Báo cáo Thực hành Kiến trúc máy tính tuần 6

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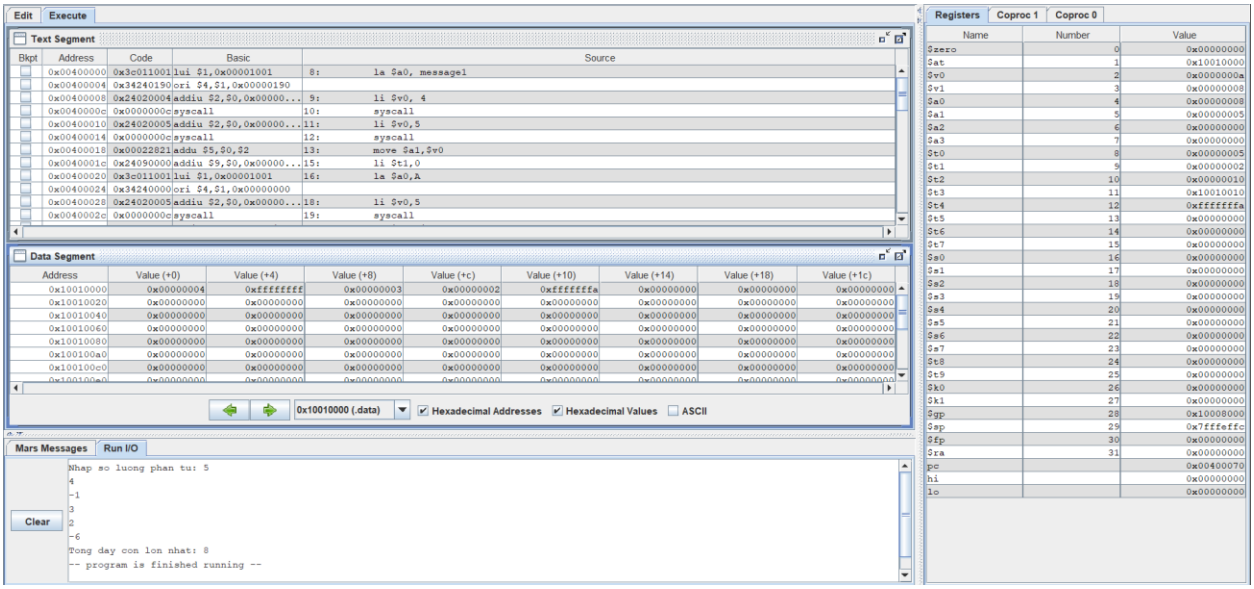
Assignment 1

```
.data
A: .word 0: 100
message1: .asciiz "Nhap so luong phan tu: "
endline: .asciiz "\n"
message2: .ascii "Tong lon nhat: "

.text
main:
	# Print "Nhap so luong phan tu: "
	li $v0, 4
	la $a0, message1
	syscall

	#read n
	li $v0, 5
	syscall
	move $a1, $v0 # $a1 = n

	# read A[i]
	la $a0,A
	li $t0, 0 # i = 0
	loop_cin:
		li $v0, 5
		syscall
		sw $v0, 0($a0)
		addi $a0, $a0, 4
		addi $t0, $t0, 1
		blt $t0, $a1, loop_cin
	j mspfx
	nop
continue:
	# print "Tong lon nhat: "
	li $v0, 4
	la $a0, message2
	syscall

	# print max-sum
	li $v0, 1
```

```
        move $a0, $v1
        syscall

        #exit
        li $v0, 10
        syscall
        nop
lock:
        j lock
        nop
end_of_main:
#---------------------------------------------------------------
#Procedure mspfx
# @brief find the maximum-sum prefix in a list of integers
# @param[in] a0 the base address of this list(A) need to be processed
# @param[in] a1 the number of elements in list(A)
# @param[out] v0 the length of sub-array of A in which max sum reachs.
# @param[out] v1 the max sum of a certain sub-array
#---------------------------------------------------------------
#Procedure mspfx
#function: find the maximum-sum prefix in a list of integers
#the base address of this list(A) in $a0 and the number of
#elements is stored in a1
mspfx:
        la $a0, A
        addi $v0,$zero,0 #initialize length in $v0 to 0
        addi $v1,$zero,0 #initialize max sum in $v1 to 0
        addi $t0,$zero,0 #initialize index i in $t0 to 0
        addi $t1,$zero,0 #initialize running sum in $t1 to 0
loop:
        add $t2,$t0,$t0 #put 2i in $t2
        add $t2,$t2,$t2 #put 4i in $t2
        add $t3,$t2,$a0 #put 4i+A (address of A[i]) in $t3
        lw $t4,0($t3) #load A[i] from mem(t3) into $t4
        add $t1,$t1,$t4 #add A[i] to running sum in $t1
        slt $t5,$v1,$t1 #set $t5 to 1 if max sum < new sum
        bne $t5,$zero,mdfy #if max sum is less, modify results
        nop
        j test #done?
        nop
```

```
mdfy:
        addi $v0,$t0,1 #new max-sum prefix has length i+1
        addi $v1,$t1,0 #new max sum is the running sum
test:
        addi $t0,$t0,1 #advance the index i
        slt $t5,$t0,$a1 #set $t5 to 1 if i<n
        bne $t5,$zero,loop #repeat if i<n
nop
done:
        j continue
        nop
mspfx_end:
```



