

ARQUITETURA DE COMPUTADORES II

EXERCÍCIO PRÁTICO 5

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PARTE 1

1. O que é um arquivo fonte?

A. um arquivo de texto que contém instruções de linguagem de programação.

2. O que é um registrador?

B. uma parte do processador que possui um padrão de bits.

3. Qual o caracter que, na linguagem assembly do SPIM, inicia um comentário?

A. #

4. Quantos bits há em cada instrução de máquina MIPS?

C. 32

5. O que é o contador de programa?

D. parte do processador que contém o endereço da próxima instrução de máquina para ser obtida.

6. Ao executarmos uma instrução, quanto será adicionado ao contador de programa?

C. 4

7. O que é uma diretiva, tal como a diretiva .text?

D. uma declaração que diz o montador algo sobre o que o programador quer, mas não corresponde diretamente a uma instrução de máquina.

8. O que é um endereço simbólico?

D. um nome usado no código-fonte em linguagem assembly para um local na memória.

9. Em qual endereço o simulador SPIM coloca a primeira instrução de máquina quando ele está sendo executado?

B. 0x00400000

10. Algumas instruções de máquina possuem uma constante como um dos operandos. Como é chamado tal operando?

A. operando imediato

11. Como é chamada uma operação lógica executada entre bits de cada coluna dos operandos para produzir um bit de resultado para cada coluna?

B. operação bitwise

12. Quando uma operação é de fato executada, como estão os operandos na ALU?

D. Cada um dos registradores deve possuir 32 bit.

13. Dezesesseis bits de dados de uma instrução de ori são usados como um operando imediato. Durante execução, o que deve ser feito primeiro?

B. Os dados são estendidos em zero à esquerda por 16 bits.

14. Qual das instruções seguintes armazenam no registrador \$5 um padrão de bits que representa positivo 48?

C. ori \$5,\$0,48

15. A instrução de ori pode armazenar o complemento de dois de um número em um registrador?

A. Não.

16. Qual das instruções seguintes limpa todos os bits no registrador \$8 com exceção do byte de baixa ordem que fica inalterado?

D. andi \$8,\$8,0xFF

17. Qual é o resultado de um ou exclusivo de padrão sobre ele mesmo?

A. Todos os bits em zero.

18. Todas as instruções de máquina têm os mesmos campos?

A. Não. Diferentes de instruções de máquina possuem campos diferentes.

PARTE 2

P1.

```
1 .text
2 .globl inicio
3 inicio:
4 addi $s0, $zero, 2 # a = $s0 = 2
5 addi $s1, $zero, 3 # b = $s1 = 3
6 addi $s2, $zero, 4 # c = $s2 = 4
7 addi $s3, $zero, 5 # d = $s3 = 5
8 add $t0, $s0, $s1 # a + b
9 add $t1, $s1, $s2 # c + d
10 sub $s4, $t0, $t1 # x = (a+b) - (c+d)
11 sub $t2, $s0, $s1 # a - b
12 add $s5, $t2, $s4 # y = a-b+x
13 sub $s1, $s4, $s5 # b = x-y
14
15 .data
```

EditExecute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x20100002	addi \$16,\$0,0x00000002	4: addi \$s0, \$zero, 2 # a = \$s0 = 2
<input type="checkbox"/>	0x00400004	0x20110003	addi \$17,\$0,0x00000003	5: addi \$s1, \$zero, 3 # b = \$s1 = 3
<input type="checkbox"/>	0x00400008	0x20120004	addi \$18,\$0,0x00000004	6: addi \$s2, \$zero, 4 # c = \$s2 = 4
<input type="checkbox"/>	0x0040000c	0x20130005	addi \$19,\$0,0x00000005	7: addi \$s3, \$zero, 5 # d = \$s3 = 5
<input type="checkbox"/>	0x00400010	0x02114020	add \$8,\$16,\$17	8: add \$t0, \$s0, \$s1 # a + b
<input type="checkbox"/>	0x00400014	0x02324820	add \$9,\$17,\$18	9: add \$t1, \$s1, \$s2 # c + d
<input type="checkbox"/>	0x00400018	0x0109a022	sub \$20,\$8,\$9	10: sub \$s4, \$t0, \$t1 # x = (a+b)-(c+d)
<input type="checkbox"/>	0x0040001c	0x02115022	sub \$10,\$16,\$17	11: sub \$t2, \$s0, \$s1 # a - b
<input type="checkbox"/>	0x00400020	0x0154a820	add \$21,\$10,\$20	12: add \$s5, \$t2, \$s4 # y = a-b+x
<input type="checkbox"/>	0x00400024	0x02958822	sub \$17,\$20,\$21	13: sub \$s1, \$s4, \$s5 # b = x-y

