Assembly Language LAB

Islamic University – Gaza
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ECOM 2125: Assembly Language LAB
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Lab # 4

Loop Instruction

Objective:

- To know more about Assembly language, such as how to repeat a block of statements using Loop Instructions.

❖ Loop Instruction

The Loop instruction provides a simple way to repeat a block of statements a specific number of times. **ECX** is automatically used as a counter and is decremented each time the loop repeats.

Syntax:

Loop *target*

The execution of the Loop instruction involves two steps:

1. First, it subtracts 1 from ECX.
2. Next, it compares ECX to zero.
   - ❖ If ECX is not equal to zero; a jump is taken to the label identified by destination.
   - ❖ Otherwise, if ECX equals zero, no jump takes place and control passes to the instruction following the loop.

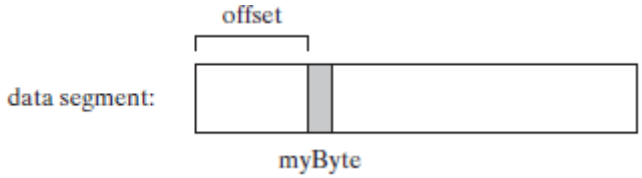
Nested Loop:

If you need to code a loop within a loop, you must save the outer loop counter's ECX value.

```
.data
count dd ?
.code
      mov ecx,value            ; set outer loop count
L1:
      mov count,ecx            ; save outer loop count
      mov ecx,New_value        ; set inner loop count
L2:
     (inner loop code)
      loop L2                  ; repeat the inner loop
     mov ecx,count             ; restore outer loop count
     loop L1                   ; repeat the outer loop
```

❖ OFFSET Operator

The OFFSET operator returns the offset of a data label. The offset represents the distance, in bytes, of the label from the beginning of the data segment. To illustrate, the following figure shows a variable named **myByte** inside the data segment.



For example:

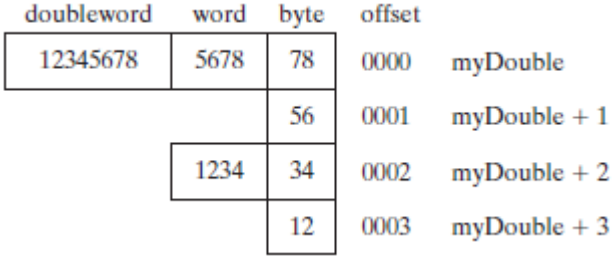
```
.DATA
bVal   BYTE  ?               ; Assume bVal is at 00404000h
wVal   WORD  ?
dVal   DWORD ?
dVal2  DWORD ?
.CODE
mov esi, OFFSET bVal    ; ESI = 00404000h
mov esi, OFFSET wVal    ; ESI = 00404001h
mov esi, OFFSET dVal    ; ESI = 00404003h
mov esi, OFFSET dVal2   ; ESI = 00404007h
```

❖ PTR Operator

You can use the PTR operator to override the declared size of an operand. This is only necessary when you're trying to access the variable using a size attribute that's different from the one used to declare the variable.

Suppose, for example, that you would like to move the lower 16 bits of a doubleword variable named **myDouble** into AX. The assembler will not permit the following move because the operand sizes do not match. But the WORD PTR operator makes it possible to move the low-order word (5678h) to AX:

```
.data
myDouble DWORD 12345678h
.code
mov ax,myDouble                 ; error
mov ax,WORD PTR myDouble        ; ax=5678h
mov ax,WORD PTR [myDouble+2]    ; ax=1234h
```

