

BÁO CÁO TUẦN 3

Bài 1:

- Data segment:

```
.data
x:      .word 10      #khai tao gia tri cho x
y:      .word 20      #khai tao gia tri cho y
z:      .word 30      #khai tao gia tri cho z
i:      .word 5       #khai tao gia tri cho i
jj:     .word 8       #khai tao gia tri cho jj
```

- Text segment:

```
.text
    la $v0,i          # gan dia chi cua i vao thanh ghi $v0
    lw $s1,0($v0)     # gan gia tri cua i vao thanh ghi $s1

    la $v1,jj         # gan dia chi cua j vao thanh ghi $v1
    lw $s2,0($v1)     # gan gia tri cua j vao thanh ghi $s2

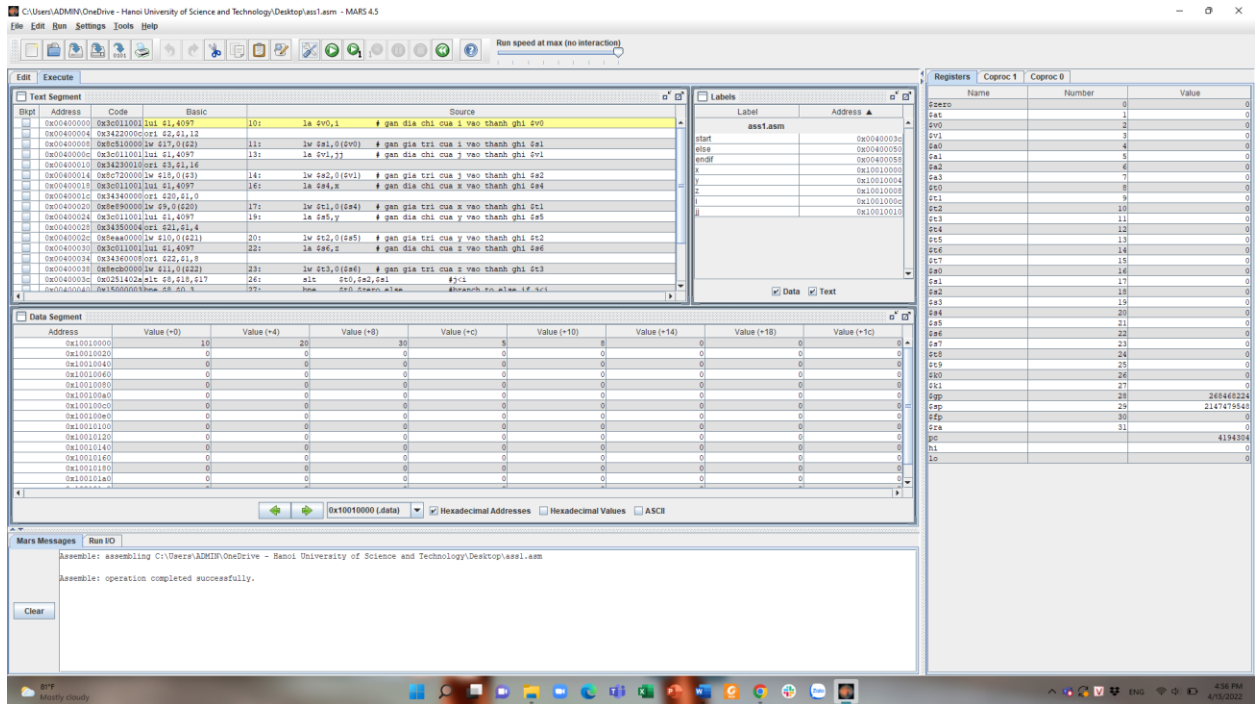
    la $s4,x          # gan dia chi cua x vao thanh ghi $s4
    lw $t1,0($s4)     # gan gia tri cua x vao thanh ghi $t1

    la $s5,y          # gan dia chi cua y vao thanh ghi $s5
    lw $t2,0($s5)     # gan gia tri cua y vao thanh ghi $t2

    la $s6,z          # gan dia chi cua z vao thanh ghi $s6
    lw $t3,0($s6)     # gan gia tri cua z vao thanh ghi $t3

start:
    slt    $t0,$s2,$s1      #j<i
    bne    $t0,$zero,else   #branch to else if j<i
    addi   $t1,$t1,1        #then part: x=x+1
    addi   $t3,$zero,1      #z=1
    j      endif           #skip "else" part
else:
    addi   $t2,$t2,-1       #begin else part: y=y-1
    add    $t3,$t3,$t3      #z=2*z
endif:
```

- Giải thích:
- + Khởi tạo giá trị cho x,y,z,i,jj



+ Vì i<jj nên giá trị thanh ghi \$t0 =0 nên ở dòng lệnh bne không nhảy đến else mà sẽ thực hiện 2 dòng lệnh sau bne là x=x+1 và z=1.

Bài 2:

- Data segment

.data

n: **.word** 6

#khởi tạo giá trị n=6

step: **.word** 1

#khởi tạo giá trị step =1

A: **.word** 1,2,3,4,5,6

#khởi tạo mảng A

- Text segment

```
lw $s3, n           #gan gia tri n vao thanh ghi $s3
la $s2, A            #gan mang A vao thanh ghi $s2
lw $s4, step         #gan gia tri step vao thanh ghi $s4
addi $s5,$zero,0     #sum=0
addi $s1,$zero,0     #i=0
loop: slt $t2,$s1,$s3
      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:
```

- Result:

Text Segment			
Bkpt	Address	Code	Basic Source
<input type="checkbox"/>	4194304	0x3c011001 lui \$t1,4097	7: lw \$s3,n #gan gia tri n vao thanh ghi \$s3
<input type="checkbox"/>	4194308	0x8c330000 lw \$t9,0(\$t1)	
<input type="checkbox"/>	4194312	0x3c011001 lui \$t1,4097	8: la \$s2,A #gan mang A vao thanh ghi \$s2
<input type="checkbox"/>	4194316	0x34320008 ori \$t8,\$t1,8	
<input type="checkbox"/>	4194320	0x3c011001 lui \$t1,4097	9: lw \$s4,step #gan gia tri step vao thanh ghi \$s4
<input type="checkbox"/>	4194324	0x8c340004 lw \$t0,4(\$t1)	
<input type="checkbox"/>	4194328	0x20180000 addi \$t2,\$t0,0	10: addi \$s5,\$zero,0 #sum=0
<input type="checkbox"/>	4194332	0x20110000 addi \$t7,\$t0,0	11: addi \$s1,\$zero,0 #i=0
<input type="checkbox"/>	4194336	0x2033502a slt \$t2,\$t1,\$t9	12: loop: slt \$t2,\$s1,\$s3
<input type="checkbox"/>	4194340	0x11400007 beq \$t0,\$t0,7	13: beq \$t2,\$zero,endiop
<input type="checkbox"/>	4194344	0x02314820 add \$s,\$t7,\$t7	14: add \$t1,\$s1,\$s1 #\$t1=2*\$s1
<input type="checkbox"/>	4194348	0x01294820 add \$s,\$s,\$s	15: add \$t1,\$t1,\$t1 #\$t1=4*\$s1
<input type="checkbox"/>	4194352	0x01324820 add \$s,\$s,\$t8	16: add \$t1,\$t1,\$s2 #t1 store the address of A[i]
<input type="checkbox"/>	4194356	0x8d280000 lw \$t0,\$t0(\$s)	17: lw \$t0,0(\$t1) #load value of A[i] in \$t0
<input type="checkbox"/>	4194360	0x02a8a820 add \$t1,\$t1,\$t0	18: add \$s5,\$s5,\$t0 #sum=sum+A[i]
<input type="checkbox"/>	4194364	0x02348820 add \$t7,\$t7,\$t0	19: add \$s1,\$s1,\$s4 #i=i+step
<input type="checkbox"/>	4194368	0x08100008 j \$l94336	20: j loop #goto loop

