

表 1 给出了测试单周期（36 条指令）及流水线（36 条指令）MIPS CPU 的一个测试程序，分别来测试单周期（实验要求）及流水线（课程设计要求）MIPS CPU。

表 1 CPU 测试所用 36 条汇编指令程序

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
00H	addiu \$1, \$0,#1	[\$1] = 0000_0001H	24010001	0010_0100_0000_0001_0000_0000_0000_0001
04H	sll \$2, \$1,#4	[\$2] = 0000_0010H	00011100	0000_0000_0000_0001_0001_0001_0000_0000
08H	addu \$3, \$2,\$1	[\$3] = 0000_0011H	00411821	0000_0000_0100_0001_0001_1000_0010_0001
0CH	srl \$4, \$2,#2	[\$4] = 0000_0004H	00022082	0000_0000_0000_0010_0010_0000_1000_0010
10H	slti \$25,\$4,#5	[\$25] = 0000_0001H	28990005	0010_1000_1001_1001_0000_0000_0000_0101
14H	bgez \$25,#16	跳转到 54H	07210010	0000_0111_0010_0001_0000_0000_0001_0000
18H	subu \$5, \$3,\$4	[\$5] = 0000_000DH	00642823	0000_0000_0110_0100_0010_1000_0010_0011
1CH	sw \$5, #20(\$0)	Mem[0000_0014H] = 0000_000DH	AC050014	1010_1100_0000_0101_0000_0000_0001_0100
20H	nor \$6, \$5,\$2	[\$6] = FFFF_FFE2H	00A23027	0000_0000_1010_0010_0011_0000_0010_0111
24H	or \$7, \$6,\$3	[\$7] = FFFF_FFF3H	00C33825	0000_0000_1100_0011_0011_1000_0010_0101
28H	xor \$8, \$7,\$6	[\$8] = 0000_0011H	00E64026	0000_0000_1110_0110_0100_0000_0010_0110
2CH	sw \$8, #28(\$0)	Mem[0000_001CH] = 0000_0011H	AC08001C	1010_1100_0000_1000_0000_0000_0001_1100
30H	beq \$8, \$3,#2	跳转到 38H	11030002	0001_0001_0000_0011_0000_0000_0000_0010
34H	slt \$9, \$6,\$7	不执行	00C7482A	0000_0000_1100_0111_0100_1000_0010_1010
38H	addiu \$1, \$0,#8	[\$1] = 0000_0008H	24010008	0010_0100_0000_0001_0000_0000_0000_1000
3CH	lw \$10,#20(\$1)	[\$10] = 0000_0011H	8C2A0014	1000_1100_0010_1010_0000_0000_0001_0100
40H	bne \$10,\$5,#4	跳转到 50H	15450004	0001_0101_0100_0101_0000_0000_0000_0100
44H	and \$11,\$2,\$1	不执行	00415824	0000_0000_0100_0001_0101_1000_0010_0100
48H	sw \$11,#28(\$1)	不执行	AC2B001C	1010_1100_0010_1011_0000_0000_0001_1100
4CH	sw \$4, #16(\$1)	不执行	AC240010	1010_1100_0010_0100_0000_0000_0001_0000
50H	jal #25	跳转到 64H, [\$31] = 0000_0054H	0C000019	0000_1100_0000_0000_0000_0000_0001_1001
54H	lui \$12,#12	[\$12] = 000C_0000H	3C0C000C	0011_1100_0000_1100_0000_0000_0000_1100
58H	srav \$26,\$12,\$2	[\$26] = 0000_000CH	004CD007	0000_0000_0100_1100_1101_0000_0000_0111
5CH	sllv \$27,\$26,\$1	[\$27] = 0000_0018H	003AD804	0000_0000_0011_1010_1101_1000_0000_0100
60H	jalr \$27	跳转到 18H, [\$31] = 0000_0064H	0360F809	0000_0011_0110_0000_1111_1000_0000_1001
64H	sb \$26,#5(\$3)	将\$26的最低 8 位值 0CH 存入 16H 的位置。显示 4 个字节的话，就是 MEM[0000_0014H] = 000C_000DH	A07A0005	1010_0000_0111_1010_0000_0000_0000_0101
68H	sltu \$13,\$3,\$3	[\$13] = 0000_0000H	0063682B	0000_0000_0110_0011_0110_1000_0010_1011
6CH	bgtz \$13,#3	不跳转	1DA00003	0001_1101_1010_0000_0000_0000_0000_0011
70H	sllv \$14,\$6,\$4	[\$14] = FFFF_FE20H	00867004	0000_0000_1000_0110_0111_0000_0000_0100
74H	sra \$15,\$14,#2	[\$15] = FFFF_FF88H	000E7883	0000_0000_0000_1110_0111_1000_1000_0011
78H	srlv \$16,\$15,\$1	[\$16] = 00FF_FFFFH	002F8006	0000_0000_0010_1111_1000_0000_0000_0110
7CH	blez \$16,#8	不跳转	1A000008	0001_1010_0000_0000_0000_0000_0000_1000
80H	srav \$16,\$15,\$1	[\$16] = FFFF_FFFFH	002F8007	0000_0000_0010_1111_1000_0000_0000_0111
84H	addiu \$11,\$0,#140	[\$11] = 0000_008CH	240B008C	0010_0100_0000_1011_0000_0000_1000_1100