Khi nhập 5 phần tử 4, -1, 2, 3, -6 thì kết quả cho ra là 8

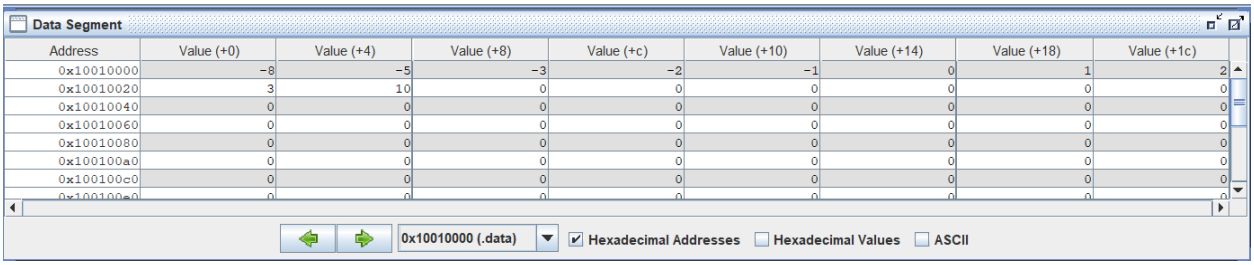
➔ Chương trình chạy đúng kết quả mong đợi.

Assignment 2

```
.data
 A: .space 100 #khai bao mang A
 Aend: .word
 Message1: .asciiz "Do dai mang la: "
 Message2: .asciiz "Nhap phan tu mang : "
 Message3: .asciiz "\n "
 ms: .asciiz " "
.text
main:
        la $a3, A # gan $a3 la dia chi phan tu dau tien cua mang
        j insert
        nop
after_insert:
        la $a0,A #$a0 = Address(A[0])
        la $a1,Aend
        la $t8, ($t0)
        mul $t7, $t0, 4
        add $a1, $a0, $t7
        add $a1, $a1, -4
        j sort #sort
        nop
after_sort:
        li $v0, 10 #exit
        syscall
end_main:

print:
        beq $t9, $t8, after_print
        nop
        la $a0, A
        mul $t6, $t9, 4
        add $t7, $a0, $t6
        lw $a0, ($t7)
        li $v0, 1
```

```
        syscall
        li $v0, 4
        la $a0, ms
        syscall
        addi $t9, $t9, 1
        j print
        nop

insert:
        li $v0, 4 #syscall in ra chuoi
        la $a0, Message1
        syscall
        li $v0, 5
        syscall
        la $t0, ($v0) #luu tam thoi do dai mang vao $t0
        li $t1, 0
loop_insert:
        beq $t1, $t0, after_insert #quay tro lai main
        nop
        li $v0, 4 #syscall in ra chuoi
        la $a0, Message2
        syscall
        li $v0, 5
        syscall
        sw $v0, 0($a3)
        addi $t1, $t1, 1
        add $a3, $a3, 4
        j loop_insert
        nop
sort:
        beq $a0,$a1,done #single element list is sorted
        nop
        j max #call the max procedure
        nop
after_max:
        lw $t0,0($a1) #load last element into $t0
        sw $t0,0($v0) #copy last element to max location
        sw $v1,0($a1) #copy max value to last element
        addi $a1,$a1,-4 #decrement pointer to last element sort #repeat sort for
smaller list
```

```
        li $v0, 4 #syscall in ra chuoi
        la $a0, Message3
        syscall
        li $t9, 0
        j print
        nop
after_print:
        j sort
        nop
done:
        j after_sort
        nop

max:
        la $a0, A
        addi $v0,$a0,0 #init max pointer to first element
        lw $v1,0($v0) #init max value to first value
        addi $t0,$a0,0 #init next pointer to first
loop:
        beq $t0,$a1,ret #if next=last, return
        nop
        addi $t0,$t0,4 #advance to next element
        lw $t1,0($t0) #load next element into $t1
        slt $t2,$t1,$v1 #(next)<(max) ?
        bne $t2,$zero,loop #if (next)<(max), repeat
        nop
        addi $v0,$t0,0 #next element is new max element
        addi $v1,$t1,0 #next value is new max value
        j loop #change completed; now repeat
        nop
ret:
        j after_max
        nop
Mảng A ban đầu: 0,-3,1,-2,3,2,-1,-5,-8,10
```