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010140	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000005
\$t1	9	0x00000007
\$t2	10	0xffffffff
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000002
\$s1	17	0x00000001
\$s2	18	0x00000004
\$s3	19	0x00000005
\$s4	20	0xfffffffffe
\$s5	21	0xfffffffffd
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffffeffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x00400028
hi		0x00000000
lo		0x00000000

Hexadecimal AddressesHexadecimal ValuesASCII

P2.

```

1 .text
2 .globl inicio
3 inicio:
4 addi $s0, $zero, 1 # x = 1
5 add $t0, $s0, $s0 # t0 = 2x
6 add $t0, $t0, $t0 # t0 = 4x
7 add $t0, $t0, $s0 # t0 = 5x
8 addi $s1, $t0, 15 # y = 5*x + 15
9 .data

```

Edit
Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x20100001	addi \$16,\$0,0x00000001	4: addi \$s0, \$zero, 1 # x = 1
<input type="checkbox"/>	0x00400004	0x02104020	add \$8,\$16,\$16	5: add \$t0, \$s0, \$s0 # t0 = 2x
<input type="checkbox"/>	0x00400008	0x01084020	add \$8,\$8,\$8	6: add \$t0, \$t0, \$t0 # t0 = 4x
<input type="checkbox"/>	0x0040000c	0x01104020	add \$8,\$8,\$16	7: add \$t0, \$t0, \$s0 # t0 = 5x
<input type="checkbox"/>	0x00400010	0x2111000f	addi \$17,\$8,0x0000000f	8: addi \$s1, \$t0, 15 # y = 5*x + 15

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010140	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000005
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000001
\$s1	17	0x00000014
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7fffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x00400014
hi		0x00000000
lo		0x00000000

Hexadecimal Addresses
Hexadecimal Values
ASCII

0x10010000 (.data)

P3.

```

1 .text
2 .globl inicio
3 inicio:
4 addi $s0, $zero, 3 # x = 3
5 add $t0, $s0, $s0 # t0 = 2x
6 add $t0, $t0, $t0 # t0 = 4x
7 add $t0, $t0, $t0 # t0 = 8x
8 add $t0, $t0, $t0 # t0 = 16x
9 sub $t0, $t0, $s0 # t0 = 15x
10 addi $s1, $zero, 4 # y = 4
11 add $t1, $s1, $s1 # t1 = 2y
12 add $t1, $t1, $t1 # t1 = 4y
13 add $t2, $t1, $t1 # t2 = 8y
14 add $t2, $t2, $t2 # t2 = 16y
15 add $t2, $t2, $t2 # t2 = 32y
16 add $t2, $t2, $t2 # t2 = 64y
17 add $t2, $t2, $t1 # t2 = 68y
18 sub $t2, $t2, $s1 # t2 = 67y
19 add $t3, $t0, $t2 # t3 = 15x+67y
20 add $t3, $t3, $t3 # t3 = 2*(15x+67y)
21 add $t3, $t3, $t3 # t3 = 4*(15x+67y)
22 add $s2, $zero, $t3 # z = 4*(15x+67y)
23 .data