88H	bltz \$16, #6	跳转到 A0H	06000006	0000_0110_0000_0000_0000_0000_0110
8CH	lw \$28, #3(\$10)	[\$28] = 000C_000DH /000C_880DH	8D5C0003	1000_1101_0101_1100_0000_0000_0000_0011
90H	bne \$28, \$29, #7	不跳转/跳转 ACH	179D0007	0001_0111_1001_1101_0000_0000_0000_0111
94H	sb \$15, #8(\$5)	Mem[0000_0015H] = 0000_0088H	A0AF0008	1010_0000_1010_1111_0000_0000_0000_1000
98H	lb \$18, #8(\$5)	[\$18] = FFFF_FF88H	80B20008	1000_0000_1011_0010_0000_0000_0000_1000
9CH	lbu \$19, #8(\$5)	[\$19] = 0000_0088H	90B30008	1001_0000_1011_0011_0000_0000_0000_1000
A0H	sltiu \$24, \$15, #0xFFFF	[\$24] = 0000_0001H	2DF8FFFF	0010_1101_1111_1000_1111_1111_1111_1111
A4H	or \$29, \$12, \$5	[\$29] = 000C000DH	0185E825	0000_0001_1000_0101_1110_1000_0010_0101
A8H	jr \$11	跳转指令 8CH	01600008	0000_0001_0110_0000_0000_0000_0000_1000
ACH	andi \$20, \$15, #0xFFFF	[\$20] = 0000_FF88H	31F4FFFF	0011_0001_1111_0100_1111_1111_1111_1111
B0H	ori \$21, \$15, #0xFFFF	[\$21] = FFFF_FFFFH	35F5FFFF	0011_0101_1111_0101_1111_1111_1111_1111
B4H	xori \$22, \$15, #0xFFFF	[\$22] = FFFF_0077H	39F6FFFF	0011_1001_1111_0110_1111_1111_1111_1111
B8H	j #00H	跳转指令 00H	08000000	0000_1000_0000_0000_0000_0000_0000_0000

