CSC 256 Assignment 2

**Please insert all your screenshot in one word document and upload it. PDF version is also acceptable.**

**Problem 1 (1.5 points) (Show all intermediate steps. No intermediate steps will receive 0 point)**

1. Convert integer -3 to 8 digit TC Binary. (0.5 point)
2. Convert decimal -1 to 8 digit TC Hex. (0.5 point)
3. Convert integer -255 to 8 digit Hex (Hint: You can either convert 255 to Hex then negate with TC Hex rule, or you can convert -255 to TC Bin, then convert it to Hex) (0.5 point)

**Problem 2** Convert the 2-digit two's complement hexadecimal integer 0x6e to decimal. Show all intermediate steps clearly. (0.5 point)

**Problem 3** Convert the decimal integer -61 to an 8-bit two's complement binary integer. Show all intermediate steps clearly. (0.5 point)

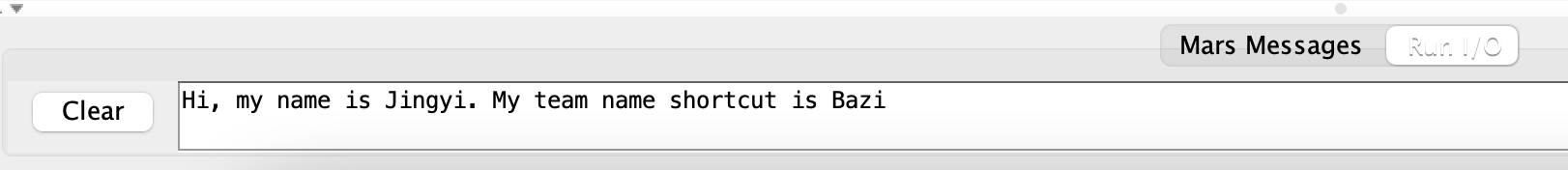
**Problem 4** You're given two 4-digit, 2's complement hexadecimal numbers X = 0xa731 and

Y = 0xe6a2. Compute X-Y. Remember to indicate overflow if it occurs. Show

all intermediate steps clearly. (1 point)

**Problem 5 (1.5 point).**

In [1st programming](https://sfsu.instructure.com/courses/27337/pages/1st-programming) , change your line 3 ““"Goodbye cruel world...\n\n\n” to “My name is (Yourname).” **Save it. Assemble it and run it.**

Your output should be something like this:

Look at the Register Components, you should see something like this:

Table

Description automatically generated

From the screenshot above we can see that, in MARS, there are 32 registers (from Number 0 to Number 31), each one has its own name. For instance, Register number 1, name is “$at”.

Look at your own MARS interface, and answer the following question:

1. Please insert the screenshot of your MARS register components. (0.25 point)
2. What is the data in Register $v0? Write it down in hexadecimal. (In the example above, the data is 0xa). Your answer should start with “0x” which indicates it is a hexadecimal number. (0.25 point)
3. Can you convert the data in Register $v0 to decimal? Can you convert it to 32-bit binary? (Your answer should start with “0b” which indicates it is a binary number) (0.25 point)
4. Can you convert the data in Register $gp to 32-bit binary? (0.25 point)

Click **“Execute”** and **“0x10010000(.data)”** which is shown as follow:

Graphical user interface, text

Description automatically generated

The Data Segment shows you the structure of Memory in the MARS. The memory has two parts: Address and Value. **Each address can store 8-digit hexadecimal data.**

For here we can see that in memory address 0x10010000, we have value 0x202c6948.

In the MARs, the Value(+4) indicates the data is saved in the address(shown in the first column) +4. For instance, the data “0x6e20696d” is saved in memory address ”0x10010000+4”, which is 0x10010004.

Similarly, the Value(+8) indicates the data is saved in the address(shown in the first column) +8. In the screenshot, the data “0x20656d61” is saved in memory address “0x10010000+8”, which is 0x10010008.

Please note the memory address is displayed in hexadecimal. Therefore, in Value(+C) in the screenshot, C is a hexadecimal, similarly, “0x4a207369” stores in memory address “0x1001000C”. In Value(+10), it means Memory Address + 0x10 (hexadecimal). Therefore, in memory with address 0x10010010 we have data 0x79676e69.

There are some more examples you can see from the screenshot:

In memory address 0x10010020 we have data 0x20656d61

In memory address 0x10010024 we have data 0x726f6873

In memory address 0x10010028 we have data 0x74756374…

Please answer the following question:

5) Please insert your MARS data segment screenshot here (0.1 point)

6) Please write down the 8 digit hexadecimal data saved in the memory address 0x10010018 according to your screenshot (0.2 point)

7) Please write down the 8 digit hexadecimal data saved in the memory address 0x10010024 according to your screenshot. (0.2 point)