                               //
                                                        $s5=0
                    ; <input:3> sw $s4, 4($t0)
                                                //
                                                        0040000c: ad140004
00400010: 8d930000
                    ; <input:4> lw $s3, 0($t4)
                                                //
                                                        $s3=memory[12]=20
                                                                                 1000110110010011000000000000000000
```

Output:

#	0 clk:0,Alu1: x Alu2=	x Aluout:	x PC out:	0 Instr:02319020 PC in:	4 W
riteData:	x DEST: x RS= x RT= x RD= x		_	-	
#	10 clk:1,Alu1: x Alu2=	x Aluout:	x PC out:	4 Instr:00139080 PC in:	8 W
riteData:	x DEST: x RS=17 RT=17 RD= x		-	-	
#	20 clk:0,Alu1: x Alu2=	x Aluout:	x PC out:	4 Instr:00139080 PC in:	8 W
riteData:	x DEST: x RS=17 RT=17 RD= x		-	_	
#	30 clk:1,Alu1: 17 Alu2=	17 Aluout:	34 PC out:	8 Instr:0230a824 PC in:	12 W
riteData:	x DEST: x RS= 0 RT=19 RD=18				
#	40 clk:0,Alu1: 17 Alu2=	17 Aluout:	34 PC_out:	8 Instr:0230a824 PC_in:	12 W
riteData:	x DEST: x RS= 0 RT=19 RD=18		-	_	
#	50 clk:1, Alu1: 0 Alu2=	19 Aluout:	76 PC_out:	12 Instr:ad140004 PC_in:	16 W
riteData:	x DEST: x RS=17 RT=16 RD=18				
#	60 clk:0,Alu1: 0 Alu2=	19 Aluout:	76 PC_out:	12 Instr:ad140004 PC_in:	16 W
riteData:	x DEST: x RS=17 RT=16 RD=18				
#	70 clk:1,Alu1: 17 Alu2=	16 Aluout:	16 PC_out:	16 Instr:8d930000 PC_in:	20 W
riteData:	34 DEST:18 RS= 8 RT=20 RD=21				
#	80 clk:0,Alu1: 17 Alu2=	16 Aluout:	16 PC_out:	16 Instr:8d930000 PC_in:	20 W
riteData:	34 DEST:18 RS= 8 RT=20 RD=21				
#	90 clk:1,Alu1: 8 Alu2=	4 Aluout:	12 PC_out:	20 Instr:xxxxxxxx PC_in:	24 W
riteData:	76 DEST:18 RS=12 RT=19 RD= X				
#	100 clk:0,Alu1: 8 Alu2=	4 Aluout:	12 PC_out:	<pre>20 Instr:xxxxxxxx PC_in:</pre>	24 W
riteData:	76 DEST:18 RS=12 RT=19 RD= X				
#	110 clk:1,Alu1: 12 Alu2=	0 Aluout:	12 PC_out:	24 Instr:xxxxxxxx PC_in:	28 W
riteData:	16 DEST:21 RS= x RT= x RD=19				
#	120 clk:0,Alu1: 12 Alu2=	0 Aluout:	12 PC_out:	24 Instr:xxxxxxxx PC_in:	28 W
riteData:	16 DEST:21 RS= x RT= x RD=19				
#	130 clk:1,Alu1: x Alu2=	x Aluout:	x PC_out:	28 Instr:xxxxxxxx PC_in:	32 W
riteData:	X DEST: X RS= x RT= x RD= x				
#	140 clk:0,Alu1: x Alu2=	x Aluout:	x PC_out:	28 Instr:xxxxxxxx PC_in:	32 W
riteData:	X DEST: X RS= x RT= x RD= x				
#	150 clk:1,Alu1: x Alu2=	x Aluout:	x PC_out:	32 Instr:xxxxxxxx PC_in:	36 W
riteData:	20 DEST:19 RS= x RT= x RD= x				

For the second test program, we used instructions that involve forwarding and hazard cases:

```
Instructions :
                                                      // Expected output :
00400000: 00622020
                    ; <input:0> add $a0, $v1, $v0 // $a0=2+3=5
                                                                               000000000110001000100000000100000
00400004: 01846824
                       ; <input:1> and $t5, $t4, $a0 // $t5=12+5=17
                                                                               00000001100001000110100000100100
                       ; <input:2> sw $s1, 0($t3)
00400008: ad710000
                                                                               1010110101110001000000000000000000
                                                     // memory[11]=1
                      ; <input:3> lw $s3, 0($t3)
0040000c: 8d730000
                                                     // $s3=memory[11]=1
                                                                               1000110101110011000000000000000000
