Computer Organization and Architecture (EET2211)

LAB IX: Determine the largest and smallest number in an array

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I. OBJECTIVE:

1. Write a program to determine the largest number in an array.
2. Write a program to determine the smallest number in an array.

II. PRE-LAB

For Obj. 1:

a. Determine the largest number in an array.

[1500h] = 03h

[1501h] = 13h

[1502h] = 22h

[1503h] = 11h

Output: 22h

b. Write the assembly code.

```
org 100h
mov ax,0000h
mov ds,ax
mov si,1500h
mov di,1510h
mov cl,[si]
inc si
mov al,[si]
dec cl
l1: inc si
   mov bl,[si]
   cmp al,bl
   jnc again
   mov al,bl
```

```
again: dec cl
       jnz l1
mov [di],al
hlt
ret
```

For Obj. 2:

a. Determine the smallest number in an array.

[1500h] = 03h

[1501h] = 13h

[1502h] = 22h

[1503h] = 11h

Output: 03h

b. Write the assembly code.

```
org 100h
mov ax,0000h
mov ds,ax
mov si,1500h
mov di,1510h
mov cl,[si]
inc si
mov al,[si]
dec cl
l1: inc si
    mov bl,[si]
    cmp al,bl
    jc again
    mov al,bl
```

```
again: dec cl
       jnz l1
mov [di],al
hlt
ret
```

III. LAB:

Assembly Program:

For Obj. 1:

```
; SASWAT MOHANTY
; 1941012407

; Write a program to determine the largest number in an array.

org 100h

mov ax,0000h
mov ds,ax
mov si,1500h    ; Total number of elements = 03
mov di,1510h    ; Memeory address for storing the output
mov cl,[si]     ; Assign the value at 1500 to cl
inc si          ; increment si i.e. to memory location 1501
mov al,[si]     ; assign the value at 1501 to al
dec cl          ; decrease the value of cl by 1
l1: inc si      ; increment si i.e. to memory location 1502
    mov bl,[si] ; assign the value at 1502 to bl
    cmp al,bl   ; compare al and bl to check which value is greater
    jnc again   ; after comaprision if there is no carry then it will jump to the "again" pointer
    mov al,bl   ; if there is carry then it will assign the value in bl  to al
again: dec cl   ; decrease the cl count by 1
       jnz l1   ; until cl count is zero the program keep on moving to "l1" pointer
mov [di],al     ; move the value in al to di i.e. to 1510 memory location
hlt

ret
```

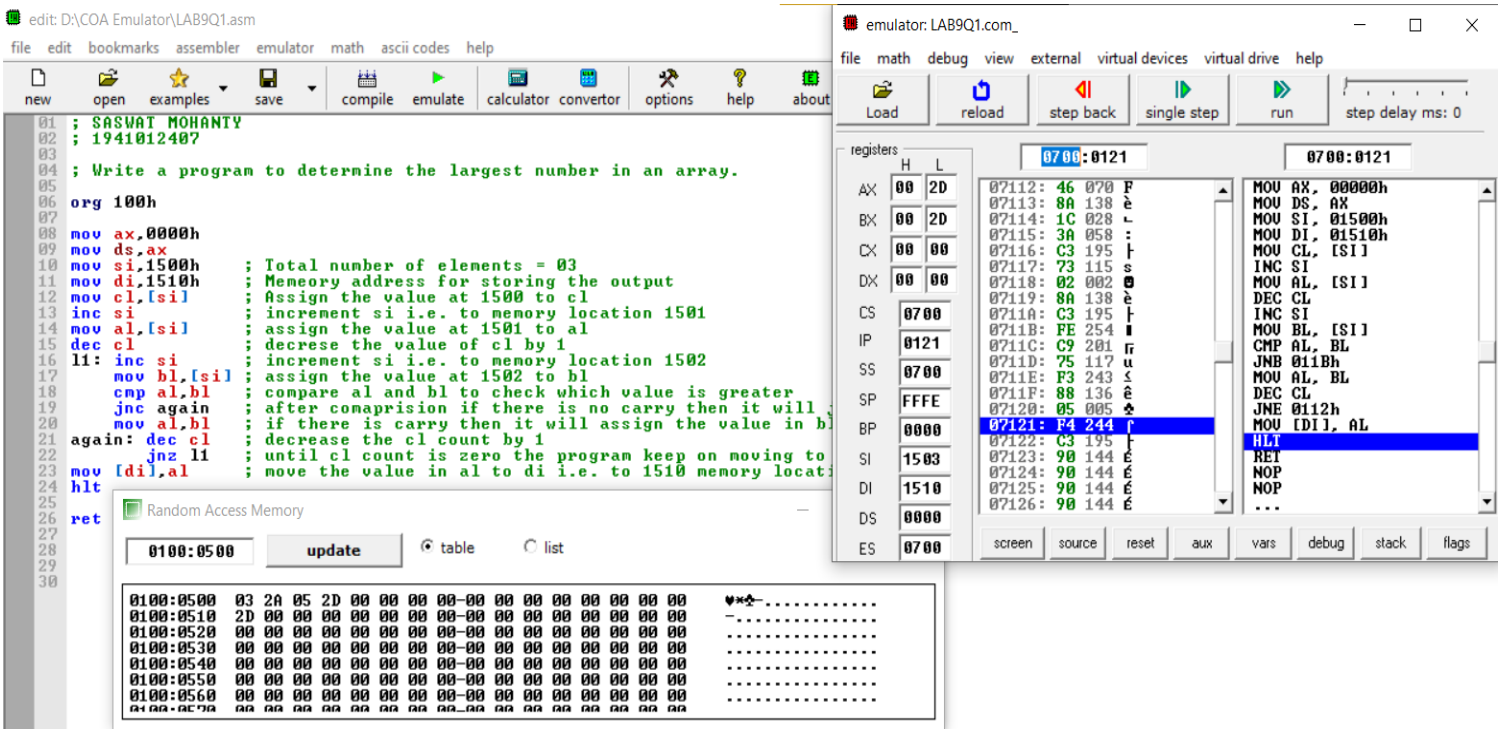
For Obj. 2:

```
; SASWAT MOHANTY
; 1941012407
```

