

Computer Architecture Lab Report Week 3

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Assignment 1:

Xét x,y,z đều bằng 2

Trường hợp 1: $i = 10, j = 2$ ($i > j$)

```
1 .text
2     addi $t1, $zero, 2 #x = 2
3     addi $t2, $zero, 2 #y = 2
4     addi $t3, $zero, 2 #z = 2
5
6     addi $s1, $zero, 10 # i = 10
7     addi $s2, $zero, 2 # j = 2
8
9     slt $t0, $s2, $s1
10    bne $t0, $zero, else
11    addi $t1, $t1, 1
12    addi $t3, $zero, 1
13    j      endif
14 else:
15    addi $t2, $t2, -1
16    add $t3, $t3, $t3
17 endif:
```

Text Segment				Labels		Name		
Bkpt	Address	Code	Basic	Source	Label	Address	Number	Value
	0x00400000	0x20090002	addi \$t1,\$zero,2	2: addi \$t1, \$zero, 2 #x = 2			0	0x00000000
	0x00400004	0x200a0002	addi \$t2,\$zero,2	3: addi \$t2, \$zero, 2 #y = 2			1	0x00000000
	0x00400008	0x200b0002	addi \$t3,\$zero,2	4: addi \$t3, \$zero, 2 #z = 2			2	0x00000000
	0x0040000c	0x2011000a	addi \$s1,\$zero,10	6: addi \$s1, \$zero, 10 # i = 10			3	0x00000000
	0x00400010	0x20120002	addi \$s2,\$zero,2	7: addi \$s2, \$zero, 2 # j = 2			4	0x00000000
	0x00400014	0x0251402a	slt \$t0,\$s2,\$s1	8: slt \$t0, \$s2, \$s1			5	0x00000000
	0x00400018	0x15000003	bne \$t0,\$zero,else	9: bne \$t0, \$zero, else			6	0x00000000
	0x0040001c	0x21290001	addi \$t1,\$t1,1	10: addi \$t1, \$t1, 1			7	0x00000000
	0x00400020	0x200b0001	addi \$t3,\$zero,1	11: addi \$t3, \$zero, 1			8	0x00000001
	0x00400024	0x0b10000c	j endif	12: j endif			9	0x00000002
	0x00400028	0x14ffff	addi \$t2,\$t2,-1	14: addi \$t2, \$t2, -1			10	0x00000001
	0x0040002c	0x014b5820	add \$t3,\$t3,\$t3	15: add \$t3, \$t3, \$t3			11	0x00000004
							12	0x00000000
							13	0x00000000
							14	0x00000000
							15	0x00000000
							16	0x00000000
							17	0x00000004
							18	0x00000002
							19	0x00000000
							20	0x00000000
							21	0x00000000
							22	0x00000000
							23	0x00000000
							24	0x00000000
							25	0x00000000
							26	0x00000000
							27	0x00000000
							28	0x10000000
							29	0x7fffffff
							30	0x00000000
							31	0x00000000
							pc	0x00400030
							t1	0x00000000
							t2	0x00000000

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

0x10010000 (data) Hexadecimal Addresses Hexadecimal Values ASCII

Nhận xét: sau lệnh slt, thanh ghi t0 thay đổi giá trị là 1, thanh ghi chứa x,y,z thay đổi, thanh ghi pc thay đổi

=> Kết quả thực thi đúng với lý thuyết

Trường hợp 2: $i = 2, j = 2$ ($i=j$)

```
1 .text
2     addi $t1, $zero, 2 #x = 2
3     addi $t2, $zero, 2 #y = 2
4     addi $t3, $zero, 2 #z = 2
5
6     addi $s1, $zero, 2 # i = 2
7     addi $s2, $zero, 2 # j = 2
8     slt $t0, $s2, $s1
9     bne $t0, $zero, else
10    addi $t1, $t1, 1
11    addi $t3, $zero, 1
12    j      endif
13 else:
14    addi $t2, $t2, -1
15    add $t3, $t3, $t3
16 endif:
17
```