Labels	
Label	Address ▲
ass2.asm	
loop	4194336
endiop	4194372
n	268500992
step	268500996
A	268501000

☒ Data ☒ Text

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	6
\$t1	9	268501020
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	6
\$s2	18	268501000
\$s3	19	6
\$s4	20	1
\$s5	21	21
\$s6	22	0
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194372
hi		0
lo		0

Nhận xét:

- Khi khởi tạo giá trị của các biến ban đầu là $n = 6$, $A[] = [1,2,3,4,5,6]$, $step = 1$, $i = 0$ và $sum = 0$, chương trình chạy qua các phần tử của mảng $A[1]$, $A[2]$, $A[3]$ và đọc giá trị vào thanh ghi \$t0 rồi cộng tổng vào thanh ghi chứa sum là \$s5.
- Giá trị của thanh ghi lưu địa chỉ phần tử $A[i]$ cũng thay đổi theo từng step.
- Sau khi chạy xong, kết quả của thanh ghi $\$s5 = 21$ đúng như kết quả tính tay.

Bài 3:

- Code

```
la    $s0, test           #load the address of test variable
lw    $s1, 0($s0)         #load the value of test to register $t1
li    $t0, 0
li    $t1, 1
li    $t2, 2
beq   $s1, $t0, case_0
beq   $s1, $t1, case_1
beq   $s1, $t2, case_2
j     default
addi  $s2, $s2, 1         #a=a+1
j     continue
sub   $s2, $s2, $t1       #a=a-1
j     continue
add   $s3, $s3, $s3       #b=2*b
j     continue
:
e:
```

- Result:

[illegible]

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	0
\$t1	9	1
\$t2	10	2
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	268500992
\$s1	17	1
\$s2	18	-1
\$s3	19	0
\$s4	20	0
\$s5	21	0
\$s6	22	0
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194368
hi		0
lo		0

Bài 4:

- a. $i < j$
Code:

```

#Laboratory Exercise 3, Assignment 4, i<j
.data
x:      .word 10      #khai tao gia tri cho x
y:      .word 20      #khai tao gia tri cho y
z:      .word 30      #khai tao gia tri cho z
i:      .word 5       #khai tao gia tri cho i
jj:     .word 8       #khai tao gia tri cho jj

.text

    la $v0,i          # gan dia chi cua i vao thanh ghi $v0
    lw $s1,0($v0)      # gan gia tri cua i vao thanh ghi $s1
    la $v1,jj          # gan dia chi cua j vao thanh ghi $v1
    lw $s2,0($v1)      # gan gia tri cua j vao thanh ghi $s2
    la $s4,x           # gan dia chi cua x vao thanh ghi $s4
    lw $t1,0($s4)      # gan gia tri cua x vao thanh ghi $t1
    la $s5,y           # gan dia chi cua y vao thanh ghi $s5
    lw $t2,0($s5)      # gan gia tri cua y vao thanh ghi $t2
    la $s6,z           # gan dia chi cua z vao thanh ghi $s6
    lw $t3,0($s6)      # gan gia tri cua z vao thanh ghi $t3

start:
    slt    $t0,$s1,$s2      #i<j thi $t0=1
    beq    $t0,$zero,else   #branch to else if i<j
    addi   $t1,$t1,1        #then part: x=x+1
    addi   $t3,$zero,1      #z=1
    j      endif           #skip "else" part
else:
    addi   $t2,$t2,-1       #begin else part: y=y-1
    add    $t3,$t3,$t3      #z=2*z
endif:

```

Result:

Text Segment					Labels	
Expt	Address	Code	Basic	Source	Label	Address
	4194304	0x3e011001	lui \$1,\$1,4097	10: la \$v0,i # gan dia chi cua i vao thanh ghi \$v0	start	4194364
	4194308	0x3422000c	ori \$2,\$1,12		else	4194384
	4194312	0x8e510000	lw \$s1,0(\$v0) # gan gia tri cua i vao thanh ghi \$s1	11: lw \$s1,0(\$v0) # gan gia tri cua i vao thanh ghi \$s1	endif	4194392
	4194316	0x3e011001	lui \$1,\$1,4097	12: la \$v1,jj # gan dia chi cua j vao thanh ghi \$v1	x	268500992
	4194320	0x34230010	ori \$3,\$1,16		y	268500996
	4194324	0x8e720000	lw \$s2,0(\$v1) # gan gia tri cua j vao thanh ghi \$s2	13: lw \$s2,0(\$v1) # gan gia tri cua j vao thanh ghi \$s2	z	268501000
	4194328	0x3e011001	lui \$1,\$1,4097	14: la \$s4,x # gan dia chi cua x vao thanh ghi \$s4	i	268501004
	4194332	0x34340000	ori \$20,\$1,0		jj	268501008
	4194336	0x8e890000	lw \$s9,0(\$20)	15: lw \$t1,0(\$s4) # gan gia tri cua x vao thanh ghi \$t1		
	4194340	0x3e011001	lui \$1,\$1,4097	16: la \$s5,y # gan dia chi cua y vao thanh ghi \$s5		
	4194344	0x34350004	ori \$21,\$1,4			
	4194348	0x8eaa0000	lw \$10,0(\$21)	17: lw \$t2,0(\$s5) # gan gia tri cua y vao thanh ghi \$t2		
	4194352	0x3e011001	lui \$1,\$1,4097	18: la \$s6,z # gan dia chi cua z vao thanh ghi \$s6		
	4194356	0x34360008	ori \$22,\$1,8			
	4194360	0x8ecb0000	lw \$11,0(\$22)	19: lw \$t3,0(\$s6) # gan gia tri cua z vao thanh ghi \$t3		
	4194364	0x0232402a	slt \$8,\$17,\$18	22: slt \$t0,\$s1,\$s2 #i<j thi \$t0=1		
	4194368	0x11000003	beq \$8,\$0,3	23: beq \$t0,\$zero,else #branch to else if i<j		
	4194372	0x21290001	addi \$9,\$9,1	24: addi \$t1,\$t1,1 #then part: x=x+1		
	4194376	0x200b0001	addi \$11,\$0,1	25: addi \$t3,\$zero,1 #z=1		
	4194380	0x08100016	j 4194392	26: j endif #skip "else" part		
	4194384	0x214affff	addi \$10,\$10,-1	27: else: addi \$t2,\$t2,-1 #begln else part: y=y-1		
	4194388	0x01cb5820	add \$11,\$11,\$11	28: add \$t3,\$t3,\$t3 #z=2*z		

