BRAC UNIVERSITY
Inspiring Excellence

Department of Computer Science and Engineering

Course Code: CSE341	Credits: 1.5
Course Name: Microprocessors	Semester: Summer 21

Lab 05

Flow control instructions and Looping structures

I. Topic Overview:

Alongside the capability of making decisions, any functional program should also have a mechanism to repeat sections of code. In this lab, students will familiarize themselves with the loop instructions to achieve that. Alongside jump, the loop instruction is also used to transfer control to another part of the program. The students will then learn to implement different looping structures. This application will make it much easier to convert a pseudo code algorithm to assembly code.

II. Lesson Fit:

There is prerequisite to this lab. Students must have a basic idea on the following concepts:

a. Jump instruction
b. Some basic operations such as MOV, ADD, SUB, MUL and DIV
c. Basic I/O operations
d. Character encoding using ASCII

III. Learning Outcome:

After this lecture, the students will be able to:

a. Control flow of the program
b. Use loops to avoid repetition

IV. Anticipated Challenges and Possible Solutions

a. Students may find it difficult to visualize how the program control flow changes when using loop/jump

Solutions:

i. Step by step simulation

b. Directly coding in assembly may come off as challenging

Solutions:

i. Writing the pseudocode first then then converting it to assembly may help

V. Acceptance and Evaluation

Students will show their progress as they complete each problem. They will be marked according to their class performance. There may be students who might not be able to finish all the tasks, they will submit them later and give a viva to get their performance mark. A deduction of 30% marks is applicable for late submission. The marks distribution is as follows:

Code: 50%

Viva: 50%

VI. Activity Detail

a. **Hour: 1**

Discussion: Looping Structure

Just like for and while loops in high level programming languages, loops can also be implemented in assembly. There are 2 ways of implementing a loop: explicit and implicit.

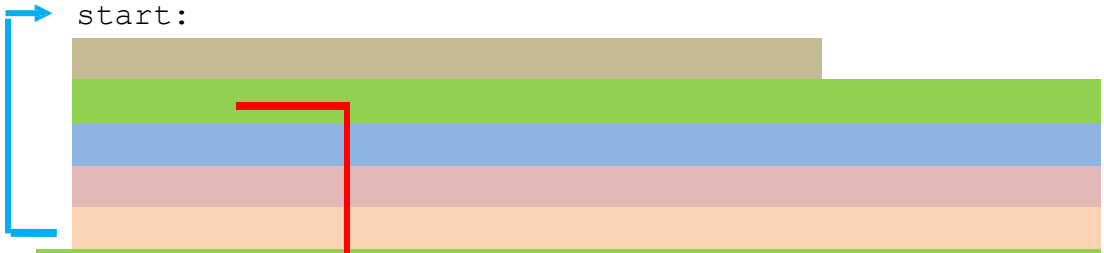
Explicit: By using compare and jump instructions to decide whether to enter the loop or not and by using the inc /add /sub instruction for increments.

Java

```
int x = 0;
while (x < 5){
    System.out.println(x);
    x++;
}
```

Assembly

```
mov ah,2
mov dl,30h  ;the emu8086 uses hexadecimal. 30h is 0
 start:
```



```
end:
```

Implicit: In this case we do not have to check whether the counter has reached the limit or not. This will be done automatically. The instructions will be loop.

loop destination_line is the syntax. CX will be used as the counter always in order for the loop instruction to execute.

JAVA

```
int x = 0;
while (x < 5){
    System.out.println(x);
    x++;
}
```

Assembly:

```
mov cx,5 ;the bound will be in cx. (the number of
times the loop will run)
mov dl,30h
mov ah,2
start:
  int 21h
  inc dl
loop start
```

NB. CX will always start from the specified count and will always decrement by 1.

b. **Hour: 2**

Discussion: Discuss the properties of a repeat-until loop structure.

Repeat Until loop: Repeat the loop until a condition is satisfied. For example you have been asked to take in characters from the user and print them until a space is pressed.

```
.code
repeat: mov
ah,1 int 21h
mov ah,2 mov
dl,al int
21h
cmp al,' '
jne repeat
```

c. **Hour: 3**

Discussion:

Check progress while the students carry on with the rest of the tasks.