Capital University of Science and Technology

Department of Computer Science

CS2523 – Computer Organization and Assembly Language

ASSIGNMENT NO. 3: Write, Assemble, Debug, and Execute Assembly Code, Instruction Groups

CLO: 2. Describe how the basic units of the Intel 8088 architecture work together to represent Integer Numbers, Floating Numbers and register representation inside the microprocessor. [C2-Understanding]

CLO: 3. Implement assembly programs of intermediate complexity using the intel 8088 architecture. The student should also be able to convert intermediate complexity program in high level language into assembly code. [C3- Applying]

Semester: Fall 22 **Max Marks:** 10

Instructor: Ms. Tayyaba Zaheer

Assigned Date: November 02, 2022 **Due Date:** November 06, 2022

Name: **Reg. No.**

Guidelines:

You are required to submit the **screenshots of code and output of the program (where required) and concepts in your own words i.e. must be hand written** in the assignment file (word or pdf – pictures attached must be readable and in portrait mode) as **courseCode_studentReg#_studenName** via Microsoft Teams.

Important Note:

1) Must not copy from other students, so do it all yourself.
2) Assignment should be hand written.

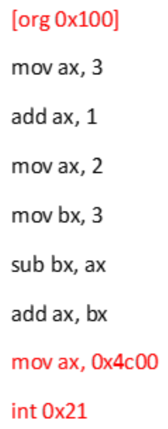
Description:

Emu8086 is an 8086-microprocessor emulator and disassembler. Emu8086 permits to assemble, emulate and debug 8086 programs (16bit/DOS).

Tasks: **[Hint: you can take help from lectures]**

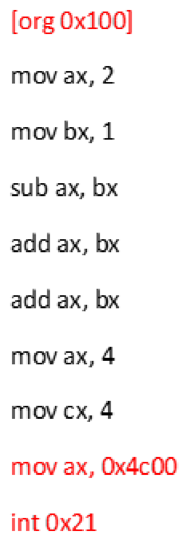
Task#1: Assembly Language Programming: Write down the states of RAM and registers, in line by line Debugging Mode, in the following given scenarios. **(06 marks)**

Question#1 (01 mark):



```
[org 0x100]
mov ax, 3
add ax, 1
mov ax, 2
mov bx, 3
sub bx, ax
add ax, bx
mov ax, 0x4c00
int 0x21
```

Question#2 (01 mark):



```
[org 0x100]
mov ax, 2
mov bx, 1
sub ax, bx
add ax, bx
add ax, bx
mov ax, 4
mov cx, 4
mov ax, 0x4c00
int 0x21
```

Question#3 (01 mark):

```
[org 0x100]

mov ax, 2

mov cx, 4

mov dx, 1

add cx, dx

add ax, dx

sub cx, dx

add dx, ax

mov bx, 8

mov ax, 0x4c00

int 0x21
```

Question#4 (03 marks):

Write down the states of RAM and registers, in line by line Debugging Mode, in the following given scenario of Assembly Language.

i. Fill out the values of registers in hexadecimal i.e. Base-16 after execution of each instruction. Consider values provided are in decimal i.e. Base-10. (1.5 Mark)

ii. Fill out the values of missing addresses in hexadecimal i.e. Base-16 of the instructions highlighted with the "?" in S.r.# 5 and 11 in table given below. Consider values provided are in hexadecimal i.e. Base-16. (1.5 Mark)

S.r.#	**Addresses in Hexadecimal**	Machine Code	**Assembly Code**
1			[org 0x0100]
2			
3	00000000	BB0A00	mov bx, 10
4	00000003	B80200	mov ax, 2
5	0000000**?**	F7E3	mul bx
6	00000008	B80400	mov ax, 4
7	0000000B	01C3	add bx, ax
8	0000000D	29C3	sub bx, ax
9			
10	0000000F	B8004C	mov ax, 0x4c00
11	000000**??**	CD21	int 0x21

Task#2: Instruction Groups: **(04 marks)**

Question: Explain and differentiate the four instruction groups of the assembly language in which instructions have been categorized i.e.

1. Data Movement Instructions
2. Arithmetic/Logic Instructions
3. Program Control Group Instructions
4. Special Group Instructions