Text Segment				Labels		Name			Number	Value
Addr	Address	Code	Basic	Source	Label	Address				
	0x00400000	0x20090002	addi \$t1,\$zero,2	2: addi \$t1, \$zero, 2 #x = 2				\$zero	0	0x00000000
	0x00400004	0x200a0002	addi \$t2,\$zero,2	3: addi \$t2, \$zero, 2 #y = 2				\$t1	1	0x00000000
	0x00400008	0x200b0002	addi \$t3,\$zero,2	4: addi \$t3, \$zero, 2 #z = 2				\$t0	2	0x00000000
	0x0040000c	0x20110002	addi \$t1,\$t1,1	6: addi \$t1, \$t1, 1				\$s1	3	0x00000000
	0x00400010	0x20120002	addi \$t3,\$zero,1	7: addi \$t3, \$zero, 1				\$a0	4	0x00000000
	0x00400014	0x0251402a	slti \$t0,\$s2,\$s1	8: slti \$t0, \$s2, \$s1				\$a1	5	0x00000000
	0x00400018	0x15000003	bne \$t0,\$zero,else	9: bne \$t0, \$zero, else				\$a2	6	0x00000000
	0x0040001c	0x21290001	addi \$t1,\$t1,1	10: addi \$t1, \$t1, 1				\$t0	8	0x00000000
	0x00400020	0x200b0002	addi \$t3,\$zero,1	11: addi \$t3, \$zero, 1				\$t1	9	0x00000000
	0x00400024	0x0010000c	j endif	12: j endif				\$t2	10	0x00000000
	0x00400028	0x214affff	addi \$t2,\$t2,-1	14: addi \$t2, \$t2, -1				\$t3	11	0x00000000
	0x0040002c	0x016b5820	add \$t3,\$t3,\$t3	15: add \$t3, \$t3, \$t3				\$t4	12	0x00000000

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

Name	Number	Value
\$zero	0	0x00000000
\$t1	1	0x00000000
\$t0	2	0x00000000
\$s1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	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
\$a0	16	0x00000000
\$a1	17	0x00000000
\$a2	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
\$t1	27	0x00000000
\$sp	28	0x10000000
\$p	29	0x7ffffc
\$fp	30	0x00000000
\$ra	31	0x00000000
\$e		0x00400030
hi		0x00000000
lo		0x00000000

Nhận xét: sau lệnh slt, thanh ghi t0 thay đổi giá trị là 0, thanh ghi chứa x,y,z thay đổi, thanh ghi pc thay đổi

=> Kết quả thực thi đúng với lý thuyết

Trường hợp 3: $i = 2, j = 11$ ($i < j$)

```

.text

addi $t1, $zero, 2 #x = 2
addi $t2, $zero, 2 #y = 2
addi $t3, $zero, 2 #z = 2


addi $s1, $zero, 2      # i = 2
addi $s2, $zero, 11     # j = 11
slt $t0, $s2, $s1
bne $t0, $zero, else
addi $t1, $t1, 1
addi $t3, $zero, 1
j      endif

else:
    addi $t2, $t2, -1
    add $t3, $t3, $t3
endif:

```

Text Segment						Labels		name		
Byte	Address	Code	Basic	Source	Label	Address	number	value		
<input type="checkbox"/>	0x00400000	0x20909002	addi \$s, \$0, 0x00000002	2: addi \$t1, \$zero, 2 #x = 2			0	0x00000000	\$zero	
<input type="checkbox"/>	0x00400004	0x20909002	addi \$t0, \$0, 0x00000002	3: addi \$t2, \$zero, 2 #y = 2			1	0x00000000	\$t1	
<input type="checkbox"/>	0x00400008	0x20909002	addi \$t1, \$0, 0x00000002	4: addi \$t3, \$zero, 2 #z = 2			2	0x00000000	\$t2	
<input type="checkbox"/>	0x0040000c	0x20110002	addi \$t1, \$0, 0x00000002	6: addi \$s1, \$zero, 2 # i = 2			3	0x00000000	\$t3	
<input type="checkbox"/>	0x00400010	0x2012000b	addi \$t1, \$0, 0x0000000b	7: addi \$s2, \$zero, 11 # j = 11			4	0x00000000	\$s1	
<input type="checkbox"/>	0x00400014	0x0251402a	slt \$t0, \$t1, \$t2	8: slt \$t0, \$s2, \$s1			5	0x00000000	\$s2	
<input type="checkbox"/>	0x00400018	0x15000003	bne \$t0, \$zero, else	9: bne \$t0, \$zero, else			6	0x00000000	\$s3	
<input type="checkbox"/>	0x0040001c	0x21900001	addi \$t1, \$0, 0x00000001	10: addi \$t1, \$t1, 1			7	0x00000000	\$t0	
<input type="checkbox"/>	0x00400020	0x20909001	addi \$t1, \$0, 0x00000001	11: addi \$t3, \$zero, 1			8	0x00000000	\$t1	
<input type="checkbox"/>	0x00400024	0x0910000c	j 0x00400030	12: j endif			9	0x00000003	\$t2	
<input type="checkbox"/>	0x00400028	0x0140ffff	addi \$t2, \$t2, -1	14: addi \$t2, \$t2, -1			10	0x00000002	\$t3	
<input type="checkbox"/>	0x0040002c	0x014b5520	add \$t3, \$t3, \$t3	15: add \$t3, \$t3, \$t3			11	0x00000001	\$t4	
<input type="checkbox"/>							12	0x00000000	\$t5	
<input type="checkbox"/>							13	0x00000000	\$t6	
<input type="checkbox"/>							14	0x00000000	\$t7	
<input type="checkbox"/>							15	0x00000000	\$a0	
<input type="checkbox"/>							16	0x00000000	\$a1	
<input type="checkbox"/>							17	0x00000002	\$a2	
<input type="checkbox"/>							18	0x0000000b	\$a3	
<input type="checkbox"/>							19	0x00000000	\$a4	
<input type="checkbox"/>							20	0x00000000	\$a5	
<input type="checkbox"/>							21	0x00000000	\$a6	
<input type="checkbox"/>							22	0x00000000	\$a7	
<input type="checkbox"/>							23	0x00000000	\$a8	
<input type="checkbox"/>							24	0x00000000	\$a9	
<input type="checkbox"/>							25	0x00000000	\$ap	
<input type="checkbox"/>							26	0x00000000	\$sp	
<input type="checkbox"/>							27	0x00000000	\$t1	
<input type="checkbox"/>							28	0x10000000	\$fp	
<input type="checkbox"/>							29	0x7ffffc	\$ra	
<input type="checkbox"/>							30	0x00000000	\$pc	
<input type="checkbox"/>							31	0x00400030	\$n1	
<input type="checkbox"/>								0x00000000	\$n2	