正确完成上述 36 条指令后，还能够再扩展 9 条指令，一共完成 45 条指令的，可用到以下部分测试，给附加分。表 2 给出了一个测试程序，来测试 45 条指令

表 2 CPU 测试 45 条指令所用汇编程序详述

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
Exception 入口地址，在 SYSCALL 指令执行后进入此处执行				
00H	sw \$1,#0(\$0)	Mem[0000_0000H] = 0000_0008H	AC010000	1010_1100_0000_0001_0000_0000_0000_0000
04H	sw \$2,#4(\$0)	Mem[0000_0004H] = 0000_0010H	AC020004	1010_1100_0000_0010_0000_0000_0000_0100
08H	sw \$3,#8(\$0)	Mem[0000_0008H] = 0000_0011H	AC030008	1010_1100_0000_0011_0000_0000_0000_1000
0CH	sw \$4,#12(\$0)	Mem[0000_000CH] = 0000_0004H	AC04000C	1010_1100_0000_0100_0000_0000_0000_1100
10H	sw \$5,#16(\$0)	Mem[0000_0010H] = 0000_000DH	AC050010	1010_1100_0000_0101_0000_0000_0001_0000
14H	sw \$6,#24(\$0)	Mem[0000_0018H] = FFFF_FFE2H	AC060018	1010_1100_0000_0110_0000_0000_0001_1000
18H	sw \$7,#112(\$0)	Mem[0000_0070H] = FFFF_FFF3H	AC070070	1010_1100_0000_0111_0000_0000_0111_0000
1CH	sw \$25,#116(\$0)	Mem[0000_0074H] = 0000_0001H	AC190074	1010_1100_0001_1001_0000_0000_0111_0100
20H	sw \$13,#24(\$0)	Mem[0000_0078H] = 0000_0000H	AC0D0078	1010_1100_0000_1101_0000_0000_0111_1000
24H	mfc0 \$1, cp0(14.0)	[\$1] = 0000_0104H	40017000	0100_0000_0000_0001_0111_0000_0000_0000
28H	addiu \$1,\$1,#4	[\$1] = 0000_0108H	24210004	0010_0100_0010_0001_0000_0000_0000_0100
2CH	mtc0 \$1, cp0(14.0)	cp0(14.0) = 0000_0108H	40817000	0100_0000_1000_0001_0111_0000_0000_0000
30H	eret	返回 108H	42000018	0100_0010_0000_0000_0000_0000_0001_1000
CPU 复位地址 0000_0034H				
34H	addiu \$1, \$0,#1	[\$1] = 0000_0001H	24010001	0010_0100_0000_0001_0000_0000_0000_0001
38H	sll \$2, \$1,#4	[\$2] = 0000_0010H	00011100	0000_0000_0000_0001_0001_0001_0000_0000
3CH	addu \$3, \$2,\$1	[\$3] = 0000_0011H	00411821	0000_0000_0100_0001_0001_1000_0010_0001
40H	srl \$4, \$2,#2	[\$4] = 0000_0004H	00022082	0000_0000_0000_0010_0010_0000_1000_0010
44H	slti \$25,\$4,#5	[\$25] = 0000_0001H	28990005	0010_1000_1001_1001_0000_0000_0000_0101
48H	bgez \$25,#14	跳转到 84H	0721000E	0000_0111_0010_0001_0000_0000_0000_1110
4CH	subu \$5, \$3,\$4	[\$5] = 0000_000DH	00642823	0000_0000_0110_0100_0010_1000_0010_0011
50H	sw \$5, #20(\$0)	Mem[0000_0014H] = 0000_000DH	AC050014	1010_1100_0000_0101_0000_0000_0001_0100
54H	nor \$6, \$5,\$2	[\$6] = FFFF_FFE2H	00A23027	0000_0000_1010_0010_0011_0000_0010_0111
58H	or \$7, \$6,\$3	[\$7] = FFFF_FFF3H	00C33825	0000_0000_1100_0011_0011_1000_0010_0101
5CH	xor \$8, \$7,\$6	[\$8] = 0000_0011H	00E64026	0000_0000_1110_0110_0100_0000_0010_0110
60H	beq \$8, \$3,#2	跳转到 6CH	11030002	0001_0001_0000_0011_0000_0000_0000_0010
64H	sw \$8, #28(\$0)	Mem[0000_001CH] = 0000_0011H	AC08001C	1010_1100_0000_1000_0000_0000_0001_1100
68H	slt \$9, \$1,\$2	不执行	0022482A	0000_0000_0010_0010_0100_1000_0010_1010
6CH	lw \$10,#28(\$0)	[\$10] = 0000_0011H	8C0A001C	1000_1100_0000_1010_0000_0000_0001_1100
70H	bne \$10,\$5,#2	跳转到 7CH	15450002	0001_0101_0100_0101_0000_0000_0000_0010