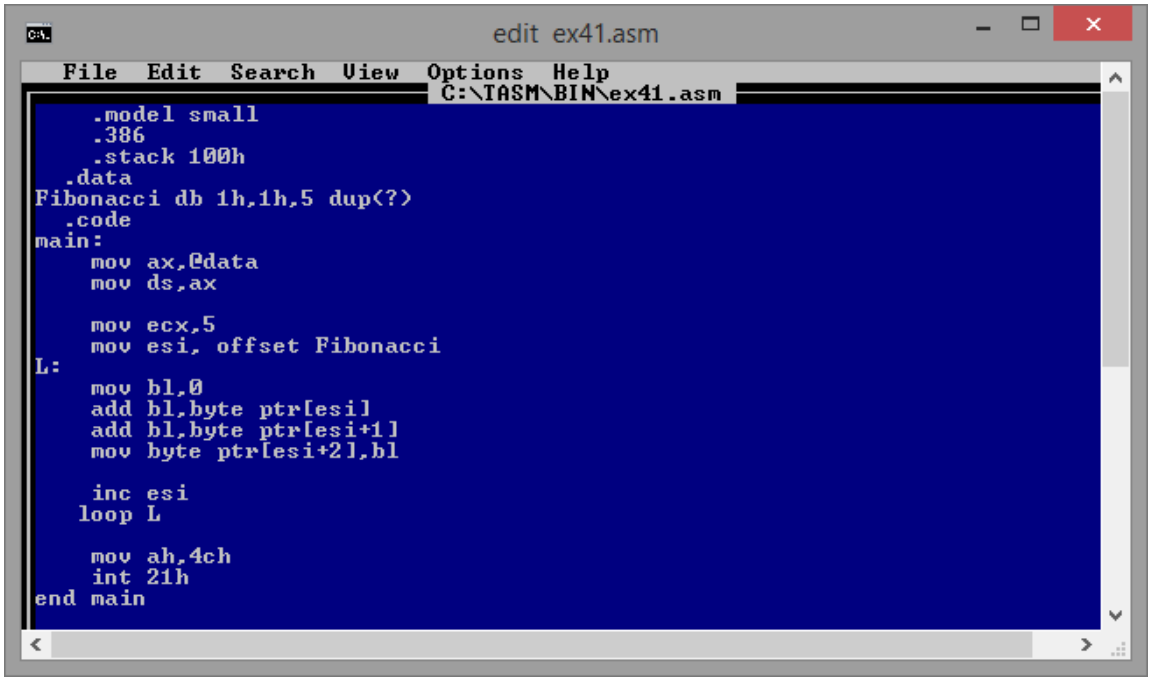


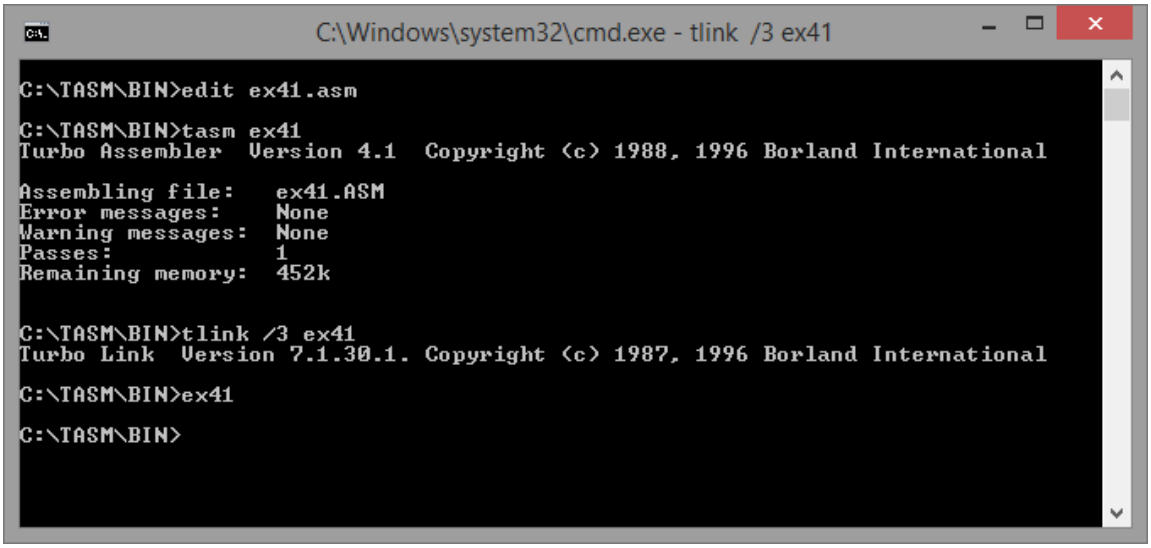
Lab work:

Excercise1:

Write a program that uses a loop to calculate the first seven values in the Fibonacci number sequence { 1,1,2,3,5,8,13 } where The Rule is $\mathbf{F_n = F_{n-1} + F_{n-2}}$. The Fibonacci sequence is referenced in the memory by the byte memory array called Fibonacci save the remaining five elements in the same array.