00400010: 02318822
                      ; <input:4> sub $s1, $s1, $s1 // $s1=0
                                                                               00000010001100011000100000100010
                      ; <input:5> add $t8, $s0, $s0 // $t8=16
00400018: 0210c020
                                                                               00000010000100001100000000100000
0040001c: 0330c020
                      ; <input:6> add $t8, $t9, $s0 // $t8=41
                                                                               00000011001100001100000000100000
                      ; <input:7> add $t9, $t8, $t8 //$t9=82
00400020: 0318c820
                                                                               00000011000110001100100000100000
00400024: 10850001
                      ; <input:9> beq $a0, $a1, 1 // jump to 0040002c
                                                                               0001000010000101000000000000000001
00400028: 022ba022
                      ; <input:10> sub $s4, $s1, $t3//
                                                                               00000010001010111010000000100010
0040002c: 02aaa825
                   ; <input:11> or $s5, $s5, $t2 // $s5=31
; <input:12> lw $t1, 0($s0) // $t1=1
                     ; <input:11> or $s5, $s5, $t2 // $s5=31
                                                                               00000010101010101010100000100101
                                                                               1000110101101001000000000000000000
00400030: 8e090000
00400034: 01295020
                       ; <input:13> add $t2, $t1, $t1// $t2=2
                                                                               00000001001010010101000000100000
```

#.	0 clk:0,Alu1: x Alu2=	x Aluout:	x PC_out:	0 Instr:00622020 PC_in:	4 V
riteData:	x DEST: x RS= x RT= x RD= x				
# riteData:	10 clk:1,Alu1: x Alu2= x DEST: x RS= 3 RT= 2 RD= x	x Aluout:	x PC_out:	4 Instr:01846824 PC_in:	8 W
	20 clk:0,Alu1: x Alu2=	x Aluout:	x PC_out:	4 Instr:01846824 PC_in:	8 W
iteData:	x DEST: x RS= 3 RT= 2 RD= x 30 clk:1,Alu1: 3 Alu2=	2 Aluout:	5 PC out:	8 Instr:ad710000 PC in:	12 W
iteData:	x DEST: x RS=12 RT= 4 RD= 4	Z AIGOGC.	J FC_Out.	0 111501.ad/10000 FC_111.	12 1
	40 clk:0,Alu1: 3 Alu2=	2 Aluout:	5 PC_out:	8 Instr:ad710000 PC_in:	12 W
iteData:	x DEST: x RS=12 RT= 4 RD= 4 50 clk:1,Alu1: 12 Alu2=	5 Aluout:	4 PC out:	12 Instr:8d730000 PC in:	16 W
iteData:	x DEST: x RS=11 RT=17 RD=13	J AIGUGE.	T FC_Out.	12 1118t1.0d/30000 FC_111.	10 1
	60 clk:0,Alu1: 12 Alu2=	5 Aluout:	4 PC_out:	12 Instr:8d730000 PC_in:	16 W
iteData:	x DEST: x RS=11 RT=17 RD=13 70 clk:1,Alu1: 11 Alu2=	0 Aluout:	11 PC out:	16 Instr:02318822 PC in:	20 W
iteData:	5 DEST: 4 RS=11 RT=19 RD= X	o Aldodt.	II PC_Out.	10 1NSC1.02310022 PC_IN.	20 V
	80 clk:0,Alu1: 11 Alu2=	0 Aluout:	11 PC_out:	16 Instr:02318822 PC_in:	20 W
iteData:	5 DEST: 4 RS=11 RT=19 RD= X	0.71	11 DO out	20 Troth.0210-020 BG in.	0.4 10
iteData:	90 clk:1,Alu1: 11 Alu2= 4 DEST:13 RS=17 RT=17 RD=19	0 Aluout:	11 PC_out:	20 Instr:0210c020 PC_in:	24 V
	100 clk:0,Alu1: 11 Alu2=	0 Aluout:	11 PC_out:	20 Instr:0210c020 PC_in:	24 V
iteData:	4 DEST:13 RS=17 RT=17 RD=19	40.51	0.77	04 7 1 0000 000 77 1	00 -
iteData:	110 clk:1,Alu1: 17 Alu2= X DEST: X RS=16 RT=16 RD=17	17 Aluout:	0 PC_out:	24 Instr:0330c020 PC_in:	28 1
	120 clk:0,Alu1: 17 Alu2=	17 Aluout:	0 PC_out:	24 Instr:0330c020 PC_in:	28 V
iteData:	X DEST: X RS=16 RT=16 RD=17	46.49			
			32 PC out:	28 Instr:0318c820 PC in:	32 T