表 2 CPU 测试 45 条指令所用汇编程序详述（续）

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
74H	and \$11,\$2,\$1	[\$11] = 0000_0000H	00415824	0000_0000_0100_0001_0101_1000_0010_0100
78H	sw \$11,#28(\$0)	不执行	AC0B001C	1010_1100_0000_1011_0000_0000_0001_1100
7CH	jal #38	跳转到 98H, [\$31] = 0000_0084H	0C000026	0000_1100_0000_0000_0000_0000_0010_0110
80H	sw \$4, #16(\$0)	Mem[0000_0010H]	AC040010	1010_1100_0000_0100_0000_0000_0001_0000

		= 0000 0004H		
84H	lui \$12,#12	[\$12] = 000C 0000H	3C0C000C	0011 1100 0000 1100 0000 0000 0000 1100
88H	sra \$26,\$12,\$2	[\$26] = 0000 000CH	004CD007	0000 0000 0100 1100 1101 0000 0000 0111
8CH	addiu \$27,\$26,#68	[\$27] = 0000 0050H	275B0044	0010 0111 0101 1011 0000 0000 0100 0100
90H	jalr \$27	跳转到 50H, [\$31] = 0000 0098H	0360F809	0000_0011_0110_0000_1111_1000_0000_1001
94H	addiu \$1,\$0,#8	[\$1] = 0000 0008H	24010008	0010 0100 0000 0001 0000 0000 0000 1000
98H	sb \$26,#5(\$3)	MEM[0000_0014H] = 000C_000DH	A07A0005	1010_0000_0111_1010_0000_0000_0000_0101
9CH	slltu \$13,\$10,\$3	[\$13] = 0000 0000H	0143682B	0000 0001 0100 0011 0110 1000 0010 1011
A0H	bgtz \$13,#2	不跳转	1DA00002	0001_1101_1010_0000_0000_0000_0000_0010
A4H	sllv \$14,\$6,\$4	[\$14] = FFFF FE20H	00867004	0000 0000 1000 0110 0111 0000 0000 0100
A8H	sra \$15,\$14,#2	[\$15] = FFFF FF88H	000E7883	0000 0000 0000 1110 0111 1000 1000 0011
ACH	srlv \$16,\$15,\$1	[\$16] = 00FF FFFFH	002F8006	0000 0000 0010 1111 1000 0000 0000 0110
B0H	blez \$16,#7	不跳转	1A000007	0001_1010_0000_0000_0000_0000_0000_0111
B4H	sra \$16,\$15,\$1	[\$16] = FFFF FFFFH	002F8007	0000 0000 0010 1111 1000 0000 0000 0111
B8H	bltz \$16,#6	跳转到 D4H	06000006	0000_0110_0000_0000_0000_0000_0000_0110
BCH	sll \$11,\$26,#4	[\$11] = 0000 00C0H	001A5900	0000 0000 0001 1010 0101 1001 0000 0000
C0H	lw \$28,#3(\$10)	[\$28]=000C_000DH / 000C 880DH	8D5C0003	1000_1101_0101_1100_0000_0000_0000_0011
C4H	bne \$28,\$29,#7	不跳转/跳转 E4H	179D0007	0001_0111_1001_1101_0000_0000_0000_0111
C8H	sb \$15,#8(\$5)	Mem[0000_0014H] = 000C 8800H	A0AF0008	1010_0000_1010_1111_0000_0000_0000_1000
CCH	lb \$18,#8(\$5)	[\$18] = FFFF FF88H	80B20008	1000 0000 1011 0010 0000 0000 0000 1000
D0H	lbu \$19,#8(\$5)	[\$19] = 0000 0088H	90B30008	1001 0000 1011 0011 0000 0000 0000 1000
D4H	slltu \$24,\$15,#0xFFFF	[\$24] = 0000 0001H	2DF8FFFF	0010 1101 1111 1000 1111 1111 1111 1111
D8H	or \$29,\$12,\$5	[\$29] = 000C_000DH	0185E825	0000 0001 1000 0101 1110 1000 0010 0101
DCH	jr \$11	跳转到 C0H	01600008	0000_0001_0110_0000_0000_0000_0000_1000
E0H	andi \$20,\$15,#0xFFFF	[\$20] = 0000 FF88H	31F4FFFF	0011 0001 1111 0100 1111 1111 1111 1111
E4H	ori \$21,\$15,#0xFFFF	[\$21] = FFFF FFFFH	35F5FFFF	0011 0101 1111 0101 1111 1111 1111 1111
E8H	xori \$22,\$15,#0xFFFF	[\$22] = FFFF 0077H	39F6FFFF	0011 1001 1111 0110 1111 1111 1111 1111
ECH	mult \$12,\$29	[HI] = 0000_0090H, [LO] = 009C_0000H	019D0018	0000_0001_1001_1101_0000_0000_0001_1000
F0H	mflo \$23	[\$23] = 009C_0000H	0000B812	0000 0000 0000 0000 1011 1000 0001 0010
F4H	mfhi \$30	[\$30] = 0000_0090H	0000F010	0000 0000 0000 0000 1111 0000 0001 0000
F8H	mtlo \$26	[LO] = 0000 000CH	03400013	0000 0011 0100 0000 0000 0000 0001 0011