Data Segment								
Address	Value (+0)	Value (+4)	Value (+8)	Value (+12)	Value (+16)	Value (+20)	Value (+24)	Value (+28)
268500992	10	20	30	5	8	0	0	0
268501024	0	0	0	0	0	0	0	0
268501056	0	0	0	0	0	0	0	0
268501088	0	0	0	0	0	0	0	0
268501120	0	0	0	0	0	0	0	0
268501152	0	0	0	0	0	0	0	0
268501184	0	0	0	0	0	0	0	0
268501216	0	0	0	0	0	0	0	0
268501248	0	0	0	0	0	0	0	0
268501280	0	0	0	0	0	0	0	0
268501312	0	0	0	0	0	0	0	0
268501344	0	0	0	0	0	0	0	0
268501376	0	0	0	0	0	0	0	0
268501408	0	0	0	0	0	0	0	0
268501440	0	0	0	0	0	0	0	0
268501472	0	0	0	0	0	0	0	0

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	268501004
\$v1	3	268501008
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	1
\$t1	9	11
\$t2	10	20
\$t3	11	1
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	5
\$s2	18	8
\$s3	19	0
\$s4	20	268500992
\$s5	21	268500996
\$s6	22	268501000
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194392
hi		0
lo		0

- b. $i \geq j$
Code:

#Laboratory Exercise 3, Assignment 4, i>=j

.data

```
x:      .word 10      #khai tao gia tri cho x
y:      .word 20      #khai tao gia tri cho y
z:      .word 30      #khai tao gia tri cho z
i:      .word 5        #khai tao gia tri cho i
jj:     .word 8        #khai tao gia tri cho jj
```

.text

```
      la $v0,i        # gan dia chi cua i vao thanh ghi $v0
      lw $s1,0($v0)   # gan gia tri cua i vao thanh ghi $s1
      la $v1,jj       # gan dia chi cua j vao thanh ghi $v1
      lw $s2,0($v1)   # gan gia tri cua j vao thanh ghi $s2
      la $s4,x        # gan dia chi cua x vao thanh ghi $s4
      lw $t1,0($s4)   # gan gia tri cua x vao thanh ghi $t1
      la $s5,y        # gan dia chi cua y vao thanh ghi $s5
      lw $t2,0($s5)   # gan gia tri cua y vao thanh ghi $t2
      la $s6,z        # gan dia chi cua z vao thanh ghi $s6
      lw $t3,0($s6)   # gan gia tri cua z vao thanh ghi $t3

start:
      slt    $t0,$s2,$s1      #j<i thi $t0=1
      beq    $t0,$zero,else   #branch to else if i<j
      addi   $t1,$t1,1        #then part: x=x+1
      addi   $t3,$zero,1      #z=1
      j      endif           #skip "else" part
else:  addi   $t2,$t2,-1       #begin else part: y=y-1
      add    $t3,$t3,$t3      #z=2*z
endif:
```

Result:

Text Segment					Labels	
Bkpt	Address	Code	Basic	Source	Label	Address ▲
<input type="checkbox"/>	4194304	0x3c011001	lui \$t1,4097	10: la \$v0,i # gan dia chi cua i vao thanh ghi \$v0	ass4_basm	
<input type="checkbox"/>	4194308	0x3422000c	ori \$t2,\$t1,12		start	4194364
<input type="checkbox"/>	4194312	0x8c510000	lw \$t1,0(\$t2)	11: lw \$s1,0(\$v0) # gan gia tri cua i vao thanh ghi \$s1	else	4194384
<input type="checkbox"/>	4194316	0x3c011001	lui \$t1,4097	12: la \$v1,j # gan dia chi cua j vao thanh ghi \$v1	endif	4194392
<input type="checkbox"/>	4194320	0x34230010	ori \$t3,\$t1,16		x	268500992
<input type="checkbox"/>	4194324	0x8c720000	lw \$t2,0(\$v1)	13: lw \$s2,0(\$v1) # gan gia tri cua j vao thanh ghi \$s2	y	268500996
<input type="checkbox"/>	4194328	0x3c011001	lui \$t1,4097	14: la \$s4,x # gan dia chi cua x vao thanh ghi \$s4	z	268501000
<input type="checkbox"/>	4194332	0x34340000	ori \$t2,\$t1,0		i	268501004
<input type="checkbox"/>	4194336	0x8e890000	lw \$t1,0(\$t4)	15: lw \$t1,0(\$s4) # gan gia tri cua x vao thanh ghi \$t1	j	268501008
<input type="checkbox"/>	4194340	0x3c011001	lui \$t1,4097	16: la \$s5,y # gan dia chi cua y vao thanh ghi \$s5		
<input type="checkbox"/>	4194344	0x34350004	ori \$t2,\$t1,4			
<input type="checkbox"/>	4194348	0x8eaa0000	lw \$t2,0(\$t21)	17: lw \$t2,0(\$s5) # gan gia tri cua y vao thanh ghi \$t2		
<input type="checkbox"/>	4194352	0x3c011001	lui \$t1,4097	18: la \$s6,z # gan dia chi cua z vao thanh ghi \$s6		
<input type="checkbox"/>	4194356	0x34360008	ori \$t2,\$t1,8			
<input type="checkbox"/>	4194360	0x8ecb0000	lw \$t3,0(\$t23)	19: lw \$t3,0(\$s6) # gan gia tri cua z vao thanh ghi \$t3		
<input type="checkbox"/>	4194364	0x0251402a	slt \$t2,\$t2,\$t7	22: slt \$t0,\$s2,\$s1 #<i thi \$t0=1		
<input type="checkbox"/>	4194368	0x11000003	beq \$t2,\$t0,3	23: beq \$t0,\$zero,else #branch to else if i<j		
<input type="checkbox"/>	4194372	0x21290001	addi \$t1,\$t1,1	24: addi \$t1,\$t1,1 #then part: x=x+1		
<input type="checkbox"/>	4194376	0x200b0001	addi \$t3,\$t3,1	25: addi \$t3,\$zero,1 #z=1		
<input type="checkbox"/>	4194380	0x08100016	j 4194392	26: j endif #skip "else" part		
<input type="checkbox"/>	4194384	0x214effff	addi \$t0,\$t0,-1	27: else: addi \$t2,\$t2,-1 #begin else part: y=y-1		
<input type="checkbox"/>	4194388	0x016b5620	add \$t1,\$t1,\$t1	28: add \$t3,\$t3,\$t3 #z=2'z		
					<input checked="" type="checkbox"/> Data <input checked="" type="checkbox"/> Text	

Data Segment								
Address	Value (+0)	Value (+4)	Value (+8)	Value (+12)	Value (+16)	Value (+20)	Value (+24)	Value (+28)
268500992	10	20	30	5	8	0	0	0
268501024	0	0	0	0	0	0	0	0
268501056	0	0	0	0	0	0	0	0
268501088	0	0	0	0	0	0	0	0
268501120	0	0	0	0	0	0	0	0
268501152	0	0	0	0	0	0	0	0
268501184	0	0	0	0	0	0	0	0
268501216	0	0	0	0	0	0	0	0
268501248	0	0	0	0	0	0	0	0
268501280	0	0	0	0	0	0	0	0
268501312	0	0	0	0	0	0	0	0
268501344	0	0	0	0	0	0	0	0
268501376	0	0	0	0	0	0	0	0
268501408	0	0	0	0	0	0	0	0
268501440	0	0	0	0	0	0	0	0
268501472	0	0	0	0	0	0	0	0

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	268501004
\$v1	3	268501008
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	0
\$t1	9	10
\$t2	10	19
\$t3	11	60
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	5
\$s2	18	8
\$s3	19	0
\$s4	20	268500992
\$s5	21	268500996
\$s6	22	268501000
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194392
hi		0
lo		0

c. $i+j \leq 0$

Code:

