Introduction

This assignment aims to make students comfortable with a basic computer system and its functionalities. For this homework, you are free to use any function from the Java language.

Description

Write a CPU emulator software that supports a basic instruction set (15 instructions) given below. Assume that the computer has 256 bytes of available memory (**M**) initially set to zero. Your emulator should load a program code from a text file. For simplicity you can store the program code in any data type you like. The use of your emulator is like:

java a1YourStudentId program.txt

The following example code is an app that can compute the sum of the numbers between 0 and 20. Your emulator must execute this sample code at minimum. Note that I may test your emulator with any code that is supported by the instruction set. You can implement your code in **Java**. Assume that initially all flags are set to zero.

You **cannot** write all your code under the main function, i.e. you must write user-defined functions and use them. Here is a sample program.txt file.

```
%A Hello world app that computes the sum of the numbers between 0 to 20
0 START
1 LOAD 20
2 STORE 200
3 LOAD 0
4 STORE 201
5 STORE 202
6 CMPM 200
7 CJMP 15
8 LOADM 202
9 ADDM 201
10 STORE 202
11 LOADM 201
12 ADD 1
13 STORE 201
14 JMP 6
15 LOADM 202
16 DISP
17 HALT
```

Instruction	Short description	Description
START	Start execution	Starts the program execution
LOAD X	Load immediate value	Load the immediate value X to AC Ex: LOAD 25 means AC=25
LOADM M[X]	Load a memory value	Load memory value stored at M[X] to AC
STORE X	Store a value	Store value in AC to memory location M[X] Ex: STORE 140 means M[140]=AC
CMPM M[X]	Compare	If the integer value in AC is greater than value in M[X] then set **F** flag to 1 If the integer value in AC is less than integer value in M[X] then set **F** flag to -1 If the integer value in AC is equal to integer value in M[X] then set **F** flag to 0
CJMP X	Conditional Jump	Update the PC with X if the F flag value is positive

JMP X	Unconditional Jump	Update the PC value with X Ex: JMP 114 PC=114
ADD X	Immediate Addition	Add immediate value of X to AC Ex: ADD 67 means AC=AC+67
ADDM M[X]	Addition with memory	Add Memory value of M[X] to AC Ex: ADDM 180 means AC=AC+M[180]
SUBM M[X]	Subtraction with memory	Subtract Memory value of M[X] from AC Ex: SUBM 150 means AC=AC-M[150]
SUB X	Immediate Subtraction	Subtract immediate value of X from AC Ex: SUB 75 means AC=AC-75
MUL N	Immediate Multiplication	Multiply AC with immediate value of N Ex: MUL 4 means AC=AC×N
MULM N	Multiplication with memory	Multiply AC with M[N] Ex: MULM 4 means AC=AC×M[4]
DISP	Display	Display the value in AC on screen
HALT	Stop execution	Stop Execution

IMPORTANT!
If your code does not compile, then you will get **zero**.
Please be careful about this and double check your code before submission.