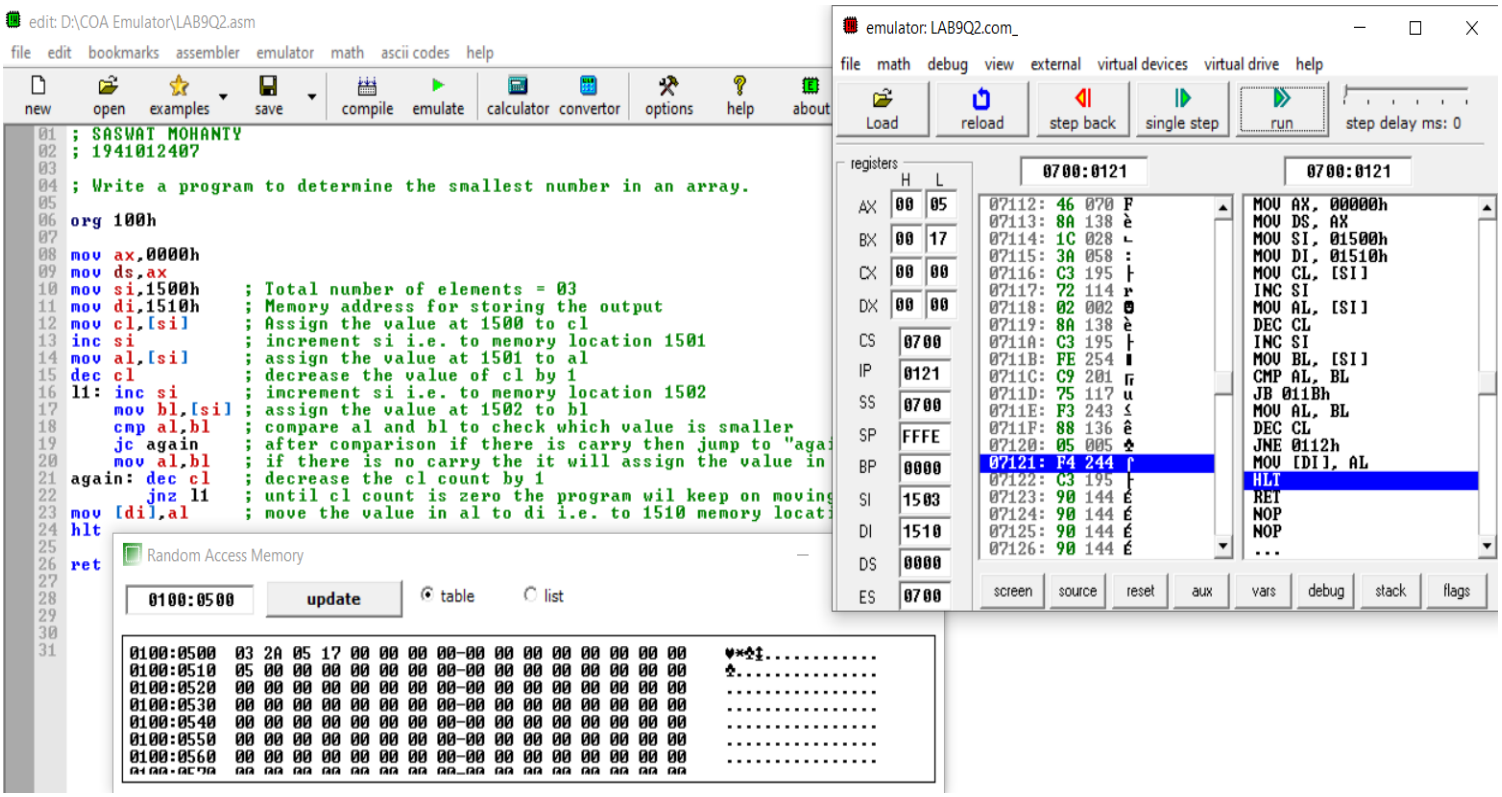
```
; Write a program to determine the smallest number in an array.

org 100h

mov ax,0000h
mov ds,ax
mov si,1500h    ; Total number of elements = 03
mov di,1510h    ; Memory address for storing the output
mov cl,[si]     ; Assign the value at 1500 to cl
inc si          ; increment si i.e. to memory location 1501
mov al,[si]     ; assign the value at 1501 to al
dec cl          ; decrease the value of cl by 1
l1: inc si      ; imcrement si i.e. to memory location 1502
    mov bl,[si] ; assign the value at 1502 to bl
    cmp al,bl   ; compare al and bl to check which value is smaller
    jc again    ; after comparison if there is carry then jump to "again" pointer
    mov al,bl   ; if there is no carry the it will assign the value in bl to al
again: dec cl   ; decrease the cl count by 1
      jnz l1    ; until cl count is zero the program wil keep on moving to "l1" pointer
mov [di],al     ; move the value in al to di i.e. to 1510 memory location
hlt

ret
```