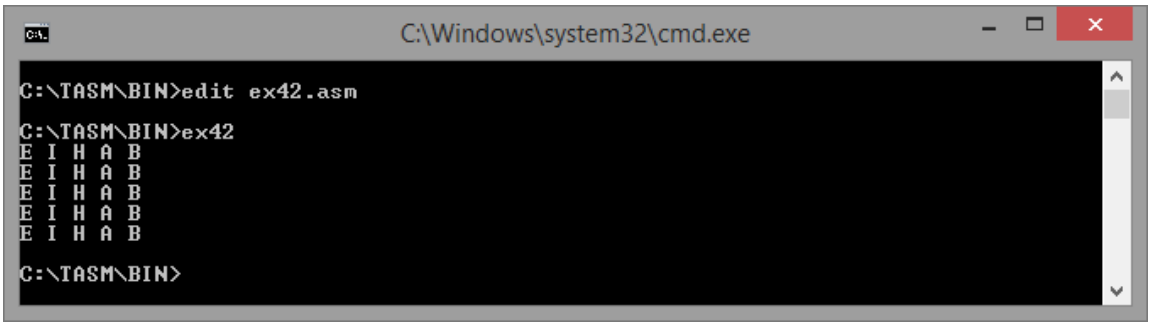
Fabonacci db 1h,1h,5 dup(?)