Nhận xét: sau lệnh slt, thanh ghi t0 thay đổi giá trị là 0, thanh ghi chứa x,y,z thay đổi, thanh ghi pc thay đổi

=> Kết quả thực thi đúng với lý thuyết

Assignment 2

```

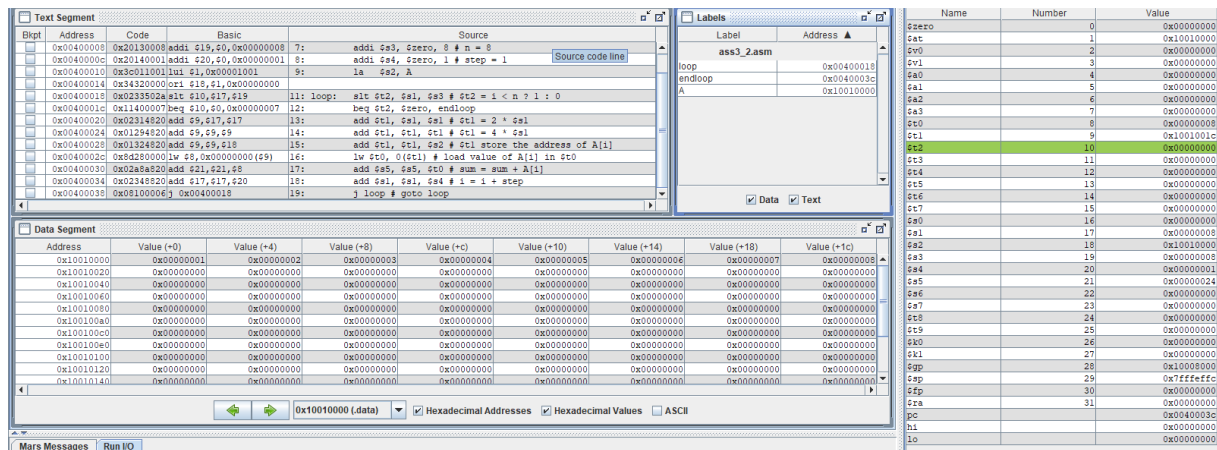
.data
A: .word 1,2,3,4,5,6,7,8
#the index i, the starting address of A, the comparison constant n, step and sum are found in registers $s1, $s2, $s3, $s4 and $s5
.text

addi $s5, $zero, 0 # sum = 0
addi $s1, $zero, 0 # i = 0
addi $s3, $zero, 8 # n = 8
addi $s4, $zero, 1 # step = 1
la $s2, A

loop: slt $t2, $s1, $s3 # $t2 = i < n ? 1 : 0
      beq $t2, $zero, endloop
      add $t1, $s1, $s1 # $t1 = 2 * $s1
      add $t1, $t1, $t1 # $t1 = 4 * $s1
      add $t1, $t1, $s2 # $t1 store the address of A[i]
      lw $t0, 0($t1) # load value of A[i] in $t0
      add $s5, $s5, $t0 # sum = sum + A[i]
      add $s1, $s1, $s4 # i = i + step
      j loop # goto loop

endloop:

```



Tổng được lưu ở thanh ghi \$s5

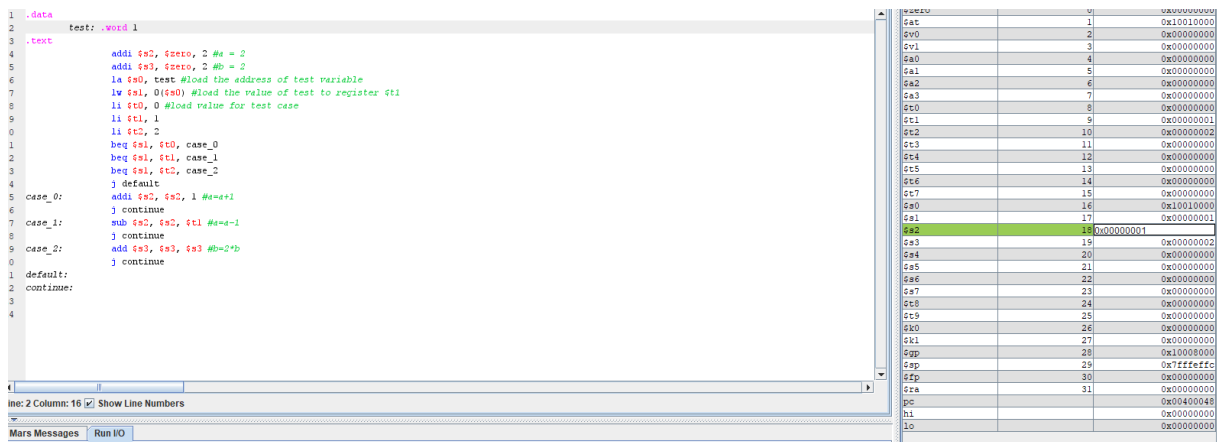
Khi kết thúc thực thi thì giá trị của thanh ghi \$s5 là 0x00000024

=> Kết quả đúng với lý thuyết

Assignment 3:

Xét $a=b=2$

- Trường hợp 1: test = 1



Nhận xét: $a = 0x00000001$, b không thay đổi

Kết quả đúng với lý thuyết

- Trường hợp 2: test = 2

```

1 .data
2     test: .word 2
3
4 .text
5     addi $t2, $zero, 2 #a = 2
6     addi $t3, $zero, 2 #b = 2
7     la $t0, test #load the address of test variable
8     lw $t1, 0($t0) #load the value of test to register $t1
9     li $t0, 0 #load value for test case
10    li $t1, 1
11    li $t2, 2
12    beq $t1, $t0, case_0
13    beq $t1, $t1, case_1
14    beq $t1, $t2, case_2
15    j default
16 case_0:
17     addi $t2, $t2, 1 #a=a+1
18     j continue
19 case_1:
20     sub $t2, $t2, $t1 #a=a-1
21     j continue
22 case_2:
23     add $t3, $t3, $t3 #b=2*b
24     j continue
25 default:
26     continue:
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```

Address	Value	Hex
\$t2	1	0x10010000
\$t0	2	0x00000000
\$t1	3	0x00000000
\$t0	4	0x00000000
\$t1	5	0x00000000
\$t2	6	0x00000000
\$t3	7	0x00000000
\$t0	8	0x00000000
\$t1	9	0x00000001
\$t2	10	0x00000002
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$t0	16	0x10010000
\$t1	17	0x00000002
\$t2	18	0x00000004
\$t3	19	0x00000004
\$t4	20	0x00000000
\$t5	21	0x00000000
\$t6	22	0x00000000
\$t7	23	0x00000000
\$t8	24	0x00000000
\$t9	25	0x00000000
\$t0	26	0x00000000
\$t1	27	0x00000000
\$t2	28	0x10000000
\$t3	29	0x7ffffcfc
\$t4	30	0x00000000
\$t5	31	0x00000000
\$t6	32	0x00400048
\$t7	33	0x00000000
\$t8	34	0x00000000
\$t9	35	0x00000000
\$t0	36	0x00000000
\$t1	37	0x00000000
\$t2	38	0x00000000
\$t3	39	0x00000000
\$t4	40	0x00000000
\$t5	41	0x00000000
\$t6	42	0x00000000
\$t7	43	0x00000000
\$t8	44	0x00000000
\$t9	45	0x00000000
\$t0	46	0x00000000
\$t1	47	0x00000000
\$t2	48	0x00000000
\$t3	49	0x00000000
\$t4	50	0x00000000
\$t5	51	0x00000000
\$t6	52	0x00000000
\$t7	53	0x00000000
\$t8	54	0x00000000
\$t9	55	0x00000000
\$t0	56	0x00000000
\$t1	57	0x00000000
\$t2	58	0x00000000
\$t3	59	0x00000000
\$t4	60	0x00000000
\$t5	61	0x00000000
\$t6	62	0x00000000
\$t7	63	0x00000000
\$t8	64	0x00000000
\$t9	65	0x00000000
\$t0	66	0x00000000
\$t1	67	0x00000000
\$t2	68	0x00000000
\$t3	69	0x00000000
\$t4	70	0x00000000
\$t5	71	0x00000000
\$t6	72	0x00000000
\$t7	73	0x00000000
\$t8	74	0x00000000
\$t9	75	0x00000000
\$t0	76	0x00000000
\$t1	77	0x00000000
\$t2	78	0x00000000
\$t3	79	0x00000000
\$t4	80	0x00000000
\$t5	81	0x00000000
\$t6	82	0x00000000
\$t7	83	0x00000000
\$t8	84	0x00000000
\$t9	85	0x00000000
\$t0	86	0x00000000
\$t1	87	0x00000000
\$t2	88	0x00000000
\$t3	89	0x00000000
\$t4	90	0x00000000
\$t5	91	0x00000000
\$t6	92	0x00000000
\$t7	93	0x00000000
\$t8	94	0x00000000
\$t9	95	0x00000000
\$t0	96	0x00000000
\$t1	97	0x00000000
\$t2	98	0x00000000
\$t3	99	0x00000000
\$t4	100	0x00000000
\$t5	101	0x00000000
\$t6	102	0x00000000
\$t7	103	0x00000000
\$t8	104	0x00000000
\$t9	105	0x00000000
\$t0	106	0x00000000
\$t1	107	0x00000000
\$t2	108	0x00000000
\$t3	109	0x00000000
\$t4	110	0x00000000
\$t5	111	0x00000000
\$t6	112	0x00000000
\$t7	113	0x00000000
\$t8	114	0x00000000
\$t9	115	0x00000000
\$t0	116	0x00000000
\$t1	117	0x00000000
\$t2	118	0x00000000
\$t3	119	0x00000000
\$t4	120	0x00000000
\$t5	121	0x00000000
\$t6	122	0x00000000
\$t7	123	0x00000000
\$t8	124	0x00000000
\$t9	125	0x00000000
\$t0	126	0x00000000
\$t1	127	0x00000000
\$t2	128	0x00000000
\$t3	129	0x00000000
\$t4	130	0x00000000
\$t5	131	0x00000000
\$t6	132	0x00000000
\$t7	133	0x00000000
\$t8	134	0x00000000
\$t9	135	0x00000000
\$t0	136	0x00000000
\$t1	137	0x00000000
\$t2	138	0x00000000
\$t3	139	0x00000000
\$t4	140	0x00000000
\$t5	141	0x00000000
\$t6	142	0x00000000
\$t7	143	0x00000000
\$t8	144	0x00000000
\$t9	145	0x00000000
\$t0	146	0x00000000
\$t1	147	0x00000000
\$t2	148	0x00000000
\$t3	149	0x00000000
\$t4	150	0x00000000
\$t5	151	0x00000000
\$t6	152	0x00000000
\$t7	153	0x00000000