表 2 CPU 测试 45 条指令所用汇编程序详述 (续)

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
FCH	mthi \$27	[HI] = 0000_0050H	03600011	0000_0011_0110_0000_0000_0001_0001
100H	mtc0 \$0,c14	cp0[14.0] = 0000_0000H	40807000	0100_0000_1000_0000_0111_0000_0000_0000
104H	syscall	cp0[14.0] =0000_0104H, cp0[13.0][6.2] =01000B, cp0[12.0][1]=1, 跳转 Exception 入口 地址, 00H	0000000C	0000_0000_0000_0000_0000_0000_0000_1100
108H	mfc0 \$2, cp0(14.0)	[\$2] = 0000_0108H	40027000	0100_0000_0000_0010_0111_0000_0000_0000
10CH	mfc0 \$3, cp0(13.0)	[\$3] = 0000_0020H	40036800	0100_0000_0000_0011_0110_1000_0000_0000
110H	mfc0 \$4, cp0(12.0)	[\$4] = 0000_0000H	40046000	0100_0000_0000_0100_0110_0000_0000_0000
114H	addiu \$1, \$0, #32	[\$1] = 0000_0020H	24010020	0010_0100_0000_0001_0000_0000_0010_0000
118H	slt \$17, \$15, \$14	[\$17] = 0000_0000H	01EE882A	0000_0001_1110_1110_1000_1000_0010_1010
11CH	lui \$17, #1234H	[\$17] = 1234_0000H	3C111234	0011_1100_0001_0001_0001_0010_0011_0100
120H	addiu \$17, \$17, #5678	[\$17] = 1234_5678H	26315678	0010_0110_0011_0001_0101_0110_0111_1000
124H	sw \$17, #0(\$1)	Mem[0000_0020H] =1234_5678H / Mem[0000_0024H] =2345_6780H / Mem[0000_0028H] =3456_7800H / Mem[0000_002CH] =4567_8000H / Mem[0000_0030H] =5678_0000H / Mem[0000_0034H] =6780_0000H / Mem[0000_0038H] =7800_0000H	AC310000	1010_1100_0011_0001_0000_0000_0000_0000
128H	sll \$17, \$17, #4	[\$17] = 2345_6780H / 3456_7800H / 4567_8000H / 5678_0000H / 6780_0000H / 7800_0000H / 8000_0000H	00118900	0000_0000_0001_0001_1000_1001_0000_0000
12CH	bgtz \$17, #-3	跳转到 124H / 跳转 / 跳转/跳转/跳转/跳转 124H/不跳转	1E20FFFD	0001_1110_0010_0000_1111_1111_1111_1101
130H	addiu \$1, \$1, #4	[\$1] = 0000_0024H / 0000_0028H / 0000_002CH / 0000_0030H / 0000_0034H / 0000_0038H / 0000_003CH	24210004	0010_0100_0010_0001_0000_0000_0000_0100
134H	addiu \$2, \$0, #60	[\$2] = 0000_003CH	2402003C	0010_0100_0000_0010_0000_0000_0011_1100
138H	lw \$17, #-28(\$1)	[\$17] = 1234_5678H	8C31FFE4	1000_1100_0011_0001_1111_1111_1110_0100

