National University of Computer and Emerging Sciences



Laboratory Manual

for

Computer Organization and Assembly Language Programming

(EL 213)

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| Course Instructor | Ms. Tazeem Haider |
| Lab Instructor(s) | Mr. Gullsher Ali  Ms. Nimra Abbas |
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Department of Computer Science

FAST-NU, Lahore, Pakistan

## Objectives

After performing this lab, students shall be able to:

* Learn about the tools required
* Be familiarized with the coding environment
* Have basic idea of assembly language programming

## ASSEMBLY TOOLS AND ENVIROMENT

There are 3 tools that you’ll need for this course:

Nasm (An assembler)

Afd (A debugger)

Dosbox (A virtual box)

Create a folder on your C drive named as “**Assembly**”. Now copy DosboxPortable , Nasm and Afd from the Assembly Tools folder and paste in newly created folder.

2. Open DosBoxPortable folder and run executable file named “DOSBoxPortable.exe”.

3. By default the drive is Z:\ . Type command **mount X C:\Assembly**. This will virtually create a drive X and C:\Assembly will contain contents for this drive.

4. Still drive is Z:\, X is only mounted, to change drive or directory write **X:** and then press enter. You are done.

5. You can write these mount commands at the end of .conf file in portable dropbox folder having the path “DosboxPortable\Data\settings\dosbox.conf”, it will save your time. Next time when you open dropbox, you don’t have to mount again and again.

6. Once you have mounted your drive, make sure that you have nasm and afd in the same mounted drive path. Now create an assembly file with the extension “<file\_name>.asm” in the same mounted drive where both nasm and afd are placed.

7. To assembly your file, firstly you have to mount your drive to the path which contains three files named nasm, afd and “\*.asm”e.g.,

**Mount x “C:\Assembly”**

**X:**

You can write the above two commands in “Dosbox.conf” file so that you don’t have to mount the drive again when you open DropBox. They will already be executed when DOSBox starts everytime

8. Once you have mounted your drive you can assemble your program by writing the following command:

**Nasm \*.asm –o \*.com –l \*.lst** //Here \* means your file name

9. This will create one com file and one listing file if there are no errors. You can now debug your program by opening the \*.com file in afd debugger using the following command:

**Afd \*.com**

10. This will open afd debugger. You can step through your code and see the value of your registers changing as you step through the written code line by line. You can use F1 or F2 to step through your code line by line.

**Exercise 1:** Write an assembly program that will sum first 10 prime numbers using only two registers ax and bx. You have to use ax to accumulate the sum whereas bx will be used to get the next hardcoded number in the list of first 10 Prime numbers. Store the final result (sum of 10 Prime numbers) in dx register.

Prime Numbers: 2,3,5,7,11,13,17,19,23,29 (Sum=129)

**Exercise 2:** If ax is initialized with 0x1212 and bx with 0x2000, Find the number ‘X’ that together with ax, makes sum equal to bx.

i.e. ax+X=bx. Find the value of X.

Once you’ve found the value of X, move it to cx.

**Exercise 3:** Write an assembly program to subtract first 10 elements of a Reverse Lucas series by using only MOV and SUB instruction. Also store the sum of these 10 numbers in some register

You are not allowed to use following numbers hard-coded except 76 and 47, generate every next term to compute final difference.

29 = 76 – 47

18 = 47 - 29

Reverse Lucas series: 76, 47, 29, 18, 11, 7, 4, 3, 1, 2 (The final sum must be C6 in hex)