#Laboratory Exercise 3, Assignment 4, $i+j \leq 0$

.data

```
x:      .word 10      #khai tao gia tri cho x
y:      .word 20      #khai tao gia tri cho y
z:      .word 30      #khai tao gia tri cho z
i:      .word 5       #khai tao gia tri cho i
jj:     .word 8       #khai tao gia tri cho jj
```

.text

```
    la $v0,i          # gan dia chi cua i vao thanh ghi $v0
    lw $s1,0($v0)     # gan gia tri cua i vao thanh ghi $s1
    la $v1,jj         # gan dia chi cua j vao thanh ghi $v1
    lw $s2,0($v1)     # gan gia tri cua j vao thanh ghi $s2
    la $s4,x          # gan dia chi cua x vao thanh ghi $s4
    lw $t1,0($s4)     # gan gia tri cua x vao thanh ghi $t1
    la $s5,y          # gan dia chi cua y vao thanh ghi $s5
    lw $t2,0($s5)     # gan gia tri cua y vao thanh ghi $t2
    la $s6,z          # gan dia chi cua z vao thanh ghi $s6
    lw $t3,0($s6)     # gan gia tri cua z vao thanh ghi $t3
    add $s6,$s1,$s2   # tinh tong i+jj

start:
    slt    $t0,$0,$s6      #0<tong thi $t0=1
    bne    $t0,$zero,else  #neu $t0 =0 thi else
    addi    $t1,$t1,1      #then part: x=x+1
    addi    $t3,$zero,1    #z=1
    j      endif          #skip "else" part
else:
    addi    $t2,$t2,-1     #begin else part: y=y-1
    add     $t3,$t3,$t3    #z=2*z
endif:
```

Result:

Text Segment					Labels	
Bkpt	Address	Code	Basic	Source	Label	Address
<input type="checkbox"/>	4194304	0x3e011001	lui \$1,\$1,4097	10: la \$v0,i # gan dia chi cua i vao thanh ghi \$v0	start	4194368
<input type="checkbox"/>	4194308	0x3e22000c	ori \$2,\$1,12		else	4194388
<input type="checkbox"/>	4194312	0x8e510000	lw \$17,0(\$2)	11: lw \$s1,0(\$v0) # gan gia tri cua i vao thanh ghi \$s1	endif	4194396
<input type="checkbox"/>	4194316	0x3e011001	lui \$1,4097	12: la \$v1,jj # gan dia chi cua j vao thanh ghi \$v1	x	268500992
<input type="checkbox"/>	4194320	0x34230010	ori \$3,\$1,16		y	268500996
<input type="checkbox"/>	4194324	0x8e720000	lw \$18,0(\$3)	13: lw \$s2,0(\$v1) # gan gia tri cua j vao thanh ghi \$s2	z	268501000
<input type="checkbox"/>	4194328	0x3e011001	lui \$1,4097	14: la \$s4,x # gan dia chi cua x vao thanh ghi \$s4	i	268501004
<input type="checkbox"/>	4194332	0x34340000	ori \$20,\$1,0			268501008
<input type="checkbox"/>	4194336	0x8e890000	lw \$9,0(\$20)	15: lw \$t1,0(\$s4) # gan gia tri cua x vao thanh ghi \$t1		
<input type="checkbox"/>	4194340	0x3e011001	lui \$1,4097	16: la \$s5,y # gan dia chi cua y vao thanh ghi \$s5		
<input type="checkbox"/>	4194344	0x34350004	ori \$21,\$1,4			
<input type="checkbox"/>	4194348	0x8eaa0000	lw \$10,0(\$21)	17: lw \$t2,0(\$s5) # gan gia tri cua y vao thanh ghi \$t2		
<input type="checkbox"/>	4194352	0x3e011001	lui \$1,4097	18: la \$s6,z # gan dia chi cua z vao thanh ghi \$s6		
<input type="checkbox"/>	4194356	0x34360008	ori \$22,\$1,8			
<input type="checkbox"/>	4194360	0x8ecb0000	lui \$11,0(\$22)	19: lw \$t3,0(\$s6) # gan gia tri cua z vao thanh ghi \$t3		
<input type="checkbox"/>	4194364	0x0232b020	add \$22,\$17,\$18	20: add \$s6,\$s1,\$s2 # tinh tong i+jj		
<input type="checkbox"/>	4194368	0x0016402a	slt \$8,\$0,\$22	22: slt \$t0,\$0,\$s6 #0ctong thi \$t0=1		
<input type="checkbox"/>	4194372	0x15000003	bne \$8,\$0,\$3	23: bne \$t0,\$zero,else #neu \$t0 =0 thi else		
<input type="checkbox"/>	4194376	0x21290001	addi \$9,\$9,1	24: addi \$t1,\$t1,1 #then part: x=x+1		
<input type="checkbox"/>	4194380	0x200b0001	addi \$11,\$0,1	25: addi \$t3,\$zero,1 #z=1		
<input type="checkbox"/>	4194384	0x08100017	j 4194396	26: j endif #skip "else" part		
<input type="checkbox"/>	4194388	0x214affff	addi \$10,\$10,-1	27: else: addi \$t2,\$t2,-1 #begin else part: y=y-1		
<input type="checkbox"/>	4194392	0x016b5820	add \$11,\$11,\$11	28: add \$t3,\$t3,\$t3 #z=\$z		

Data Segment								
Address	Value (+0)	Value (+4)	Value (+8)	Value (+12)	Value (+16)	Value (+20)	Value (+24)	Value (+28)
268500992	10	20	30	5	8	0	0	0
268501024	0	0	0	0	0	0	0	0
268501056	0	0	0	0	0	0	0	0
268501088	0	0	0	0	0	0	0	0
268501120	0	0	0	0	0	0	0	0
268501152	0	0	0	0	0	0	0	0
268501184	0	0	0	0	0	0	0	0
268501216	0	0	0	0	0	0	0	0
268501248	0	0	0	0	0	0	0	0
268501280	0	0	0	0	0	0	0	0
268501312	0	0	0	0	0	0	0	0
268501344	0	0	0	0	0	0	0	0
268501376	0	0	0	0	0	0	0	0
268501408	0	0	0	0	0	0	0	0
268501440	0	0	0	0	0	0	0	0
268501472	0	0	0	0	0	0	0	0