iteData:	130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24	16 Aluout:	32 13_343.		
ŧ	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2=	16 Aluout:	_	28 Instr:0318c820 PC_in:	32 V
<u> </u>	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24		_	28 Instr:0318c820 PC_in:	32 V
iteData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RT=10 RD=17 130 clk:1,Alu1: 16 Alu2=		_	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in:	
iteData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24	16 Aluout:	32 PC_out:	28 Instr:0318c820 PC_in:	32
iteData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A AS=10 Al=10 AD=1/ 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24	16 Aluout: 16 Aluout: 16 Aluout:	32 PC_out: 32 PC_out: 32 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in:	32 32
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2=	16 Aluout:	32 PC_out:	28 Instr:0318c820 PC_in:	32 32
iteData: eData: eData: eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2=	16 Aluout: 16 Aluout: 16 Aluout:	32 PC_out: 32 PC_out: 32 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in:	32 32 36
iteData: eData: eData: eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 KI=10 KD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in:	32 32 36 36
eData: eData: eData: eData: eData: eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A AS=10 Al=10 AD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in:	32 32 36 36 40
iteData: eData: eData: eData: eData: eData: eData: eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 25 Alu2= 170 clk:1,Alu1: 41 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in:	32 32 36 36 40
eData: eData: eData: eData: eData: eData: eData: eData: eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A AS=10 Al=10 AD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in:	32 32 36 36 40 40
eData: eData: eData: eData: eData: eData: eData: eData: eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 36 Instr:022ba022 PC_in:	32 32 36 36 40 40 44
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 92 PC_out: 0 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in:	32 32 36 36 40 40 44
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aaa825 PC_in: 41 Instr:02aaa825 PC_in:	32 32 36 36 40 40 44 44
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A AS=10 Al=10 AD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 92 PC_out: 0 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in:	32 32 36 36 40 40 44 44
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aaa825 PC_in: 41 Instr:02aaa825 PC_in:	32 32 36 36 40 40 44 44 48
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout: 11 Aluout: 10 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out: 11 PC_out: 31 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aa825 PC_in: 41 Instr:8d690000 PC_in: 42 Instr:8d690000 PC_in: 43 Instr:01295020 PC_in:	32 32 36 36 40 40 44 44 48 48
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RT=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 240 clk:0,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout: 11 Aluout: 10 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out: 11 PC_out: 31 PC_out: 31 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aaa825 PC_in: 44 Instr:8d690000 PC_in: 48 Instr:01295020 PC_in: 48 Instr:01295020 PC_in:	32 32 36 36 40 40 44 44 48 48 52