- Mảng A sau khi sắp xếp: -8,-5,-3,-2,-1,0,1,2,3,10

➔ Chương trình chạy đúng kết quả mong đợi

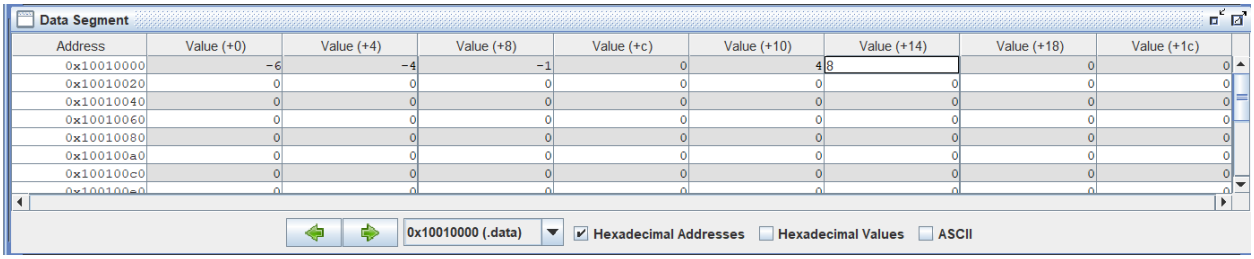
Assignment 3

```
.data
        A: .word -6,-4,4,8,0,-1
        Aend: .word
.text
        la $a0, A
        la $a1, Aend
        li $s0, 0 # count = 0 (count la bien dem phan tu)
        li $s1, -1 # i = -1 (i trong loopi)

DemPhanTu:
        beq $a1, $a0, Size # So sanh dia chi hien tai trong a1 voi dia chi co so cua
mang A
        addi $a1, $a1, -4 # dia chi a1 giam de den tung dia chi cua tung phan tu
trong mang
        addi $s0, $s0, 1 # So luong phan tu tang thêm 1
        j DemPhanTu
Size:
        addi $t0, $s0, -1 # t0 = So luong phan tu cua mang A - 1
loop1:
        addi $s1, $s1, 1 # i++
        li $s2, 0 # j = 0 (j trong loop 2)
        beq $s1, $t0, Exit # Neu i = size - 1 thì thoat
loop2:
        sub $t2, $t0, $s1 # t2 = (size - 1) - i
```

```
        beq $s2, $t2, loop1 # Neu j = (size - 1) - i thi nhay den loop1
if_swap:
        sll $t3, $s2, 2 # Tính offset cua dia chi A[j]
        add $s3, $a0, $t3 # Tính dia chi A[j]
        lw $v0, 0($s3) # Load giá tri A[j]
        addi $s3, $s3, 4 # Tính dia chi cua A[j+1]
        lw $v1, 0($s3) # Load giá tri A[j+1]
        sle $t4, $v0, $v1 # Neu A[j] <= A[j+1] thì t4 = 1;
        # A[j] > A[j+1] thì t4 = 0
        beq $t4, $zero, swap # t4 = 0 thì nhay den swap
        addi $s2, $s2, 1 # j++
        j loop2
swap:
        sw $v0, 0($s3) # Ghi A[j] vào A[j+1]
        addi $s3, $s3, -4 # Tính dia chi cua A[j] = dia chi cua A[j+1] - 4
        sw $v1, 0($s3) # Ghi A[j+1] vào A[j]
        addi $s2, $s2, 1 # j++
        j loop2
Exit:
        li $v0, 10
        syscall
```