```

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x20100003	addi \$16,\$0,0x00000003	4: addi \$s0, \$zero, 3 # x = 3
<input type="checkbox"/>	0x00400004	0x02104020	add \$8,\$16,\$16	5: add \$t0, \$s0, \$s0 # t0 = 2x
<input type="checkbox"/>	0x00400008	0x01084020	add \$8,\$8,\$8	6: add \$t0, \$t0, \$t0 # t0 = 4x
<input type="checkbox"/>	0x0040000c	0x01084020	add \$8,\$8,\$8	7: add \$t0, \$t0, \$t0 # t0 = 8x
<input type="checkbox"/>	0x00400010	0x01084020	add \$8,\$8,\$8	8: add \$t0, \$t0, \$t0 # t0 = 16x
<input type="checkbox"/>	0x00400014	0x01104022	sub \$8,\$8,\$16	9: sub \$t0, \$t0, \$s0 # t0 = 15x
<input type="checkbox"/>	0x00400018	0x20110004	addi \$17,\$0,0x00000004	10: addi \$s1, \$zero, 4 # y = 4
<input type="checkbox"/>	0x0040001c	0x02314820	add \$9,\$17,\$17	11: add \$t1, \$s1, \$s1 # t1 = 2y
<input type="checkbox"/>	0x00400020	0x01294820	add \$9,\$9,\$9	12: add \$t1, \$t1, \$t1 # t1 = 4y
<input type="checkbox"/>	0x00400024	0x01295020	add \$10,\$9,\$9	13: add \$t2, \$t1, \$t1 # t2 = 8y
<input type="checkbox"/>	0x00400028	0x014a5020	add \$10,\$10,\$10	14: add \$t2, \$t2, \$t2 # t2 = 16y
<input type="checkbox"/>	0x0040002c	0x014a5020	add \$10,\$10,\$10	15: add \$t2, \$t2, \$t2 # t2 = 32y
<input type="checkbox"/>	0x00400030	0x014a5020	add \$10,\$10,\$10	16: add \$t2, \$t2, \$t2 # t2 = 64y
<input type="checkbox"/>	0x00400034	0x01495020	add \$10,\$10,\$9	17: add \$t2, \$t2, \$t1 # t2 = 68y
<input type="checkbox"/>	0x00400038	0x01515022	sub \$10,\$10,\$17	18: sub \$t2, \$t2, \$s1 # t2 = 67y
<input type="checkbox"/>	0x0040003c	0x010a5820	add \$11,\$8,\$10	19: add \$t3, \$t0, \$t2 # t3 = 15x+67y
<input type="checkbox"/>	0x00400040	0x016b5820	add \$11,\$11,\$11	20: add \$t3, \$t3, \$t3 # t3 = 2*(15x+67y)
<input type="checkbox"/>	0x00400044	0x016b5820	add \$11,\$11,\$11	21: add \$t3, \$t3, \$t3 # t3 = 4*(15x+67y)
<input type="checkbox"/>	0x00400048	0x000b9020	add \$18,\$0,\$11	22: add \$s2, \$zero, \$t3 # z = 4*(15x+67y)

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Coproc 1

Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x0000002d
\$t1	9	0x00000010
\$t2	10	0x00000010c
\$t3	11	0x0000004e4
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000003
\$s1	17	0x00000004
\$s2	18	0x0000004e4
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7fffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x0040004c
hi		0x00000000
lo		0x00000000

0x10010000 (.data)

☒ Hexadecimal Addresses
 ☒ Hexadecimal Values
 ☐ ASCII

P4.

```

1 .text
2 .globl inicio
3 inicio:
4 addi $s0, $zero, 3 # x = 3
5 addi $s1, $zero, 4 # y = 4
6 add $t0, $zero, $s0 # t0 = x = 3
7 sll $t0, $t0, 4 # t0 = 16x
8 sub $t0, $t0, $s0 # t0 = 15x
9 add $t1, $zero, $s1 # t1 = y = 4
10 sll $t1, $t1, 6 # t1 = 64y
11 add $t2, $s1, $s1 # t2 = 2y
12 add $t2, $t2, $s1 # t2 = 3y
13 add $t1, $t1, $t2 # t1 = 67y
14 add $t3, $t0, $t1 # t3 = 15x + 67y
15 sll $s6, $t3, 2 # z = (15x + 67y) * 4