Observations (with screen shots):

For Obj. 1:



For Obj. 2:



Conclusion:

For Obj. 1:

It can be concluded to determine the largest number in an array when dry run and executed in system found to be same. Thus, the program to determine the largest number in an array was executed.

For Obj. 2:

It can be concluded to determine the smallest number in an array when dry run and executed in system found to be same. Thus, the program to determine the smallest number in an array was executed.

IV. POST LAB:

1. What is ARM processor?

An ARM processor is one of a family of CPUs based on the RISC (reduced instruction set computer) architecture developed by Advanced RISC Machines (ARM).

2. Differentiate between ARM processor and RISC.

ARM	RISC
ARM is proprietary.	RISC is open-source.
ARM makes 32-bit and 64-bit RISC multi-core processors.	RISC processors are designed to perform a smaller number of types of computer instructions so that they can operate at a higher speed, performing more millions of instructions per second (MIPS).
ARM has added more complex instructions to increase processor performance (at the expense of higher power consumption).	RISC approach is more successful in reducing overall power consumption, sometimes at the expense of lower performance.

3. Differentiate between ARM processor and 8086.

ARM	8086
Integrated in designs which were manufactured on 28, 16, 14 or 10 nanometer FinFET nodes	Manufactured on a 3-micron process

RICS Design	CISC Design
Consists of a front end, back end (execution engine) and an un-core memory subsystem which includes the L2 cache.	Consists of two main blocks, the BIU and EU

4. Differentiate between ARM processor and microcontroller.

ARM is core for both microprocessor and micro-controller. ARM is based on CPU architecture so we generally call it has microprocessor when placed on a chip if ARM is combined with memories (RAM and ROM) on a single chip we can call it has micro-controller it has limited memory but when coming to microprocessor RAM and ROM are connected externally speed will be more.

5. List few applications of ARM processor-based system.

- ARM processor features include:
- Load/store architecture.
- An orthogonal instruction set.
- Mostly single-cycle execution.
- Enhanced power-saving design.
- 64 and 32-bit execution states for scalable high performance.
- Hardware virtualization support.