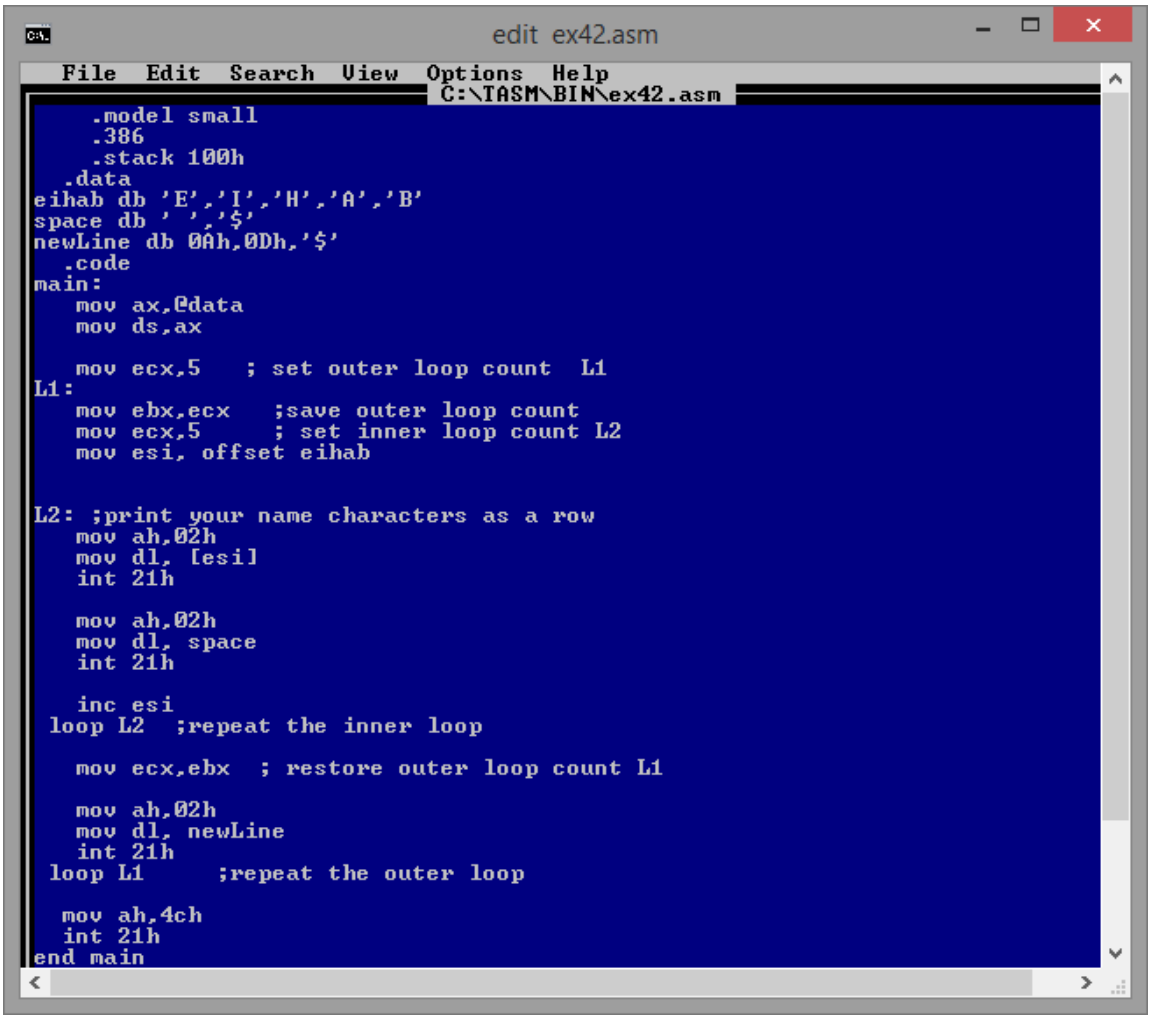




Excercise2:

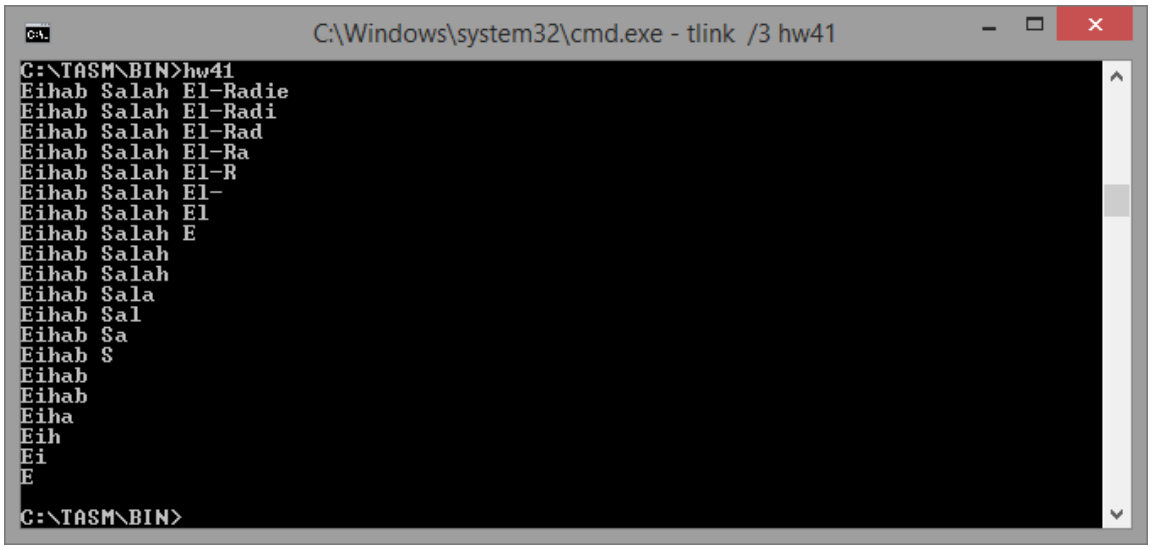
Write an assembly code that prints the characters of **your name**, 5 times on the screen. Each character followed by space and each full name from 1 to 5 is separated by new line, as the following:





Homework:

1. Write an assembly language program using the Loop instruction to print all letters of **your full name** decreasingly as follows:



2. Using loop, Use the array odd to find the square of the numbers between 1 and 5 and put the square of each number in the array square:

```
odd db 1,3,5,7,9
square db 5 dup(?)
```

3. Rewrite Excercise1 (Fibonacci number sequence) with just 2 add instructions and without PTR Operator.

4. Rewrite Excercise1 (Fibonacci number sequence) with just 2 add instructions and without PTR and OFFSET Operators.