\$t8	154	0x00000000
\$t9	155	0x00000000
\$t0	156	0x00000000
\$t1	157	0x00000000
\$t2	158	0x00000000
\$t3	159	0x00000000
\$t4	160	0x00000000
\$t5	161	0x00000000
\$t6	162	0x00000000
\$t7	163	0x00000000
\$t8	164	0x00000000
\$t9	165	0x00000000
\$t0	166	0x00000000
\$t1	167	0x00000000
\$t2	168	0x00000000
\$t3	169	0x00000000
\$t4	170	0x00000000
\$t5	171	0x00000000
\$t6	172	0x00000000
\$t7	173	0x00000000
\$t8	174	0x00000000
\$t9	175	0x00000000
\$t0	176	0x00000000
\$t1	177	0x00000000
\$t2	178	0x00000000
\$t3	179	0x00000000
\$t4	180	0x00000000
\$t5	181	0x00000000
\$t6	182	0x00000000
\$t7	183	0x00000000
\$t8	184	0x00000000
\$t9	185	0x00000000
\$t0	186	0x00000000
\$t1	187	0x00000000
\$t2	188	0x00000000
\$t3	189	0x00000000
\$t4	190	0x00000000
\$t5	191	0x00000000
\$t6	192	0x00000000
\$t7	193	0x00000000
\$t8	194	0x00000000
\$t9	195	0x00000000
\$t0	196	0x00000000
\$t1	197	0x00000000
\$t2	198	0x00000000
\$t3	199	0x00000000
\$t4	200	0x00000000
\$t5	201	0x00000000
\$t6	202	0x00000000
\$t7	203	0x00000000
\$t8	204	0x00000000
\$t9	205	0x00000000
\$t0	206	0x00000000
\$t1	207	0x00000000
\$t2	208	0x00000000
\$t3	209	0x00000000
\$t4	210	0x00000000
\$t5	211	0x00000000
\$t6	212	0x00000000
\$t7	213	0x00000000
\$t8	214	0x00000000
\$t9	215	0x00000000
\$t0	216	0x00000000
\$t1	217	0x00000000
\$t2	218	0x00000000
\$t3	219	0x00000000
\$t4	220	0x00000000
\$t5	221	0x00000000
\$t6	222	0x00000000
\$t7	223	0x00000000
\$t8	224	0x00000000
\$t9	225	0x00000000
\$t0	226	0x00000000
\$t1	227	0x00000000
\$t2	228	0x00000000
\$t3	229	0x00000000
\$t4	230	0x00000000
\$t5	231	0x00000000
\$t6	232	0x00000000
\$t7	233	0x00000000
\$t8	234	0x00000000
\$t9	235	0x00000000
\$t0	236	0x00000000
\$t1	237	0x00000000
\$t2	238	0x00000000
\$t3	239	0x00000000
\$t4	240	0x00000000
\$t5	241	0x00000000
\$t6	242	0x00000000
\$t7	243	0x00000000
\$t8	244	0x00000000
\$t9	245	0x00000000
\$t0	246	0x00000000
\$t1	247	0x00000000
\$t2	248	0x00000000
\$t3	249	0x00000000
\$t4	250	0x00000000
\$t5	251	0x00000000
\$t6	252	0x00000000
\$t7	253	0x00000000
\$t8	254	0x00000000
\$t9	255	0x00000000
\$t0	256	0x00000000
\$t1	257	0x00000000
\$t2	258	0x00000000
\$t3	259	0x00000000
\$t4	260	0x00000000
\$t5	261	0x00000000
\$t6	262	0x00000000
\$t7	263	0x00000000
\$t8	264	0x00000000
\$t9	265	0x00000000
\$t0	266	0x00000000
\$t1	267	0x00000000
\$t2	268	0x00000000
\$t3	269	0x00000000
\$t4	270	0x00000000
\$t5	271	0x00000000
\$t6	272	0x00000000
\$t7	273	0x00000000
\$t8	274	0x00000000
\$t9	275	0x00000000
\$t0	276	0x00000000
\$t1	277	0x00000000
\$t2	278	0x00000000
\$t3	279	0x00000000
\$t4	280	0x00000000
\$t5	281	0x00000000
\$t6	282	0x00000000
\$t7	283	0x00000000
\$t8	284	0x00000000
\$t9	285	0x00000000
\$t0	286	0x00000000
\$t1	287	0x00000000
\$t2	288	0x00000000
\$t3	289	0x00000000
\$t4	290	0x00000000
\$t5	291	0x00000000
\$t6	292	0x00000000
\$t7	293	0x00000000
\$t8	294	0x00000000
\$t9	295	0x00000000
\$t0	296	0x00000000
\$t1	297	0x00000000
\$t2	298	0x00000000
\$t3	299	0x00000000
\$t4	300	0x00000000
\$t5	301	0x00000000
\$t6	302	0x00000000
\$t7	303	0x00000000
\$t8	304	0x00000000
\$t9	305	0x00000000
\$t0	306	0x00000000
\$t1	307	0x00000000
\$t2	308	0x00000000
\$t3	309	0x00000000
\$t4	310	0x00000000
\$t5	311	0x00000000
\$t6	312	0x00000000
\$t7	313	0x00000000
\$t8	314	0x00000000
\$t9	315	0x00000000
\$t0	316	0x00000000
\$t1	317	0x00000000
\$t2	318	0x00000000
\$t3	319	0x00000000
\$t4	320	0x00000000
\$t5	321	0x00000000
\$t6	322	0x00000000
\$t7	323	0x00000000
\$t8	324	0x00000000
\$t9	325	0x00000000
\$t0	326	0x00000000
\$t1	327	0x00000000
\$t2	328	0x00000000
\$t3	329	0x00000000
\$t4	330	0x00000000
\$t5	331	0x00000000
\$t6	332	0x00000000
\$t7	333	0x00000000
\$t8	334	0x00000000
\$t9	335	0x00000000
\$t0	336	0x00000000
\$t1	337	0x00000000
\$t2	338	0x00000000
\$t3	339	0x00000000
\$t4	340	0x000000

