# Capital University of Science and Technology

Department of Computer Science

## CS2523 – Computer Organization and Assembly Language

## ASSIGNMENT NO. 2: Basics of Computer Organization and Assembly Language, Data Representation

**CLO: 1.** Define concepts in the design of microprocessor as state machine and designing its data path and its controller. [C1- Remembering]

**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]

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

**Instructor:** Ms. Tayyaba Zaheer

**Assigned Date:** October 17, 2022 **Due Date:** October 22, 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.**

**Objectives:**

After completion of this Assignment, you will have gained basic knowledge of computer organization and assembly. You will be able to understand the data representation and memory addressing. You will be able to understand the building blocks of assembly language.

**Data Representation: Topic:** Number Systems, and Conversion between Decimal, Binary, Hexadecimal, and other bases. **Related Reading:** Class Lectures.

**Tools/Software Requirement (Optional):**

1. Microsoft Word.
2. emu8086.

**Important Note:**

1) Must not copy from other students, so do it all yourself.

**Description:**

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

**Tasks:**

**Task#1: Signed Numbers Representation: (03 marks)**

**Question 1 (01 mark):** Find the signed magnitude of –130 using 8-bit binary sequence? If you think that -130 cannot be represented in 8 bits using signed magnitude representation then justify your answer.
**Solution:**

**Question 2 (02 marks):** Find the 2's complement of –130 using 16-bit binary sequence? If you think that -130 cannot be represented in 16 bits using 2's complement representation then justify your answer. If can be represented then convert binary to hexadecimal as well.
**Solution:**

**Task#2: Data Representation: (07 marks)**

**Question 1 (02 marks):** Perform the following operations and elaborate the state of Carry Flag after each operation:

a) 0000 – 0001
b) 1111 + 0001
c) 0111 + 0001
**d)** 1000 – 0001

**Solution:**

**Question 2 (02 marks):** Perform the following operations and elaborate the state of Overflow Flag after each operation:

a) 0100 + 0001
b) 1100 + 1100
c) 1000 + 1000
d) 0100 + 0100

**Solution:**

**Question 3 (02 marks):** Consider the floating-point representation with 3-bit exponent, 4-bit mantissa, 1-bit sign. Represent the number "**-.05**" into floating point representation by using step by step conversion as studied in the class.
**Solution:**

**Question 4 (01 mark):** The address of var1 is 00400B20. The address of the next variable after var1 is 0040A06C. How many bytes are used by var1?
**Solution:**