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	268501004
\$v1	3	268501008
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	1
\$t1	9	10
\$t2	10	19
\$t3	11	60
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	5
\$s2	18	8
\$s3	19	0
\$s4	20	268500992
\$s5	21	268500996
\$s6	22	13
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194396
hi		0
lo		0

d. $i+j > m+n$

Code:

```

.data
x:      .word 10      #khai tao gia tri cho x
y:      .word 20      #khai tao gia tri cho y
z:      .word 30      #khai tao gia tri cho z
i:      .word 5       #khai tao gia tri cho i
jj:     .word 8       #khai tao gia tri cho jj
.text
    addi $k0,$zero,10      #khai tao gia tri cho m
    addi $k1,$zero,12      #khai tao gia tri cho n
    la $v0,i               # gan dia chi cua i vao thanh ghi $v0
    lw $s1,0($v0)          # gan gia tri cua i vao thanh ghi $s1
    la $v1,jj              # gan dia chi cua j vao thanh ghi $v1
    lw $s2,0($v1)          # gan gia tri cua j vao thanh ghi $s2
    la $s4,x               # gan dia chi cua x vao thanh ghi $s4
    lw $t1,0($s4)          # gan gia tri cua x vao thanh ghi $t1
    la $s5,y               # gan dia chi cua y vao thanh ghi $s5
    lw $t2,0($s5)          # gan gia tri cua y vao thanh ghi $t2
    la $s6,z               # gan dia chi cua z vao thanh ghi $s6
    lw $t3,0($s6)          # gan gia tri cua z vao thanh ghi $t3
    add $s6,$s1,$s2 # tinh tong i+jj
    add $s7,$k0,$k1 # tinh tong m+n

start:
    slt    $t0,$s7,$s6      #m+n<i+j thi $t0=1
    beq    $t0,$zero,else   #$t0=0 thi else
    addi   $t1,$t1,1         #then part: x=x+1
    addi   $t3,$zero,1       #z=1
    j      endif            #skip "else" part
else:
    addi   $t2,$t2,-1        #begin else part: y=y-1
    add    $t3,$t3,$t3        #z=2*z
endif:

```

Result:

Text Segment					Labels	
Bkpt	Address	Code	Basic	Source	Label	Address
	4194304	0x201e000a	addi \$t6,\$t0,10	9: addi \$t0,\$zero,10 #khol tao gia tri cho m		
	4194308	0x201b000c	addi \$t7,\$t0,12	10: addi \$t1,\$zero,12 #khol tao gia tri cho n		
	4194312	0x3c011001	lui \$t1,4097	11: la \$v0,1 # gan dia chi cua i vao thanh ghi \$v0		
	4194316	0x3422000c	ori \$t2,\$t1,12			
	4194320	0x8c510000	lw \$t1,0(\$v0)	12: lw \$t1,0(\$v0) # gan gia tri cua i vao thanh ghi \$t1		
	4194324	0x3c011001	lui \$t1,4097	13: la \$v1,\$j # gan dia chi cua j vao thanh ghi \$v1		
	4194328	0x34230010	ori \$t3,\$t1,16			
	4194332	0x8c720000	lw \$t2,0(\$v1)	14: lw \$t2,0(\$v1) # gan gia tri cua j vao thanh ghi \$t2		
	4194336	0x3c011001	lui \$t1,4097	15: la \$t4,x # gan dia chi cua x vao thanh ghi \$t4		
	4194340	0x34340000	ori \$t0,\$t1,0			
	4194344	0x8e890000	lw \$t5,0(\$t0)	16: lw \$t1,0(\$t4) # gan gia tri cua x vao thanh ghi \$t1		
	4194348	0x3c011001	lui \$t1,4097	17: la \$t5,y # gan dia chi cua y vao thanh ghi \$t5		
	4194352	0x34350004	ori \$t1,\$t1,4			
	4194356	0x8eaa0000	lw \$t0,0(\$t1)	18: lw \$t2,0(\$t5) # gan gia tri cua y vao thanh ghi \$t2		
	4194360	0x3c011001	lui \$t1,4097	19: la \$t6,z # gan dia chi cua z vao thanh ghi \$t6		
	4194364	0x34360008	ori \$t2,\$t1,8			
	4194368	0x8ecb0000	lw \$t3,0(\$t6)	20: lw \$t3,0(\$t6) # gan gia tri cua z vao thanh ghi \$t3		
	4194372	0x0232b020	add \$t2,\$t1,\$t8	21: add \$t6,\$t1,\$t2 # tinh tong i+j		
	4194376	0x035bb820	add \$t3,\$t6,\$t7	22: add \$t7,\$t0,\$t1 # tinh tong m+n		
	4194380	0x02fe402a	slt \$t0,\$t3,\$t6	24: slt \$t0,\$t3,\$t6 #m<n<i+j thi \$t0=1		
	4194384	0x11000003	beq \$t0,\$zero,3	25: beq \$t0,\$zero,else #t0=0 thi else		
	4194388	0x21290001	addi \$t1,\$t1,1	26: addi \$t1,\$t1,1 #then part: x=x+1		
	4194392	0x200b0001	addi \$t3,\$t3,1	27: addi \$t3,\$t3,1 #t=1		
	4194396	0x200b0001	addi \$t3,\$t3,1			
	4194400	0x200b0001	addi \$t3,\$t3,1			
	4194404	0x200b0001	addi \$t3,\$t3,1			
	4194408	0x200b0001	addi \$t3,\$t3,1			
	4194412	0x200b0001	addi \$t3,\$t3,1			
	4194416	0x200b0001	addi \$t3,\$t3,1			
	4194420	0x200b0001	addi \$t3,\$t3,1			
	4194424	0x200b0001	addi \$t3,\$t3,1			
	4194428	0x200b0001	addi \$t3,\$t3,1			
	4194432	0x200b0001	addi \$t3,\$t3,1			
	4194436	0x200b0001	addi \$t3,\$t3,1			
	4194440	0x200b0001	addi \$t3,\$t3,1			
	4194444	0x200b0001	addi \$t3,\$t3,1			
	4194448	0x200b0001	addi \$t3,\$t3,1			
	4194452	0x200b0001	addi \$t3,\$t3,1			
	4194456	0x200b0001	addi \$t3,\$t3,1			
	4194460	0x200b0001	addi \$t3,\$t3,1			
	4194464	0x200b0001	addi \$t3,\$t3,1			
	4194468	0x200b0001	addi \$t3,\$t3,1			
	4194472	0x200b0001	addi \$t3,\$t3,1			
	4194476	0x200b0001	addi \$t3,\$t3,1			
	4194480	0x200b0001	addi \$t3,\$t3,1			
	4194484	0x200b0001	addi \$t3,\$t3,1			
	4194488	0x200b0001	addi \$t3,\$t3,1			
	4194492	0x200b0001	addi \$t3,\$t3,1			
	4194496	0x200b0001	addi \$t3,\$t3,1			
	4194500	0x200b0001	addi \$t3,\$t3,1			
	4194504	0x200b0001	addi \$t3,\$t3,1			
	4194508	0x200b0001	addi \$t3,\$t3,1			
	4194512	0x200b0001	addi \$t3,\$t3,1			
	4194516	0x200b0001	addi \$t3,\$t3,1			
	4194520	0x200b0001	addi \$t3,\$t3,1			
	4194524	0x200b0001	addi \$t3,\$t3,1			
	4194528	0x200b0001	addi \$t3,\$t3,1			
	4194532	0x200b0001	addi \$t3,\$t3,1			
	4194536	0x200b0001	addi \$t3,\$t3,1			
	4194540	0x200b0001	addi \$t3,\$t3,1			
	4194544	0x200b0001	addi \$t3,\$t3,1			
	4194548	0x200b0001	addi \$t3,\$t3,1			
	4194552	0x200b0001	addi \$t3,\$t3,1			
	4194556	0x200b0001	addi \$t3,\$t3,1			
	4194560	0x200b0001	addi \$t3,\$t3,1			
	4194564	0x200b0001	addi \$t3,\$t3,1			
	4194568	0x200b0001	addi \$t3,\$t3,1			
	4194572	0x200b0001	addi \$t3,\$t3,1			
	4194576	0x200b0001	addi \$t3,\$t3,1			
	4194580	0x200b0001	addi \$t3,\$t3,1			
	4194584	0x200b0001	addi \$t3,\$t3,1			
	4194588	0x200b0001	addi \$t3,\$t3,1			
	4194592	0x200b0001	addi \$t3,\$t3,1			
	4194596	0x200b0001	addi \$t3,\$t3,1			
	4194600	0x200b0001	addi \$t3,\$t3,1			
	4194604	0x200b0001	addi \$t3,\$t3,1			
	4194608	0x200b0001	addi \$t3,\$t3,1			
	4194612	0x200b0001	addi \$t3,\$t3,1			
	4194616	0x200b0001	addi \$t3,\$t3,1			
	4194620	0x200b0001	addi \$t3,\$t3,1			
	4194624	0x200b0001	addi \$t3,\$t3,1			
	4194628	0x200b0001	addi \$t3,\$t3,1			
	4194632	0x200b0001	addi \$t3,\$t3,1			
	4194636	0x200b0001	addi \$t3,\$t3,1			
	4194640	0x200b0001	addi \$t3,\$t3,1			
	4194644	0x200b0001	addi \$t3,\$t3,1			
	4194648	0x200b0001	addi \$t3,\$t3,1			
	4194652	0x200b0001	addi \$t3,\$t3,1			
	4194656	0x200b0001	addi \$t3,\$t3,1			
	4194660	0x200b0001	addi \$t3,\$t3,1			
	4194664	0x200b0001	addi \$t3,\$t3,1			
	4194668	0x200b0001	addi \$t3,\$t3,1			
	4194672	0x200b0001	addi \$t3,\$t3,1			
	4194676	0x200b0001	addi \$t3,\$t3,1			
	4194680	0x200b0001	addi \$t3,\$t3,1			
	4194684	0x200b0001	addi \$t3,\$t3,1			
	4194688	0x200b0001	addi \$t3,\$t3,1			
	4194692	0x200b0001	addi \$t3,\$t3,1			
	4194696	0x200b0001	addi \$t3,\$t3,1			
	4194700	0x200b0001	addi \$t3,\$t3,1			
	4194704	0x200b0001	addi \$t3,\$t3,1			
	4194708	0x200b0001	addi \$t3,\$t3,1			
	4194712	0x200b0001	addi \$t3,\$t3,1			
	4194716	0x200b0001	addi \$t3,\$t3,1			
	4194720	0x200b0001	addi \$t3,\$t3,1			
	4194724	0x200b0001	addi \$t3,\$t3,1			
	4194728	0x200b0001	addi \$t3,\$t3,1			
	4194732	0x200b0001	addi \$t3,\$t3,1			
	4194736	0x200b0001	addi \$t3,\$t3,1			
	4194740	0x200b0001	addi \$t3,\$t3,1			
	4194744	0x200b0001	addi \$t3,\$t3,1			
	4194748	0x200b0001	addi \$t3,\$t3,1			
	4194752	0x200b0001	addi \$t3,\$t3,1			
	4194756	0x200b0001	addi \$t3,\$t3,1			
	4194760	0x200b0001	addi \$t3,\$t3,1			
	4194764	0x200b0001	addi \$t3,\$t3,1			
	4194768	0x200b0001	addi \$t3,\$t3,1			
	4194772	0x200b0001	addi \$t3,\$t3,1			
	4194776	0x200b0001	addi \$t3,\$t3,1			
	4194780	0x200b0001	addi \$t3,\$t3,1			
	4194784	0x200b0001	addi \$t3,\$t3,1			
	4194788	0x200b0001	addi \$t3,\$t3,1			
	4194792	0x200b0001	addi \$t3,\$t3,1			
	4194796	0x200b0001	addi \$t3,\$t3,1			
	4194800	0x200b0001	addi \$t3,\$t3,1			
	4194804	0x200b0001	addi \$t3,\$t3,1			
	4194808	0x200b0001	addi \$t3,\$t3,1			
	4194812	0x200b0001	addi \$t3,\$t3,1			
	4194816	0x200b0001	addi \$t3,\$t3,1			
	4194820	0x200b0001	addi \$t3,\$t3,1			
	4194824	0x200b0001	addi \$t3,\$t3,1			
	4194828	0x200b0001	addi \$t3,\$t3,1			
	4194832	0x200b0001	addi \$t3,\$t3,1			
	4194836	0x200b0001	addi \$t3,\$t3,1			
	4194840	0x200b0001	addi \$t3,\$t3,1			
	4194844	0x200b0001	addi \$t3,\$t3,1			
	4194848	0x200b0001	addi \$t3,\$t3,1			
	4194852	0x200b0001	addi \$t3,\$t3,1			
	4194856	0x200b0001	addi \$t3,\$t3,1			
	4194860	0x200b0001	addi \$t3,\$t3,1			
	4194864	0x200b0001	addi \$t3,\$t3,1			
	4194868	0x200b0001	addi \$t3,\$t3,1			
	4194872	0x200b0001	addi \$t3,\$t3,1			
	4194876	0x200b0001	addi \$t3,\$t3,1			
	4194880	0x200b0001	addi \$t3,\$t3,1			
	4194884	0x200b0001	addi \$t3,\$t3,1			
	4194888	0x200b0001	addi \$t3,\$t3,1			
	4194892	0x200b0001	addi \$t3,\$t3,1			
	4194896	0x200b0001	addi \$t3,\$t3,1			
	4194900	0x200b0001	addi \$t3,\$t3,1			
	4194904	0x200b0001	addi \$t3,\$t3,1			
	4194908	0x200b0001	addi \$t3,\$t3,1			
	4194912	0x200b0001	addi \$t3,\$t3,1			
	4194916	0x200b0001	addi \$t3,\$t3,1			
	4194920	0x200b0001	addi \$t3,\$t3,1			
	4194924	0x200b0001	addi \$t3,\$t3,1			
	4194928	0x200b0001	addi \$t3,\$t3,1			
	4194932	0x200b0001	addi \$t3,\$t3,1			
	4194936	0x200b0001	addi \$t3,\$t3,1			
	4194940	0x200b0001	addi \$t3,\$t3,1			
	4194944	0x200b0001	addi \$t3,\$t3,1			
	4194948	0x200b0001	addi \$t3,\$t3,1			
	4194952	0x200b0001	addi \$t3,\$t3,1			
	4194956	0x200b0001	addi \$t3,\$t3,1			
	4194960	0x200b0001	addi \$t3,\$t3,1			
	4194964	0x200b0001	addi \$t3,\$t3,1			
	4194968	0x200b0001	addi \$t3,\$t3,1			
	4194972	0x200b0001	addi \$t3,\$t3,1			
	4194976	0x200b0001	addi \$t3,\$t3,1			
	4194980	0x200b0001	addi \$t3,\$t3,1			
	4194984	0x200b0001	addi \$t3,\$t3,1			
	4194988	0x200b0001	addi \$t3,\$t3,1			
	4194992	0x200b0001	addi \$t3,\$t3,1			
	4194996	0x200b0001	addi \$t3,\$t3,1			
	4195000	0x200b0001	addi \$t3,\$t3,1			
	4195004	0x200b0001	addi \$t3,\$t3,1			
	4195008	0x200b0001	addi \$t3,\$t3,1			
	4195012	0x200b0001	addi \$t3,\$t3,1			
	4195016	0x200b0001	addi \$t3,\$t3,1			
	4195020	0x200b0001	addi \$t3,\$t3,1			
	4195024	0x200b0001	addi \$t3,\$t3,1			
	4195028	0x200b0001	addi \$t3,\$t3,1			
	4195032	0x200b0001	addi \$t3,\$t3,1			
	4195036	0x200b0001	addi \$t3,\$t3,1			
	4195040	0x200b0001	addi \$t3,\$t3,1	</		

