National University of Computer and Emerging Sciences

Laboratory Manual

for

Computer Organization and Assembly Language Programming

(EL 213)

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Section	H
Semester	Fall 2023

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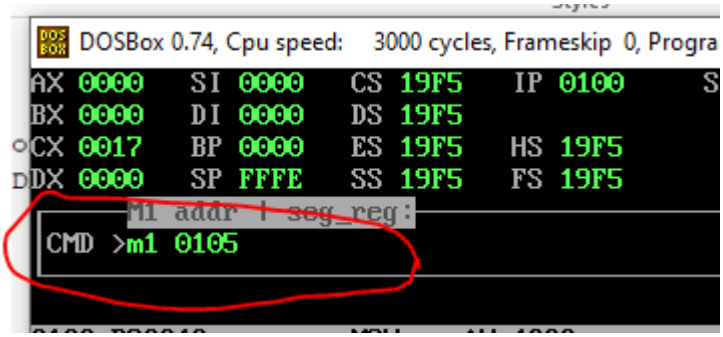
In lab Questions

Task 1a: **Write, assemble (with listing file) and open the code in AFD.**

```
; lab2Task1code

[org 0x0100]

       ; no code because we just want to look

       ; at how data is stored in memory

mov ax, 0x4c00 ; termination statements

int 21h

; data declaration

Num1: dd 0A0B0C0Dh

Num2: dw 0102h

Num3  db 33h

Nums: dw 3456h

      db  99h

my_array: dw 0E0Fh, 0506h, 0708h, 0910h
```

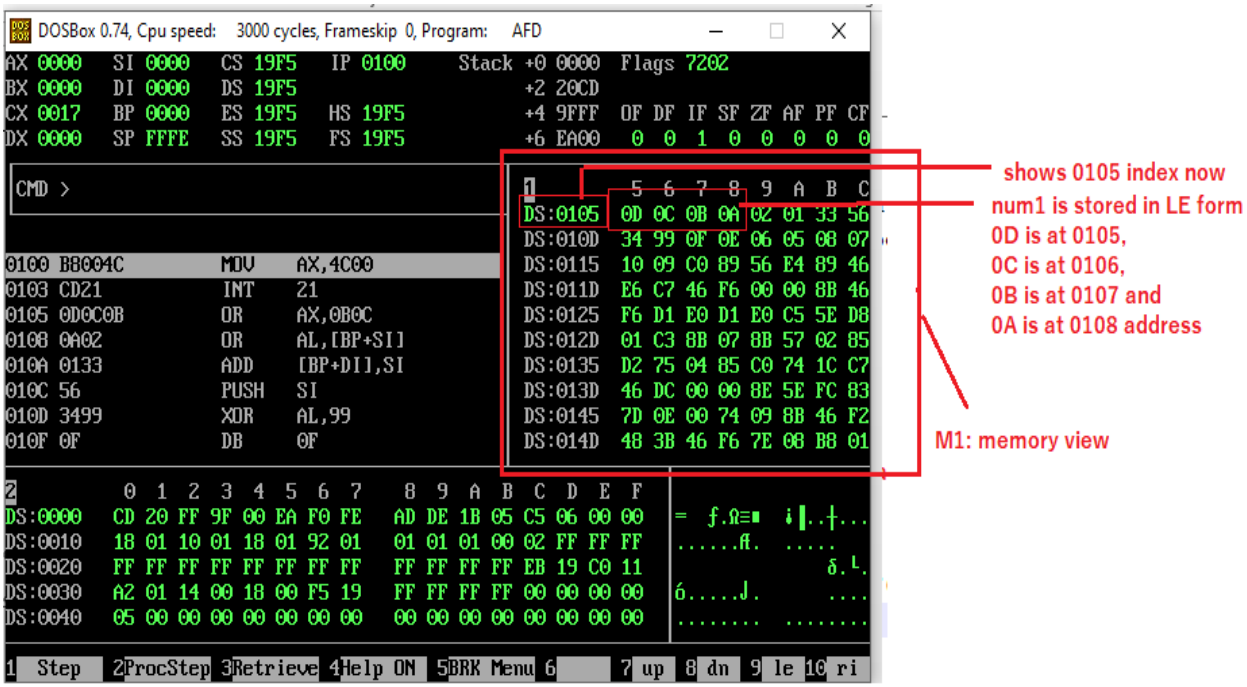
Task1b: See the data in memory view M1 by writing the following statement.



Where 0105 is address at which num1 is pointing.

You can see the address of num1 from listing file, see fig1, just add 0100h to it (base address from where code starts to load)

See how data is stored in little endian form in memory and write the address that points to each byte.



Task2: Run the following code and see the changes in registers write the values of ax, al and ah after each line.

```
;lab2task2code
[org 0x0100]
;code
       Mov ax, [num1]       ;ax=?
       Mov ax, [num2]       ;ax=?
       Mov ax, [num2+2]     ;ax=?
       Mov ax, [num2+1]     ;ax=?
       Mov al, [num2+3]     ;ax=?
       Mov ah, [num1]       ;ax=?
       Mov ax, [array1]     ;ax=?
       Mov ax, [array1+2]   ;ax=?
       Mov al, [array2]     ;ax=?
       Mov al, [array2+1]   ;ax=?
       Mov ax, [array2]     ;ax=?
mov ax, 0x4c00 ; termination statements
int 21h
; data
       Num1: dw 0A0Bh
       Num2: dd 0C0D0E0Dh
       Array1: dw 0102h , 0304h
       Array2: db 05h , 06h, 07h
```

Task 3: Run the following code and see the changes in memory (in labels you declared)

```
;lab2task2code
[org 0x0100]
;code

       Mov ax, 9876h
       Mov bx, 5432h
       Mov  [num1], ax
       Mov [num2], bx
       Mov [num2+2], bx
       Mov [array1], ax
       Mov [array2], bl
       Mov [array2], ax
       Mov word [num1], 0000h
       Mov byte [num1], 01h
       Mov  byte [num2+1], 11h
       Mov word [array1+2], 3870h

mov ax, 0x4c00 ; termination statements
int 21h

; data

       Num1: dw 0A0Bh
       Num2: dd 0C0D0E0Dh
       Array1: dw 0102h , 0304h
       Array2: db 05h , 06h, 07h
```

Task 4: Identify the problems by running following instructions in AFD and correct them by replacing them with one or two instructions having the same effect.

a. mov [02], [22]

b. mov [wordvar], 20

c. mov bx, al

d. mov ax, [si+di+100]

Task 5: Convert the following C++ codes in assembly language.

Part a: Calculate the Absolute Difference

```
int x = 8;
int y = 15;
int z = 20;
```

```
int result;

if (x > y) {
    if (x > z) {
        result = x - z;
    } else {
        result = z - x;
    }
} else {
    if (y > z) {
        result = y - z;
    } else {
        result = z - y;
    }
}
```

Part B: Determine the Smallest Number

```
int p = 42;
int q = 18;
int r = 30;
int smallest;

if (p < q) {
    if (p < r) {
        smallest = p;
    } else {
        smallest = r;
    }
} else {
    if (q < r) {
        smallest = q;
    } else {
        smallest = r;
    }
}
```

Part C: Temperature Classification

```
int temperature = 78;
int classification;
```

```
if (temperature < 0) {
    classification = 1; // Freezing
} else if (temperature >= 0 && temperature < 25) {
    classification = 2; // Cold
} else if (temperature >= 25 && temperature < 70) {
    classification = 3; // Moderate
} else {
    classification = 4; // Hot
}
```