表 2 CPU 测试 45 条指令所用汇编程序详述（续）

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
13CH	srl \$17,\$17,#4	[\$17] = 0123_4567H / 0012_3456H / 0001_2345H / 0000_1234H / 0000_0123H / 0000_0012H / 0000_0001H / 0000_0000H	00118902	0000_0000_0001_0001_1000_1001_0000_0010
140H	sw \$17,#0(\$2)	Mem[0000_003CH] =0123_4567H / Mem [0000_0040H] =0012_3456H / Mem [0000_0044H] =0001_2345H / Mem [0000_0048H] =0000_1234H / Mem [0000_004CH] =0000_0123H / Mem [0000_0050H] =0000_0012H / Mem [0000_0054H] =0000_0001H / Mem [0000_0058H] =0000_0000H	AC510000	1010_1100_0101_0001_0000_0000_0000_0000
144H	bne \$17,\$0,#-3	跳转到 13CH /跳转/ 跳转/跳转/跳转/跳转/ /跳转 13CH/不跳转	1620FFFD	0001_0110_0010_0000_1111_1111_1111_1101
148H	addiu \$2,\$2,#4	[\$2] = 0000_0040H / 0000_0044H / 0000_0048H / 0000_004CH / 0000_0050H / 0000_0054H / 0000_0058H / 0000_005CH	24420004	0010_0100_0100_0010_0000_0000_0000_0100
14CH	addiu \$6,\$0,#68	[\$6] = 0000_0044H	24060044	0010_0100_0000_0110_0000_0000_0100_0100
150H	addiu \$7,\$0,#100	[\$7] = 0000_0064H	24070064	0010_0100_0000_0111_0000_0000_0110_0100
154H	lw \$3,#-28(\$1)	[\$3] = 1234_5678H / 2345_6780H / 3456_7800H / 4567_8000H / 5678_0000H / 6780_0000H / 7800_0000H	8C23FFE4	1000_1100_0010_0011_1111_1111_1110_0100
158H	lw \$4,#-4(\$2)	[\$4] = 0000_0000H / 0000_0001H / 0000_0012H / 0000_0123H / 0000_1234H / 0001_2345H / 0012_3456H	8C44FFFC	1000_1100_0100_0100_1111_1111_1111_1100
15CH	or \$5,\$3,\$4	[\$5] = 1234_5678H / 2345_6781H / 3456_7812H / 4567_8123H / 5678_1234H / 6781_2345H / 7812_3456H	00642825	0000_0000_0110_0100_0010_1000_0010_0101