```

        addi $t1, $t1, 1 # x = x+1
        addi $t3, $zero, 1 #z = 1
    j      endif
else:
        addi $t2, $t2, -1 #y = y-1
        add $t3, $t3, $t3 # z = 2*z
endif:

```

b) $i \geq j$

Code:

```

.text
        addi $t1, $zero, 2 #x = 2
        addi $t2, $zero, 2 #y = 2
        addi $t3, $zero, 2 #z = 2

        addi $s1, $zero, 11      # i = 11
        addi $s2, $zero, 5 # j = 5
        slt $t0, $s1,$s2
        bne $t0, $zero, else
        addi $t1, $t1, 1
        addi $t3, $zero, 1
    j      endif
else:
        addi $t2, $t2, -1
        add $t3, $t3, $t3
endif:

```

c) $i+j \leq 0$

Code:

```

.text
        addi $t1, $zero, 2 #x = 2
        addi $t2, $zero, 2 #y = 2
        addi $t3, $zero, 2 #z = 2

        addi $s1, $zero, 11      # i = 11
        addi $s2, $zero, 5 # j = 5

        add $t4, $s1, $s2 #t4 = s1+s2 (tức là i+j)
        slt $t0, $zero,$t4
        bne $t0, $zero, else

```

```

        addi $t1, $t1, 1
        addi $t3, $zero, 1
    j      endif
else:
        addi $t2, $t2, -1
        add $t3, $t3, $t3
endif:

```

d) $i+j > m+n$

Code:

```

.text
        addi $t1, $zero, 2      #x = 2
        addi $t2, $zero, 2      #y = 2
        addi $t3, $zero, 2      #z = 2

        addi $s1, $zero, 11     # i = 11
        addi $s2, $zero, 5      # j = 5
        addi $s3, $zero, 3      # m = 3
        addi $s4, $zero, 2      # n = 2

        add $t4, $s1, $s2       #t4 = s1+s2 (tức là i+j)
        add $t5, $s3, $s4       # t5 = s3+s4 ( tức là m+n)

        slt $t0, $t5,$t4
        beq $t0, $zero, else
        addi $t1, $t1, 1
        addi $t3, $zero, 1
    j      endif
else:
        addi $t2, $t2, -1
        add $t3, $t3, $t3
endif:

```

Assignment 5:

a) $i \leq n$

Code:

.data

A: .word 1,2,3,4,5,6,7,8,9,10

#the index i, the starting address of A, the comparison constant n, step and sum are found in registers \$s1, \$s2, \$s3, \$s4 and \$s5

```

.text
    addi $s5, $zero, 0      # sum = 0
    addi $s1, $zero, 0      # i = 0
    addi $s3, $zero, 8      # n = 8
    addi $s4, $zero, 1      # step = 1
    la $s2, A

loop:
    slt $t2, $s3, $s1        # $t2 = n < i ? 1 : 0
    bne $t2, $zero, endloop
    add $t1, $s1, $s1        # $t1 = 2 * $s1
    add $t1, $t1, $t1        # $t1 = 4 * $s1
    add $t1, $t1, $s2        # $t1 store the address of A[i]
    lw $t0, 0($t1)          # load value of A[i] in $t0
    add $s5, $s5, $t0        # sum = sum + A[i]
    add $s1, $s1, $s4        # i = i + step
    j loop                   # goto loop
endloop:

```

b) sum ≥ 0

Code:

```
.data
```

```
A: .word 1,2,-4,3,4,5,6,7,8,9,10
```

#the index i, the starting address of A, the comparison constant n, step and sum are found in registers \$s1, \$s2, \$s3, \$s4 and \$s5

```
.text
```

```

    addi $s5, $zero, 0 # sum = 0
    addi $s1, $zero, 0 # i = 0
    addi $s3, $zero, 8 # n = 8
    addi $s4, $zero, 1 # step = 1
    la $s2, A

```

```

loop:    slt $t2, $s5, $zero # $t2 = sum < 0 ? 1 : 0
        bne $t2, $zero, endloop      # nếu sum < 0 thì endloop
        add $t1, $s1, $s1 # $t1 = 2 * $s1
        add $t1, $t1, $t1 # $t1 = 4 * $s1
        add $t1, $t1, $s2 # $t1 store the address of A[i]
        lw $t0, 0($t1) # load value of A[i] in $t0
        add $s5, $s5, $t0 # sum = sum + A[i]
        add $s1, $s1, $s4 # i = i + step

```



```

        j loop # goto loop
endloop:

```

c) $A[i] \neq 0$

Code:

```

.data

```

```

A: .word 1,2,0,3,4,5,6,7,8,9,10

```

#the index i, the starting address of A, the comparison constant n, step and sum are found in registers \$s1, \$s2, \$s3, \$s4 and \$s5

