

# Capital University of Science and Technology

## Department of Computer Science

### CS2523 - Computer Organization and Assembly Language

## ASSIGNMENT NO. 5: Effective Address Calculation, Jumps/Branching,

## **Relative Addressing, Bit Manipulation**

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

**CLO: 3.** <u>Implement</u> 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: December 28, 2022 Due Date: January 04, 2023

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: Effective Address Calculation:

(03 marks)

Question: What is the effective address generated by each of the following instruction?

Initially BX=0x0100, label=0x0234, [label]=0x0010, and SI=0x00E1

(Offset in part a is in decimal)

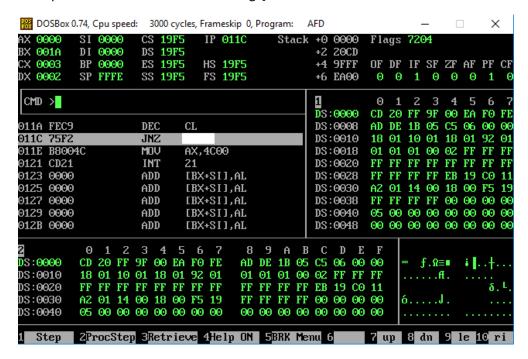
- a) mov ax, [bx+40]
- b) mov ax, [bx+label]

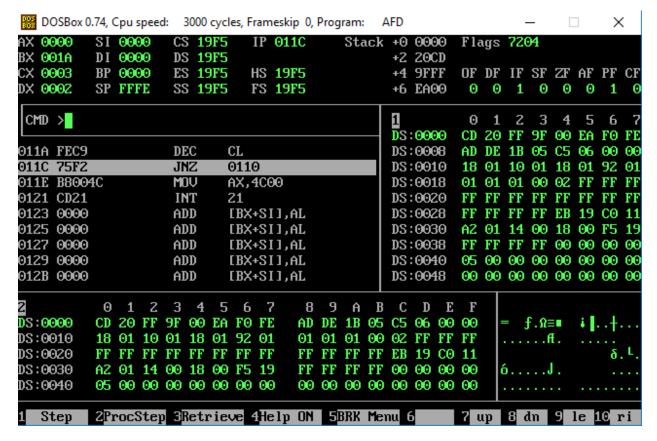
c) mov ax, [bx+si]

Task#2: Conditional, Unconditional Jumps and Relative Addressing:

(04 marks)

**Question:** Analyze the given Relative Address/Jump Address and explain the reason behind the value 0110 i.e. JNZ 0110 [You can consult the helping material provided with the assignment i.e. "conditionalJumpsCodes" and "RelativeAddressing"]





#### Task#3: Bit Manipulation:

(03 marks)

**Question 1:** Suppose AL contains 10011011b and CF= 0. Give the new contents of AL after each of the following instructions is executed. Assume the preceding initial condition for each part of this Question is AL contains 10011011b and CF= 0.

- a) SHL AL,1
- b) SHR AL, CL if CL contains 3
- c) ROLAL,1
- d) SAR AL, CL if CL contains 3
- e) RCR AL,CL if CL contains 2

**Question 2:** Need to turn on Bit 4 and Bit 7 of a byte (remember that the bit on the right-hand side is Bit 0). Define the mask and logical operator accordingly and show your result.

#### **Solution:**

7	6	5	4	3	2	1	0	Bit Position
0	0	0	0	0	0	0	0	Data
								Mask
1	0	0	1	0	0	0	0	Logical Operator
								<b>-???</b>