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	268501004
\$v1	3	268501008
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	0
\$t1	9	10
\$t2	10	19
\$t3	11	60
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	5
\$s2	18	8
\$s3	19	0
\$s4	20	268500992
\$s5	21	268500996
\$s6	22	13
\$s7	23	22
\$t8	24	0
\$t9	25	0
\$k0	26	10
\$k1	27	12
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194408
hi		0
lo		0

Bài 5:

- a. $i < n$
Code:

```

.data
n:      .word 6                                #khai tao gia tri n=6
step:   .word 1                                #khai tao gia tri step =1
A:      .word 1,2,3,4,5,6                      #khai tao mang A

.text
        lw $s3,n                               #gan gia tri n vao thanh ghi $s3
        la $s2, A                               #gan mang A vao thanh ghi $s2
        lw $s4, step                             #gan gia tri step vao thanh ghi $s4
        addi $s5,$zero,0                         #sum=0
        addi $s1,$zero,0                         #i=0
loop:   slt $t2,$s1,$s3
        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:

```

Text Segment				Labels			
Bkpt	Address	Code	Basic	Source			
<input type="checkbox"/>	4194304	0x3c011001	lui \$t1,4097	7:	lw \$s3,n	#gan gia tri n vao thanh ghi \$s3	
<input type="checkbox"/>	4194308	0x8c330000	lw \$t9,0(\$t1)				
<input type="checkbox"/>	4194312	0x3c011001	lui \$t1,4097	8:	la \$s2,A	#gan mang A vao thanh ghi \$s2	
<input type="checkbox"/>	4194316	0x34320008	ori \$t8,\$t1,8				
<input type="checkbox"/>	4194320	0x3c011001	lui \$t1,4097	9:	lw \$s4,step	#gan gia tri step vao thanh ghi \$s4	
<input type="checkbox"/>	4194324	0xc340004	lw \$t20,4(\$t1)				
<input type="checkbox"/>	4194328	0x20150000	addi \$t21,\$t0,0	10:	addi \$s5,\$zero,0	\$sum=0	
<input type="checkbox"/>	4194332	0x20110000	addi \$t17,\$t0,0	11:	addi \$s1,\$zero,0	\$i=0	
<input type="checkbox"/>	4194336	0x0233502a	sllt \$t0,\$t17,\$t9	12: loop:	sllt \$t2,\$s1,\$s3		
<input type="checkbox"/>	4194340	0x11400007	bqeq \$t0,\$t0,7	13:	bqeq \$t2,\$zero,endifloop		
<input type="checkbox"/>	4194344	0x02314820	add \$s,\$t17,\$t17	14:	add \$t1,\$s1,\$s1	#\$t1=2*\$s1	
<input type="checkbox"/>	4194348	0x01294820	add \$s,\$s,\$s	15:	add \$t1,\$t1,\$t1	#\$t1=4*\$s1	
<input type="checkbox"/>	4194352	0x01324820	add \$s,\$s,\$t8	16:	add \$t1,\$t1,\$s2	#\$t1 store the address of A[1]	
<input type="checkbox"/>	4194356	0xs2800000	lw \$t0,0(\$s)	17:	lw \$t0,0(\$t1)	load value of A[1] in \$t0	
<input type="checkbox"/>	4194360	0x023a8a20	add \$t1,\$t1,\$t8	18:	add \$s5,\$s5,\$t0	\$sum=sum+A[1]	
<input type="checkbox"/>	4194364	0x02348820	add \$t1,\$t17,\$t20	19:	add \$s1,\$s1,\$s4	\$i=i+step	
<input type="checkbox"/>	4194368	0x08100008	j 4194336	20:	j loop	goto loop	

Label	Address
ass5_a.asm	
loop	4194336
endifloop	4194372
n	268500992
step	268500996
A	268501000

☒ Data ☒ Text

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	6
\$t1	9	268501020
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	6
\$s2	18	268501000
\$s3	19	6
\$s4	20	1
\$s5	21	21
\$s6	22	0
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194372
hi		0
lo		0

b. $i \leq n$

Code:

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	0
\$t1	9	268501024
\$t2	10	1
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	7
\$s2	18	268501000
\$s3	19	6
\$s4	20	1
\$s5	21	20
\$s6	22	0
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194372
hi		0
lo		0

c. $i+j \leq 0$

Code:

#Laboratory Exercise 3, Assignment 2, sum>=0

```
.data
n:      .word 6           #khởi tạo giá trị n=6
step:   .word 1           #khởi tạo giá trị step =1
A:      .word -1,-4,3,4,5,6 #khởi tạo mảng A
.text
        lw $s3,n          #gán giá trị n vào thanh ghi $s3
        la $s2, A         #gán mảng A vào thanh ghi $s2
        lw $s4, step      #gán giá trị step vào thanh ghi $s4
        addi $s5,$zero,0   #sum=0
        addi $s1,$zero,0   #i=0
loop:   slt $t2,$s1,$s3
        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]
        slt $t7,$s5,$0     #sum<0 thì $t7=1
        beq $t7,$zero, endloop
        add $s1,$s1,$s4     #i=i+step
        j loop             #goto loop
endloop:
```

Result:

[illegible]

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	4
\$t1	9	268501012
\$t2	10	1
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	3
\$s2	18	268501000
\$s3	19	6
\$s4	20	1
\$s5	21	2
\$s6	22	0
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194380
hi		0
lo		0

d. $i+j > m+n$

Code:

```

.data
n:      .word 6           #khai tao gia tri n=6
step:   .word 1          #khai tao gia tri step =1
A:      .word 1,2,3,0,5,6 #khai tao mang A

.text

lw $s3,n                #gan gia tri n vao thanh ghi $s3
la $s2,A                #gan mang A vao thanh ghi $s2
lw $s4, step            #gan gia tri step vao thanh ghi $s4
addi    $s5,$zero,0     #sum=0
addi    $s1,$zero,0     #i=0

loop:   slt      $t2,$s1,$s3  #i<n thi $t2=1
        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
        beq     $t0,$0,endloop #A[i]==0 thi endloop
        add     $s5,$s5,$t0   #sum=sum+A[i]
        add     $s1,$s1,$s4   #i=i+step
        j       loop         #goto loop

endloop:

```

Result:

Text Segment				Source	
Bkpt	Address	Code	Basic		
<input type="checkbox"/>	4194304	0x3c011001 lui \$1,4097	7:	lw \$s3,n	#gan gia tri n vao thanh ghi \$s3
<input type="checkbox"/>	4194308	0x8c330000 lw \$19,0(\$t1)			
<input type="checkbox"/>	4194312	0x3c011001 lui \$1,4097	8:	la \$s2,A	#gan mang A vao thanh ghi \$s2
<input type="checkbox"/>	4194316	0x34320008 ori \$18,\$1,8			
<input type="checkbox"/>	4194320	0x3c011001 lui \$1,4097	9:	lw \$s4, step	#gan gia tri step vao thanh ghi \$s4
<input type="checkbox"/>	4194324	0x8c340004 lw \$20,4(\$t1)			
<input type="checkbox"/>	4194328	0x01500000 addi \$21,\$0,0	10:	addi \$s5,\$zero,0	#sum=0
<input type="checkbox"/>	4194332	0x20110000 addi \$17,\$0,0	11:	addi \$t1,\$zero,0	#i=0
<input type="checkbox"/>	4194336	0x0233502a slt \$10,\$17,\$19	12: loop:	slt \$t2,\$s1,\$s3	#i<n thi \$t2=1
<input type="checkbox"/>	4194340	0x11400008 beq \$10,\$0,8	13:	beq \$t2,\$zero, endloop	
<input type="checkbox"/>	4194344	0x02314820 add \$9,\$17,\$17	14:	add \$t1,\$s1,\$s1	#\$t1=2*\$s1
<input type="checkbox"/>	4194348	0x01294820 add \$9,\$9,\$9	15:	add \$t1,\$t1,\$t1	#\$t1=4*\$s1
<input type="checkbox"/>	4194352	0x01324820 add \$9,\$9,\$18	16:	add \$t1,\$t1,\$s2	#\$t1 store the address of A[i]
<input type="checkbox"/>	4194356	0x8d280000 lw \$8,0(\$9)	17:	lw \$t0,0(\$t1)	#load value of A[i] in \$t0
<input type="checkbox"/>	4194360	0x11000003 beq \$8,\$0,3	18:	beq \$t0,\$0, endloop	#A[i]==0 thi endloop
<input type="checkbox"/>	4194364	0x023a5020 addi \$21,\$21,\$8	19:	add \$s5,\$s5,\$t0	#sum=sum+A[i]
<input type="checkbox"/>	4194368	0x02348820 add \$17,\$17,\$20	20:	add \$s1,\$s1,\$s4	#i=i+step
<input type="checkbox"/>	4194372	0x08100008 j 4194336	21:	j loop	#goto loop

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	0
\$t1	9	268501012
\$t2	10	1
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	3
\$s2	18	268501000
\$s3	19	6
\$s4	20	1
\$s5	21	6
\$s6	22	0
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194376
hi		0
lo		0

Bài 6:

Code

#Laboratory Exercise 3, Assignment 6

```
.data
n:                .word    10
arr:              .word    12,32,-45,-26,80,13,-74,-100,39,-204
step:             .word    1
.text
#load
lw    $s3, n
la    $s2, arr
lw    $s4, step
#work
addi   $s1, $0, 0          #i=0
addi   $s6, $0, 0          #max_abs

loop:
    slt    $t2, $s1, $s3    #t2 = i < n ? 1 : 0
    beq    $t2, $0, endloop #if (i>=n) jump endloop
    add    $t1, $s1, $s1
    add    $t1, $t1, $t1
    add    $t1, $t1, $s2
    lw     $t0, 0($t1)      #arr[i]

if_1:
    bgtz   $t0,     endif_1    #if(arr[i]>0) jump endif_1
    sub    $t0, $0, $t0

endif_1:
if_2:
    slt    $t2, $t0, $s6      #t2 = arr[i]<max_abs ? 1 : 0
    bne    $t2, $0, endif_2   #if($t2!=0) jump endif_2: if(arr[i]<max_abs) jump endif_2
    add    $s6, $0, $t0      #max_abs=arr[i]

endif_2:
    add    $s1, $s1, $s4      #i=i+1
    j      loop

endloop:
```

Result

Text Segment					Labels	
Bkpt	Address	Code	Basic	Source	Label	Address
	4194304	0x3c011001	lui \$1,4097	8: lw \$s3, n	ass6.asm	
	4194308	0x8c330000	lw \$19,0(\$1)		loop	4194336
	4194312	0x3c011001	lui \$1,4097	9: la \$s2, arr	if_1	4194360
	4194316	0x34320004	ori \$18,\$1,4		endif_1	4194368
	4194320	0x3c011001	lui \$1,4097	10: lw \$s4, step	if_2	4194368
	4194324	0x8c34002c	lw \$20,44(\$1)		endif_2	4194380
	4194328	0x20110000	addi \$17,\$0,0	12: addi \$s1, \$0, 0	endloop	4194388
	4194332	0x20160000	addi \$22,\$0,0	13: addi \$s6, \$0, 0	n	268500992
	4194336	0x0233502a	slt \$10,\$17,\$19	15: slt \$t2, \$s1, \$s3	arr	268500996
	4194340	0x1140000b	beq \$10,\$0,\$11	16: beq \$t2, \$0, endloop	step	268501036
	4194344	0x02314820	add \$9,\$17,\$17	17: add \$t1, \$s1, \$s1		
	4194348	0x01294820	add \$9,\$9,\$9	18: add \$t1, \$t1, \$t1		
	4194352	0x01324820	add \$9,\$9,\$18	19: add \$t1, \$t1, \$s2		
	4194356	0x84280000	lw \$5,0(\$9)	20: lw \$t0, 0(\$t1)		
	4194360	0x1d000001	bgtz \$5,1	22: bgtz \$t0, endif_1		
	4194364	0x00084022	sub \$5,\$0,\$8	23: sub \$t0, \$0, \$t0		
	4194368	0x0116502a	slt \$10,\$8,\$22	26: slt \$t2, \$t0, \$s6		
	4194372	0x15400001	bne \$10,\$0,\$1	27: bne \$t2, \$0, endif_2		
	4194376	0x0008b020	add \$22,\$0,\$8	28: add \$s6, \$0, \$t0		
	4194380	0x02348820	add \$17,\$17,\$20	30: add \$s1, \$s1, \$s4		
	4194384	0x08100008	j 4194336	31: j loop		

Address	Value (+0)	Value (+4)	Value (+8)	Value (+12)	Value (+16)	Value (+20)	Value (+24)	Value (+28)
268500992	10	12	32	-45	-26	80	13	-74
268501024	-100	39	-204	1	0	0	0	0
268501056	0	0	0	0	0	0	0	0
268501088	0	0	0	0	0	0	0	0
268501120	0	0	0	0	0	0	0	0
268501152	0	0	0	0	0	0	0	0
268501184	0	0	0	0	0	0	0	0
268501216	0	0	0	0	0	0	0	0
268501248	0	0	0	0	0	0	0	0
268501280	0	0	0	0	0	0	0	0
268501312	0	0	0	0	0	0	0	0
268501344	0	0	0	0	0	0	0	0
268501376	0	0	0	0	0	0	0	0
268501408	0	0	0	0	0	0	0	0
268501440	0	0	0	0	0	0	0	0
268501472	0	0	0	0	0	0	0	0

Registers	Coproc 1	Coproc 0
Name	Number	Value
\$zero	0	0
\$at	1	268500992
\$v0	2	0
\$v1	3	0
\$a0	4	0
\$a1	5	0
\$a2	6	0
\$a3	7	0
\$t0	8	204
\$t1	9	268501032
\$t2	10	0
\$t3	11	0
\$t4	12	0
\$t5	13	0
\$t6	14	0
\$t7	15	0
\$s0	16	0
\$s1	17	10
\$s2	18	268500996
\$s3	19	10
\$s4	20	1
\$s5	21	0
\$s6	22	204
\$s7	23	0
\$t8	24	0
\$t9	25	0
\$k0	26	0
\$k1	27	0
\$gp	28	268468224
\$sp	29	2147479548
\$fp	30	0
\$ra	31	0
pc		4194388
hi		0
lo		0