

TEST CODE 1 – Has all of the instructions defined by the project requirement (V1).

ADVANCED HARDWARE DESIGN (TEAM 5)

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PC	INSTRUCTION (imm values shown as decimal. Convert this to binary for opcode)	OPCODE	COMMENTS
0	Addi r0,r1,9	00000100000000010000000000001001	R1 now has 0x9
4	Addi r0,r2,2	00000100000000010000000000000010	R2 now has 0x2
8	Subi r1,r1,2	00001000001000010000000000000010	R1 now has 0x7
12	Addi r1,r2,1	00000100001000100000000000000001	R2 now has 0x8
16	Or r1,r2,r3	000000000010001000011000000000111	R3 now has 0xF
20	And r2,r3,r4	00000000010000110010000000000101	R4 now has 0x8
24	Andi r3,r5,11	000011000110010100000000000001011	R5 now has 0xB
28	Ori r3,r6,11	000100000110011000000000000001011	R6 now has 0xF
32	Sub r2,r1,r1	000000000100000100001000000000011	R1 now has 0x1
36	Nor r1,r2,r7	00000000001000100011100000001001	R7 now has 0xFFFFF6
40	Shl r1,r8,2	00010100001010000000000000000010	R8 now has 0x4
44	Sw r1,r8,4	001000000010100000000000000000100	Location 5 now has the 0x4
48	Lw r1,r9,4	000111000010100100000000000000100	R9 now has 0x4
52	Add r9,r9,r9	000000010010100101001000000000001	First Time: R9 now has 0x8 Second Time: R9 now has 0x10
56	Beq r9,r2,-8	00101001001000101111111111111110	First Time: Since R9 == R2. Branch to prev ins. Second Time: R9 now has 0x10. Go to next ins.
60	Addi r0,r10,3	000001000000101000000000000000011	R10 now has 0x3
64	Addi r0,r11,1	000001000000101100000000000000001	R11 now has 0x1
68	Addi r11,r11,1	000001010110101100000000000000001	First Time: R11 now has 0x2 Second Time: R11 now has 0x3
72	Bne r10,r11,-8	00101101010010111111111111111110	First Time: Since R10 != R11. Branch to prev ins. Second Time: R10 == R11. Go to next ins.
76	Addi r0,r12,1	000001000000110000000000000000001	R12 now has 0x1
80	Addi r12,r12,1	000001011000110000000000000000001	First Time: R12 now has 0x2. Second Time: R12 now has 0x3.
84	Blr r12,r10,-8	00100101100010101111111111111110	First Time: Since R12 < R10. Branch to prev ins. Second Time: R12 == R10. Go to next ins.
88	Jmp 96	00110000000000000000000000000001000	Jumps to 96 (PC Value). Will skip the next instruction.
92	Addi r0,r14,255	00000100000011100000000011111111	<i>THIS INSTRUCTION WILL NOT BE EXECUTED</i>
96	Addi r0,r15,170	00000100000011110000000010101010	R15 now has 0xAA
100	Hal	11111100000000000000000000000000	Program end.

NOTE: All registers and dmem locations have 0x0 value prior to this program's execution.

NOTE: For jump and branch instructions, divide the decimal value by 4 before converting it to binary. This is done to negate the fact that MIPS concatenates "00" at the end of these values.

REGISTER AND DMEM VALUES AFTER THIS PROGRAM FINISHES

REGISTER/DMEM	VALUE (in hex)
r1	0x00000001
r2	0x00000008
r3	0x0000000F
r4	0x00000008
r5	0x0000000B
r6	0x0000000F
r7	0xFFFFFFFF6
r8	0x00000004
r9	0x00000010
dmem location = 5	0x00000004
r10	0x00000003
r11	0x00000003
r12	0x00000003
r15	0x000000AA

NOTE: Registers and dmem locations that are not shown on the table above have 0x0 value.

ASSEMBLY CODE

```
addi r0,r1,00000000000001001
addi r0,r2,0000000000000010
subi r1,r1,0000000000000010
addi r1,r2,0000000000000001
or r1,r2,r3
and r2,r3,r4
andi r3,r5,0000000000001011
ori r3,r6,0000000000001011
sub r2,r1,r1
nor r1,r2,r7
shl r1,r8,000000000000010
sw r1,r8,0000000000000100
lw r1,r9,0000000000000100
add r9,r9,r9
beq r9,r2,111111111111110
addi r0,r10,000000000000011
addi r0,r11,000000000000001
addi r11,r11,000000000000001
bne r10,r11,111111111111110
addi r0,r12,000000000000001
addi r12,r12,000000000000001
blt r12,r10,111111111111110
jmp 0000000000000000011000
addi r0,r14,0000000011111111
addi r0,r15,0000000010101010
hal
```

OPCODE

"00000100","00000001","00000000","00001001",
"00000100","00000010","00000000","00000010",
"00001000","00100001","00000000","00000010",
"00000100","00100010","00000000","00000001",
"00000000","00100010","00011000","00000111",
"00000000","01000011","00100000","00000101",
"00001100","01100101","00000000","00001011",
"00010000","01100110","00000000","00001011",
"00000000","01000001","00001000","00000011",
"00000000","00100010","00111000","00001001",
"00010100","00101000","00000000","00000010",
"00100000","00101000","00000000","00000100",
"00011100","00101001","00000000","00000100",
"00000001","00101001","01001000","00000001",
"00101001","00100010","11111111","11111110",
"00000100","00001010","00000000","00000011",
"00000100","00001011","00000000","00000001",
"00000101","01101011","00000000","00000001",
"00101101","01001011","11111111","11111110",
"00000100","00001100","00000000","00000001",
"00000101","10001100","00000000","00000001",
"00100101","10001010","11111111","11111110",
"00110000","00000000","00000000","00011000",
"00000100","00001110","00000000","11111111",
"00000100","00001111","00000000","10101010",
"11111100","00000000","00000000","00000000"