EC2.101: Digital Systems and Microcontrollers **Monsoon 2019**

Processor Assignment

Released: November 5th *Deadline: November 13th*

Instructions

- This assignment is designed to get you familiar with writing code in assembly language. You will be using the instruction set of the simple processor designed and discussed in class.
- The code should be tested on the processor simulator. Check the README for instructions.
- Submit your code files and a report as a zip file, named as ⟨rollnumber⟩.zip. There would be three code files, one for each question, namely 1.txt, 2.txt and 3.txt.
- The report should briefly describe your approach to solve each problem.
- The deadline is November 13th, 23:55. This is a hard deadline and no submissions will be accepted after this.
- Plagiarism detectors will be run on all submissions, so please do not copy. If found, you would be given a straight zero for the assignment.

Question 1: Fibonacci (10 marks)

Find the largest number in the Fibonacci sequence that is ≤X. The number 'X' is stored in memory location 50. So you have to keep computing the Fibonacci sequence until you reach that term. Store your result in register-5 (r5). Assume X ≥2

For instance, if X=10, the fibonacci sequence would be 0,1,1,2,3,5,8,13....
Therefore, 8 must be stored in r5.

A sample memory file m1.txt has been provided to you, which loads X into the memory.

Question 2: Help Rahul (10 marks)

Rahul is a big fan of Bon Jovi and Queen. He has 'X' number of Bon Jovi records and 'Y' Queen records. He wants to pack all of these records into different boxes. (He has an infinite supply of boxes)

But he can pack records belonging to only one artist in each box and he must pack the same number of records in each box. What is the maximum number of records he can pack in each box? Help him find this and store this answer in register 5(r5).

X and Y are stored in memory locations 100 and 110 respectively. A sample memory file m2.txt has been provided, which loads these values into the memory.

For instance, if X=56 and Y=63, then he can pack a maximum of 7 records in each box.

Question 3: The Star Wars 'order' dilemma (20 marks)

There are N Star Wars movies that your friend has asked you to watch. Each movie has a rating associated with it. There are multiple orders in which you could watch these films, and every Star Wars fan in this world would have an order of their own. Your friend stored these in the memory of your processor in the order he/she wanted you to watch them in.

However, you want to watch these movies only in the increasing order of their rating so that you're happy by the end of the marathon. If two movies have same ratings, you can watch either one first.

The movies' ratings have been stored in contiguous memory locations by your friend. The base address of the numbers is 200. That means the first movie rating has been stored in memory location 200, the next one in 201 and so on. N has been stored in memory location 190.

For instance, if N=6 and the memory contents are:
Memory: 200 201 202 203 204 205
Values: 32 45 12 56 39 45

So rearrange these movies in the increasing order of their ratings like this:

Memory: 200 201 202 203 204 205
Values: 12 32 39 45 45 56

The memory file m3.txt loads sample data into the memory.
Use any algorithm you wish, whichever you think would be the easiest to implement. No need to worry about time complexity :)

Deliverable

A zip file, ⟨rollnumber⟩.zip containing the following text files:

- 1.txt
- 2.txt
- 3.txt
- report.txt

Ensure that your code doesn't have any comments so that we'd be able to run it on the simulator without any hassle. Write whatever you need to in the report. Happy coding :)