```

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x20100003	addi \$16,\$0,0x00000003	4: addi \$s0, \$zero, 3 # x = 3
<input type="checkbox"/>	0x00400004	0x20110004	addi \$17,\$0,0x00000004	5: addi \$s1, \$zero, 4 # y = 4
<input type="checkbox"/>	0x00400008	0x00104020	add \$8,\$0,\$16	6: add \$t0, \$zero, \$s0 # t0 = x = 3
<input type="checkbox"/>	0x0040000c	0x00084100	sll \$8,\$8,0x00000004	7: sll \$t0, \$t0, 4 # t0 = 16x
<input type="checkbox"/>	0x00400010	0x01104022	sub \$8,\$8,\$16	8: sub \$t0, \$t0, \$s0 # t0 = 15x
<input type="checkbox"/>	0x00400014	0x00114820	add \$9,\$0,\$17	9: add \$t1,\$zero, \$s1 # t1 = y = 4
<input type="checkbox"/>	0x00400018	0x00094980	sll \$9,\$9,0x00000006	10: sll \$t1, \$t1, 6 # t1 = 64y
<input type="checkbox"/>	0x0040001c	0x02315020	add \$10,\$17,\$17	11: add \$t2, \$s1, \$s1 # t2 = 2y
<input type="checkbox"/>	0x00400020	0x01515020	add \$10,\$10,\$17	12: add \$t2, \$t2, \$s1 # t2 = 3y
<input type="checkbox"/>	0x00400024	0x012a4820	add \$9,\$9,\$10	13: add \$t1, \$t1, \$t2 # t1 = 67y
<input type="checkbox"/>	0x00400028	0x01095820	add \$11,\$8,\$9	14: add \$t3, \$t0, \$t1 # t3 = 15x + 67y
<input type="checkbox"/>	0x0040002c	0x000bb080	sll \$22,\$11,0x00000002	15: sll \$s6, \$t3, 2 # z = (15x + 67y) * 4

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Coproc 1

Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x0000002d
\$t1	9	0x0000010c
\$t2	10	0x0000000c
\$t3	11	0x00000139
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000003
\$s1	17	0x00000004
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x000004e4
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7fffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x00400030
hi		0x00000000
lo		0x00000000

0x10010000 (.data)

☒ Hexadecimal Addresses
 ☒ Hexadecimal Values
 ☐ ASCII


```
1 .text
2 .globl inicio
3 inicio:
4 ori $s0, $zero, 0x186A
5 sll $s0, $s0, 4 # x = 100000
6 ori $s1, $zero, 0x30D4
7 sll $s1, $s1, 4 # y = 200000
8 add $s2, $s0, $s1 # z = x + y = 300000
9 .data
```

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x3410186a	ori \$16,\$0,0x0000186a	4: ori \$s0, \$zero, 0x186A
<input type="checkbox"/>	0x00400004	0x00108100	sll \$16,\$16,0x00000004	5: sll \$s0, \$s0, 4 # x = 100000
<input type="checkbox"/>	0x00400008	0x341130d4	ori \$17,\$0,0x000030d4	6: ori \$s1, \$zero, 0x30D4
<input type="checkbox"/>	0x0040000c	0x00118900	sll \$17,\$17,0x00000004	7: sll \$s1, \$s1, 4 # y = 200000
<input type="checkbox"/>	0x00400010	0x02119020	add \$18,\$16,\$17	8: add \$s2, \$s0, \$s1 # z = x + y = 300000

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Coproc 1

Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000000
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x000186a0
\$s1	17	0x00030d40
\$s2	18	0x000493e0
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffffcfc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x00400014
hi		0x00000000
lo		0x00000000

←

→

0x10010000 (.data)

☒ Hexadecimal Addresses
 ☒ Hexadecimal Values
 ☐ ASCII

P6.

```

1  .text
2  .globl inicio
3  inicio:
4  ori $s0, $zero, 0x0111 # x = 0x00000111
5  sll $s0, $s0, 16 # x = 0x01110000
6  ori $s0, $s0, 0x1111 # x = 0x01111111
7  ori $s1, $zero, 0x0493E # y = 0x000049E
8  sll $s1, $s1, 4 # y = 0x00049E0
9  sll $t0, $s1, 2 # t0 = 4y
10 sub $s2, $s0, $t0 # z = x - 4y
11 .data