表 2 CPU 测试 45 条指令所用汇编程序详述（续）

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
160H	sb \$5,#0(\$7)	Mem[0000_0064H] = 0000_0078H / Mem[0000_0064H] = 0000_8178H / Mem[0000_0064H] = 0012_8178H / Mem[0000_0064H] = 2312_8178H / Mem[0000_0068H] = 0000_0034H / Mem[0000_0068H] = 0000_4534H / Mem[0000_0068H] = 0056_4534H	A0E50000	1010_0000_1110_0101_0000_0000_0000_0000
164H	addiu \$7,\$7,#1	[\$7] = 0000_0065H / 0000_0066H / 0000_0067H / 0000_0068H / 0000_0069H / 0000_006AH / 0000_006BH	24E70001	0010_0100_1110_0111_0000_0000_0000_0001
168H	addiu \$1,\$1,#4	[\$1] = 0000_0040H / 0000_0044H / 0000_0048H / 0000_004CH / 0000_0050H / 0000_0054H / 0000_0058H	24210004	0010_0100_0010_0001_0000_0000_0000_0100
16CH	bne \$2,\$6,#-7	跳转到 154H/跳转/跳转/跳转/跳转/跳转/跳转/跳转 154H/不跳转	1446FFF9	0001_0100_0100_0110_1111_1111_1111_1001
170H	ADDIU \$2,\$2,#-4	[\$2] = 0000_0058H / 0000_0054H / 0000_0050H / 0000_004CH / 0000_0048H / 0000_0044H / 0000_0040H	2442FFFC	0010_0100_0100_0010_1111_1111_1111_1100
174H	addiu \$9,\$0,#100	[\$9] = 0000_0064H	24090064	0010_0100_0000_1001_0000_0000_0110_0100
178H	lbu \$9,#3(\$9)	[\$9] = 0000_0023H	91290003	1001_0001_0010_1001_0000_0000_0000_0011
17CH	addiu \$13,\$0,#104	[\$13] = 0000_0068H	240D0068	0010_0100_0000_1101_0000_0000_0110_1000
180H	lw \$13,#0(\$13)	[\$13] = 0056_4534H	8DAD0000	1000_1101_1010_1101_0000_0000_0000_0000
184H	li \$9,\$9,#24	[\$9] = 2300_0000H	00094E00	0000_0000_0000_1001_0100_1110_0000_0000
188H	xori \$13,\$13,#9	[\$13] = 0056_453DH	39AD0009	0011_1001_1010_1101_0000_0000_0000_1001
18CH	sw \$13,#1(\$7)	MEM[0000_006CH] = 0056_453DH	ACED0001	1010_1100_1110_1101_0000_0000_0000_0001
190H	lw \$1,#0(\$0)	[\$1] = 0000_0008H	8C010000	1000_1100_0000_0001_0000_0000_0000_0000
194H	lw \$2,#4(\$0)	[\$2] = 0000_0010H	8C020004	1000_1100_0000_0010_0000_0000_0000_0100
198H	lw \$3,#8(\$0)	[\$3] = 0000_0011H	8C030008	1000_1100_0000_0011_0000_0000_0000_1000
19CH	lw \$4,#12(\$0)	[\$4] = 0000_0004H	8C04000C	1000_1100_0000_0100_0000_0000_0000_1100
1A0H	lw \$5,#16(\$0)	[\$5] = 0000_000DH	8C050010	1000_1100_0000_0101_0000_0000_0001_0000
1A4H	lw \$6,#24(\$0)	[\$6] = FFFF_FFE2H	8C060018	1000_1100_0000_0110_0000_0000_0001_1000

表 2 CPU 测试 45 条指令所用汇编程序详述（续）

指令地址	汇编指令	结果描述	机器指令的机器码	
			16 进制	二进制
1A8H	lw \$7,#112(\$0)	[\$7] = FFFF FFF3H	8C070070	1000 1100 0000 0111 0000 0000 0111 0000
1ACH	lw \$25,#116(\$0)	[\$25] = 0000 0001H	8C190074	1000 1100 0001 1001 0000 0000 0111 0100
1B0H	lw \$13,#120(\$0)	[\$13] = 0000 0000H	8C0D0078	1000 1100 0000 1101 0000 0000 0111 1000
1B4H	j #34H	跳转到 34H	0800000D	0000 1000 0000 0000 0000 0000 0000 1101