

Programming Assignment #4

CSCE 2610 - Assembly Language and Computer Organization Summer 2021

100 Points

Due: 07/28/2021, 11:55 PM

Instructions: Compile and simulate the assembly programs (.S file) using DS-5 simulator and make sure it's working. Comment your assembly programs. Create an assignment folder with folder name as *eid_PA4* (example: xyz0202_PA4) and add all the source files (.S file) and the readme file to the folder. Please create a zip archive of your assignment folder and upload the zip file to Canvas. **Not following the above instructions could result in not accepting your work. Late submissions are not allowed.**

1. Write an ARMv8 assembly function to convert a given word to all lower case and find the length of the given word. The base address of the input string (word) is passed using register *X1* and the resultant length should be stored in *X0*. Assume all the registers are used by the main (caller) function to store some data before calling the function. Write a main assembly function to test the assembly function. Create a static character array (string) that is stored in the data section of the assembly code. Pass the base address of the static array as an input to test the function and store the returned value from the function in *X20*. Assemble, test, and simulate the assembly code using DS-5 simulator. Do not upload the entire DS-5 project. Only upload the assembly file (.S file) from the DS-5 project to Canvas. Comment your assembly code. **(35 Points)**
2. A snail fell in a 300 meter well and wants to go back up. Every day it goes back up one-half ($1/2$) of the distance that is left to go up. The total distance y the snail climbed back in n days is computed by the equation $y = \sum_{x=1}^n 300/2^x$. The input n is in register *X20* and is a non-zero positive integer less than 250. The output y should be stored in register *S20*. Use single precision floating-point to compute y . Assemble, test, and simulate the assembly code using DS-5 simulator. Do not upload the entire DS-5 project. Only upload the assembly file (.S file) from the DS-5 project to Canvas. Comment your code. **(25 Points)**
3. Natural log of a value is computed as $\ln(1+x) = \sum_{n=1}^a \frac{(-1)^{(n+1)} x^n}{n}$. Write a ARMv8 assembly program to compute natural log of a value. Assume the input x is in *D20* and the input a is in *X20*. Store the result in *D21*. The user input x is a double precision floating-point value between 0.0 and 5.0. The user input a is a 64-bit non-negative

integer less than 5000. Use double precision floating-point for the computation. Assemble, test, and simulate the assembly code using DS-5 simulator. Do not upload the entire DS-5 project. Only upload the assembly file (.S file) from the DS-5 project to Canvas. Comment your code. **(40 Points)**

An example assembly code (string_code.S and first_fp.S) is posted on canvas to jump start your assignment.

Deliverables:

1. Commented assembly code for question 1, 2, and 3
2. A readme file that describes how to compile, execute, and test the assembly code.