```

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x34100111	ori \$16,\$0,0x00000111	4: ori \$s0, \$zero, 0x0111 # x = 0x00000111
<input type="checkbox"/>	0x00400004	0x00108400	sll \$16,\$16,0x00000010	5: sll \$s0, \$s0, 16 # x = 0x01110000
<input type="checkbox"/>	0x00400008	0x36101111	ori \$16,\$16,0x00001111	6: ori \$s0, \$s0, 0x1111 # x = 0x01111111
<input type="checkbox"/>	0x0040000c	0x3411493e	ori \$17,\$0,0x0000493e	7: ori \$s1, \$zero, 0x0493E # y = 0x000049E
<input type="checkbox"/>	0x00400010	0x00118900	sll \$17,\$17,0x00000004	8: sll \$s1, \$s1, 4 # y = 0x00049E0
<input type="checkbox"/>	0x00400014	0x00114080	sll \$8,\$17,0x00000002	9: sll \$t0, \$s1, 2 # t0 = 4y
<input type="checkbox"/>	0x00400018	0x02089022	sub \$18,\$16,\$8	10: sub \$s2, \$s0, \$t0 # z = x - 4y

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Coproc 1

Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00124f80
\$t1	9	0x00000000
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x01111111
\$s1	17	0x000493e0
\$s2	18	0x00fec191
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffffeffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x0040001c
hi		0x00000000
lo		0x00000000

←

→

0x10010000 (.data)

Hexadecimal Addresses

Hexadecimal Values

ASCII

P7.

```
.text
.globl inicio
inicio:
ori $8, $0, 0x01 # $8 = 0x00000000000000000000000000000001
sll $t1, $8, 1 # t1 = $8 << 1 = 0x000000000000000000000000000010
or $t1, $t1, $8 # t1 = 0x00000000000000000000000000000011
sll $t2, $t1, 2 # t2 = t1 << 2 = 0x0000000000000000000000000001100
or $t1, $t2, $t1 # t2 = 0x0000000000000000000000000001111
sll $t2, $t1, 4 # t2 = t1 << 4 = 0x0000000000000000000000000001110000
or $t1, $t2, $t1 # t2 = 0x0000000000000000000000000001111111
sll $t2, $t1, 8 # t2 = t1 << 8 = 0x0000000000000000000000000001111100000000
or $t1, $t2, $t1 # t2 = 0x000000000000000000000000000111111111111111
sll $t2, $t1, 16 # t2 = t1 << 16 = 0x11111111111111110000000000000000
or $8, $t2, $t1 # $8 = 0x11111111111111111111111111111111
.data
```

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x34080001	ori \$8,\$0,0x00000001	4: ori \$8, \$0, 0x01 # \$8 = 0x00000000000000000000000000000001
<input type="checkbox"/>	0x00400004	0x00084840	sll \$9,\$8,0x00000001	5: sll \$t1, \$8, 1 # t1 = \$8 << 1 = 0x00000000000000000000000000000010
<input type="checkbox"/>	0x00400008	0x01284825	or \$9,\$9,\$8	6: or \$t1, \$t1, \$8 # t1 = 0x00000000000000000000000000000011
<input type="checkbox"/>	0x0040000c	0x00095080	sll \$10,\$9,0x00000002	7: sll \$t2, \$t1, 2 # t2 = t1 << 2 = 0x0000000000000000000000000001100
<input type="checkbox"/>	0x00400010	0x01494825	or \$9,\$10,\$9	8: or \$t1, \$t2, \$t1 # t2 = 0x0000000000000000000000000001111
<input type="checkbox"/>	0x00400014	0x00095100	sll \$10,\$9,0x00000004	9: sll \$t2, \$t1, 4 # t2 = t1 << 4 = 0x0000000000000000000000000001110000
<input type="checkbox"/>	0x00400018	0x01494825	or \$9,\$10,\$9	10: or \$t1, \$t2, \$t1 # t2 = 0x0000000000000000000000000001111111
<input type="checkbox"/>	0x0040001c	0x00095200	sll \$10,\$9,0x00000008	11: sll \$t2, \$t1, 8 # t2 = t1 << 8 = 0x0000000000000000000000000001111100000000
<input type="checkbox"/>	0x00400020	0x01494825	or \$9,\$10,\$9	12: or \$t1, \$t2, \$t1 # t2 = 0x000000000000000000000000000111111111111111
<input type="checkbox"/>	0x00400024	0x00095400	sll \$10,\$9,0x00000010	13: sll \$t2, \$t1, 16 # t2 = t1 << 16 = 0x11111111111111110000000000000000
<input type="checkbox"/>	0x00400028	0x01494025	or \$8,\$10,\$9	14: or \$8, \$t2, \$t1 # \$8 = 0x11111111111111111111111111111111

