Assignment 2

Due date: 3rd Feb 2023

Section 1 (20 marks)

Use the following variable definitions for Q1 to Q4:

```
.data
var1 SBYTE -4,-2,3,1
var2 WORD 1000h,2000h,3000h,4000h
var3 SWORD -16,-42
var4 DWORD 1,2,3,4,5
```

1. For each of the following statements, state whether or not the instruction is valid: (4 marks)
   a. mov ax,var1
   b. mov ax,var2
   c. mov eax,var3
   d. mov var2,var3
   e. movzx ax,var2
   f. movzx var2,al
   g. mov ds,ax
   h. mov ds,1000h

2. What will be the hexadecimal value of the destination operand after each of the following instructions execute in sequence? (1 mark)
   mov al,var1 ;
   mov ah,[var1+3] ;

3. What will be the value of the destination operand after each of the following instructions execute in sequence? (1 mark)
   mov ax,var2 ;
   mov ax,[var2+4] ;

4. What will be the value of the destination operand after each of the following instructions execute in sequence? (2 mark)
   mov edx,var4 ;
   movzx edx,var2 ;
   mov edx,[var4+4] ;
   movsx edx,var1 ;

5. Use the following data for 1-5 questions: (5 marks)
   .data
   val1 BYTE 10h
   val2 WORD 8000h
   val3 DWORD 0FFFFh
   val4 WORD 7FFFh

   1. Write an instruction that increments val2.
   2. Write an instruction that subtracts val3 from EAX.
   3. Write instructions that subtract val4 from val2.
   4. If val2 is incremented by 1 using the ADD instruction, what will be the values of the Carry and Sign flags?
   5. If val4 is incremented by 1 using the ADD instruction, what will be the values of the Overflow and Sign flags?

6. Where indicated, write down the values of the Carry, Sign, Zero, and Overflow flags after each instruction has executed: (1.5 marks)
   mov ax,7FF0h
   add al,10h ;
   a. CF = SF = ZF = OF =
   add ah,1 ;
   b. CF = SF = ZF = OF =
   add ax,2 ;
   c. CF = SF = ZF = OF =

7. Given the following data definition in assembly.

   .data
   myBytes BYTE 10h,20h,30h,40h
   myWords WORD 3 DUP(?),2000h
   myString BYTE ”ABCDE”

   Answer 1-4 questions:(2 marks)

   1. What will be the value of EAX after the following instructions mov eax,TYPE myBytes execute?
   2. Write a single instruction that moves the first two bytes in myBytes to the DX register.

3. Write an instruction that moves the second byte in myWords to the AL register.

4. Write an instruction that moves all four bytes in myBytes to the EAX register.

8. Given the following data definition in assembly.

```
.data
myBytes BYTE 10h,20h,30h,40h
myWords WORD 8Ah,3Bh,72h,44h,66h
myDoubles DWORD 1,2,3,4,5
myPointer DWORD myDoubles
```

Answer the following question: (3.5 marks)

Fill in the requested register values on the right side of the following instruction sequence:

- mov esi,OFFSET myBytes
- mov al,[esi]
- mov al,[esi+3]
- mov esi,OFFSET myWords + 2
- mov ax,[esi]
- mov edi,8
- mov edx,[myDoubles + edi]

Section 2 (30 marks)

Objectives
- To learn how to write a program in assembly language.
- To learn the difference between data and code segments.
- Be able to use different instruction mnemonics.

(a) Write a program that uses a loop to calculate the first seven values of the Fibonacci number sequence, described by the following formula: Fib(1) = 1, Fib(2) = 1, Fib(n) = Fib(n -1) + Fib(n - 2). (Use only one instruction (Don't use the same way provided in activity 3 in lab 3.)(10 points)

(b) Write a program that contains a definition of each of the following data types: BYTE, SBYTE, WORD, SWORD, DWORD, SDWORD, QWORD. Initialize each variable to a value that is consistent with its data type. (10 points)

(c) Write an assembly program that finds the sum for the following array elements 10000h,20000h,30000h,40000h.

All elements are of DWORD type.
(10 points)

Hint: Use a loop to iterate through array elements in (c)

Submission

For Section 1, the file should be in word docx or pdf format

- It is mandatory that students complete their own work and must be able to justify their answers when asked to do so by instructors and teaching staff.
- Students are responsible for making sure that their assignments are received by or on the due dates
- Submit the assignment ONLY on brightspace
- Submissions by email will not be accepted
- Add the following note at the beginning of your assignment: I confirm that I will keep the content of this assignment confidential. I confirm that I have not received any unauthorized assistance in preparing for or writing this assignment. I acknowledge that a mark of 0 may be assigned for copied work." + Name + SID

For Section 2 (programming assessment),

- Submit your source code in .asm file (preferred) or .txt file. Include title, name, date, ID and description on the top of source code
- Additional Instructions for Programs

- Write your program in a .asm file on MS Visual Studio or easy-MASM.
- Test and debug the program and make sure it runs without any issue before submission.
- Submit the .asm file or copy and paste your code into a .txt file and submit it.
- For the programs DO NOT SEND A PDF, A HANDWRITTEN PAPER, OR A ZIPPED FOLDER.
- Student **must** submit a screen shot of the program execution.

Evaluation

- Any late submissions will lose 50
- Any programs submitted as PDF or handwritten notes, even if submitted on time, would receive an automatic zero.