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RI=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 240 clk:0,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 240 clk:0,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 250 clk:1,Alu1: 11 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout: 11 Aluout: 10 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out: 11 PC_out: 31 PC_out: 31 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aa825 PC_in: 41 Instr:8d690000 PC_in: 42 Instr:8d690000 PC_in: 43 Instr:01295020 PC_in:	32 W 32 36 36 40 40 44 48 48 52 52 556
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RT=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=11 240 clk:0,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 240 clk:0,Alu1: 11 Alu2= 11 DEST:11 RS= 9 RT= 9 RD= 9 260 clk:0,Alu1: 11 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout: 11 Aluout: 10 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out: 11 PC_out: 31 PC_out: 31 PC_out: 11 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aaa825 PC_in: 44 Instr:8d690000 PC_in: 48 Instr:01295020 PC_in: 48 Instr:01295020 PC_in:	32 32 36 36 40 40 44 44 48 48 52
eData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A AS=10 Al=10 AD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 240 clk:0,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 250 clk:1,Alu1: 11 Alu2= 11 DEST:11 RS= 9 RT= 9 RD= 9 260 clk:0,Alu1: 11 Alu2= 11 DEST:11 RS= 9 RT= 9 RD= 9	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout: 10 Aluout: 0 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out: 11 PC_out: 31 PC_out: 11 PC_out: 11 PC_out: 11 PC_out: 11 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 41 Instr:02aaa825 PC_in: 42 Instr:8d690000 PC_in: 43 Instr:01295020 PC_in: 44 Instr:01295020 PC_in: 45 Instr:01295020 PC_in: 47 Instr:01295020 PC_in: 48 Instr:01295020 PC_in: 49 Instr:01295020 PC_in: 50 Instr:xxxxxxxxx PC_in:	32 32 36 36 40 40 44 44 48 52 52 52
riteData: riteData: riteData: reData:	17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 A DEST: A RS=10 RT=10 RD=17 130 clk:1,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 140 clk:0,Alu1: 16 Alu2= 17 DEST:19 RS=25 RT=16 RD=24 150 clk:1,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 160 clk:0,Alu1: 25 Alu2= 0 DEST:17 RS=24 RT=24 RD=24 170 clk:1,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 180 clk:0,Alu1: 41 Alu2= 32 DEST:24 RS= 4 RT= 5 RD=25 190 clk:1,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 200 clk:0,Alu1: 5 Alu2= 41 DEST:24 RS=17 RT=11 RD= X 210 clk:1,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 220 clk:0,Alu1: 0 Alu2= 82 DEST:25 RS=21 RT=10 RD=11 230 clk:1,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=11 240 clk:0,Alu1: 21 Alu2= 0 DEST: X RS=11 RT= 9 RD=21 240 clk:0,Alu1: 11 Alu2= 11 DEST:11 RS= 9 RT= 9 RD= 9 260 clk:0,Alu1: 11 Alu2=	16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 16 Aluout: 41 Aluout: 41 Aluout: 5 Aluout: 5 Aluout: 11 Aluout: 10 Aluout: 0 Aluout: 0 Aluout:	32 PC_out: 32 PC_out: 32 PC_out: 41 PC_out: 41 PC_out: 82 PC_out: 0 PC_out: 11 PC_out: 11 PC_out: 31 PC_out: 11 PC_out: 11 PC_out: 11 PC_out: 11 PC_out:	28 Instr:0318c820 PC_in: 28 Instr:0318c820 PC_in: 32 Instr:10850001 PC_in: 32 Instr:10850001 PC_in: 36 Instr:022ba022 PC_in: 40 Instr:022ba022 PC_in: 40 Instr:02aaa825 PC_in: 40 Instr:02aaa825 PC_in: 44 Instr:8d690000 PC_in: 44 Instr:8d690000 PC_in: 48 Instr:01295020 PC_in: 48 Instr:01295020 PC_in: 52 Instr:xxxxxxxx PC_in:	32 32 36 36 40 40 44 44 48 48 52 52 56

Note:

To try a new test program of your own choice:

- 1-Create a text file containing the instructions in binary.
- 2-Rename the file to "Binary.txt".
- 3-Move the file to the folder where your project is saved for example:
- C:/Modelsim/examples.