Mảng A ban đầu: -6,-4,4,8,0,-1

Mảng A sau khi sắp xếp: -6,-4,-1,0,4,8



➔ Chương trình chạy đúng mong đợi

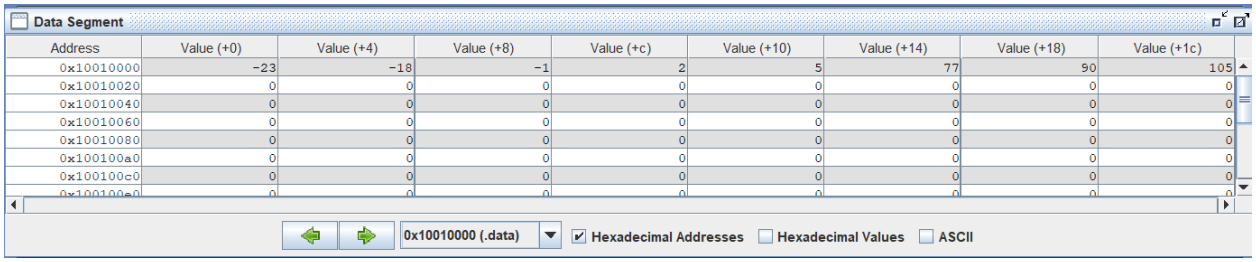
Assignment 4

```
.data
        A: .word -1,-18,5,90,77,105,-23,2
        Aend: .word
.text
        la $a0, A
        la $a1, Aend
        li $s0, 0 # count = 0 (count la bien dem phan tu)
        li $s1, 0 # key = 0
        li $s2, 0 # j = 0
        li $s3, 1 # i = 1
DemPhanTu:
        beq $a1, $a0, Loop # So sanh dia chi hien tai trong a1 voi dia chi co so cua
mang A
        addi $a1, $a1, -4 # Dia chi a1 giam de den tung dia chi cua tung phan tu
trong mang
        addi $s0, $s0, 1 # So luong phan tu tang thêm 1
        j DemPhanTu
Loop:
        beq $s3, $s0, Exit # Neu i = So luong phan tu có trong mang thì thoát
        sll $t0, $s3, 2 # Tính Offset cua dia chi A[i]
        add $s4, $a0, $t0 # Tính dia chi cua A[i]
        lw $s1, 0($s4) # Load giá tri A[i] = key
        addi $s2, $s3, -1 # j = i - 1
While:
        slt $t1, $s2, $zero # Neu j >= 0 thì t1 = 0
        sll $t0, $s2, 2 # Tính offset cua dia chi A[j]
        add $s5, $a0, $t0 # Tính dia chi cua A[j]
        lw $t3, 0($s5) # Load giá tri A[j] = thanh ghi t3
        sle $t4, $t3, $s1 # Neu key >= t3 thì t4 = 0
        add $t1, $t1, $t4
        bne $t1, $zero, loop_continue # Neu t1 = 0 thì dung while
        addi $s5, $s5, 4 # Tính dia chi cua A[j+1]
        sw $t3, 0($s5) # Ghi giá tri A[j] vào A[j+1]
        addi $s2, $s2, -1 # j = j - 1
        j While
loop_continue:
        addi $s5, $s5, 4 # Tính ??a ch? c?a A[j+1]
        sw $s1, 0($s5) # Ghi giá tr? key vào A[j+1]
```

```
        addi $s3, $s3, 1 # i++
        j Loop
Exit:
        li $v0, 10
        syscall
```

Mảng A ban đầu: -1,-18,5,90,77,105,-23,2

Mảng A sau khi sắp xếp: -23,-18,-1,2,5,77,90,105



➔ Chương trình chạy đúng với mong đợi