```

.text

```

```

    addi $s5, $zero, 0 # sum = 0

```

```

    addi $s1, $zero, 0 # i = 0

```

```

    addi $s3, $zero, 8 # n = 8

```

```

    addi $s4, $zero, 1 # step = 1

```

```

    la  $s2, A

```

```

loop:

```

```

    add $t1, $s1, $s1 # $t1 = 2 * $s1

```

```

    add $t1, $t1, $t1 # $t1 = 4 * $s1

```

```

    add $t1, $t1, $s2 # $t1 store the address of A[i]

```

```

    lw $t0, 0($t1) # load value of A[i] in $t0

```

```

    beq $t0, $zero, endloop      # nếu A[i] = 0 thì endloop

```

```

    add $s5, $s5, $t0 # sum = sum + A[i]

```

```

    add $s1, $s1, $s4 # i = i + step

```

```

    j loop # goto loop

```

```

endloop:

```

Assignment 6:

```

.data

```

```

A: .word 1,2,0,-3,4,5,-10,7,-8,9

```

#\$s5 là max là phần tử có giá trị tuyệt đối lớn nhất

#\$s6 là vị trí của phần tử có trị tuyệt đối max

```

.text

```

```

    addi $s5, $zero, 0 #tamp = 0

```

```

    addi $s1, $zero, 0 # i = 0

```

```

    addi $s3, $zero, 10 # n = 10

```

```
addi $s4, $zero, 1 # step = 1
```

```
la $s2, A
```

loop:

```
slt $t2, $s1, $s3      # $t2 = i < n ? 1 : 0
```

```
beq $t2, $zero, endloop
```

```
add $t1, $s1, $s1      # $t1 = 2 * $s1
```

```
add $t1, $t1, $t1      # $t1 = 4 * $s1
```

```
add $t1, $t1, $s2      # $t1 store the address of A[i]
```

```
lw $t0, 0($t1)         # load value of A[i] in $t0
```

```
slt $t4, $t0, $zero    # A[i] < 0 ? 1: 0
```

```
beq $t4, $zero, duong
```

```
sub $t0, $zero, $t0    #khi a[i] là số âm thì thực hiện lấy trị tuyệt
```

đối

duong:

```
slt $t4, $s5, $t0      # so sánh a[i] với max
```

```
beq $t4, $zero, sai    # nếu a[i] < max thì nhảy qua sai
```

```
add $s5, $zero, $t0    #max v= a[i]
```

```
add $s6, $zero, $s1    #cập nhật vị trí mới
```

```
j      cont
```

sai:

```
addi $s5, $s5, 0
```

```
addi $s6, $s6, 0
```

```
j      cont
```

cont:

```
add $s1, $s1, $s4      # i = i + step
```

```
j loop # goto loop
```

endloop:

Mảng: $A = \{1, 2, 0, -3, 4, 5, -10, 7, -8, 9\}$

Kết quả: Vị trí có giá trị tuyệt đối lớn nhất là \$s6 là 6

Giá trị có trị tuyệt đối lớn nhất là \$s5 là 0xa

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x10010000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x00000009
\$t1	9	0x10010024
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x0000000a
\$s2	18	0x10010000
\$s3	19	0x0000000a
\$s4	20	0x00000001
\$s5	21	0x0000000a
\$s6	22	0x00000006
\$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		0x00400064
hi		0x00000000
lo		0x00000000

=> Kết quả thực thi đúng với lí thuyết

Mảng: $A = \{1, 2, 0, -3, 4, -15, 10, 7, -8, -14\}$

Kết quả: Vị trí có giá trị tuyệt đối lớn nhất là \$s6 là 5

Giá trị có trị tuyệt đối lớn nhất là \$s5 là 0xf

Name	Number	Value
\$zero	0	0x00000000
\$at	1	0x10010000
\$v0	2	0x00000000
\$v1	3	0x00000000
\$a0	4	0x00000000
\$a1	5	0x00000000
\$a2	6	0x00000000
\$a3	7	0x00000000
\$t0	8	0x0000000e
\$t1	9	0x10010024
\$t2	10	0x00000000
\$t3	11	0x00000000
\$t4	12	0x00000000
\$t5	13	0x00000000
\$t6	14	0x00000000
\$t7	15	0x00000000
\$s0	16	0x00000000
\$s1	17	0x0000000a
\$s2	18	0x10010000
\$s3	19	0x0000000a
\$s4	20	0x00000001
\$s5	21	0x0000000f
\$s6	22	0x00000005
\$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		0x00400064
hi		0x00000000
lo		0x00000000