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010140	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010160	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010180	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Coproc 1

Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0xffffffff
\$t1	9	0x0000ffff
\$t2	10	0xffff0000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7ffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x0040002c
hi		0x00000000
lo		0x00000000

0x10010000 (.data)

☒ Hexadecimal Addresses
 ☒ Hexadecimal Values
 ☐ ASCII

P8.

```
.text
.globl inicio
inicio:
ori $8, $8, 0x1234 # $8 = 0x1234
sll $t5, $8, 16 # $t5 = 0x12340000
ori $14, $14, 0x5678 # $t6 = 0x00005678
or $8, $t5, $14 # $t8 = 0x12345678
srl $9, $8, 24 # $9 = 0x12
sll $10, $8, 8
srl $10, $10, 24 # $10 = 0x34
sll $11, $8, 16
srl $11, $11, 24 # $11 = 0x56
sll $12, $8, 24
srl $12, $12, 24 # $12 = 0x78
.data
```

Edit

Execute

Text Segment

Bkpt	Address	Code	Basic	Source
<input type="checkbox"/>	0x00400000	0x35081234	ori \$8,\$8,0x00001234	4: ori \$8, \$8, 0x1234 # \$8 = 0x1234
<input type="checkbox"/>	0x00400004	0x00086c00	sll \$13,\$8,0x00000010	5: sll \$t5, \$8, 16 # \$t5 = 0x12340000
<input type="checkbox"/>	0x00400008	0x35ce5678	ori \$14,\$14,0x00005678	6: ori \$14, \$14, 0x5678 # \$t6 = 0x00005678
<input type="checkbox"/>	0x0040000c	0x01ae4025	or \$8,\$13,\$14	7: or \$8, \$t5, \$14 # \$t8 = 0x12345678
<input type="checkbox"/>	0x00400010	0x00084e02	srl \$9,\$8,0x00000018	8: srl \$9, \$8, 24 # \$9 = 0x12
<input type="checkbox"/>	0x00400014	0x00085200	sll \$10,\$8,0x00000008	9: sll \$10, \$8, 8
<input type="checkbox"/>	0x00400018	0x000a5602	srl \$10,\$10,0x00000018	10: srl \$10, \$10, 24 # \$10 = 0x34
<input type="checkbox"/>	0x0040001c	0x00085c00	sll \$11,\$8,0x00000010	11: sll \$11, \$8, 16
<input type="checkbox"/>	0x00400020	0x000b5e02	srl \$11,\$11,0x00000018	12: srl \$11, \$11, 24 # \$11 = 0x56
<input type="checkbox"/>	0x00400024	0x00086600	sll \$12,\$8,0x00000018	13: sll \$12, \$8, 24
<input type="checkbox"/>	0x00400028	0x000c6602	srl \$12,\$12,0x00000018	14: srl \$12, \$12, 24 # \$12 = 0x78

Data Segment

Address	Value (+0)	Value (+4)	Value (+8)	Value (+c)	Value (+10)	Value (+14)	Value (+18)	Value (+1c)
0x10010000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010020	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010040	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010060	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010080	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100a0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100c0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x100100e0	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010100	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010120	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010140	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010160	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000
0x10010180	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000	0x00000000

Registers

Coproc 1

Coproc 0

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x00000000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x12345678
\$t1	9	0x00000012
\$t2	10	0x00000034
\$t3	11	0x00000056
\$t4	12	0x00000078
\$t5	13	0x12340000
\$t6	14	0x00005678
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x00000000
\$s2	18	0x00000000
\$s3	19	0x00000000
\$s4	20	0x00000000
\$s5	21	0x00000000
\$s6	22	0x00000000
\$s7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$k0	26	0x00000000
\$k1	27	0x00000000
\$gp	28	0x10008000
\$sp	29	0x7fffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
pc		0x0040002c
hi		0x00000000
lo		0x00000000

←

→

0x10010000 (.data)

☒ Hexadecimal Addresses
 ☒ Hexadecimal Values
 ☐ ASCII