Lab One – Part B

There will be questions in both the MidTerm and Major exams from this Chapter. Hence, this assignment has to be done *individually*.

Do not to use a compiler [www.godbolt.org] to generate the assembly [in the first instance] as you will not have access to the same in the closed book/notes/no internet Midterm and Majors exams. You can use compiler to give you hints after you have exhausted your thinking quota.

Write RISC-V assembly code for the following:

1. For a given input tuple $[n, r]$ $\{n, r \leq 20\}$, print the value of $({}^{n}_{r}C)$ where you have defined a function for factorial fact(n) = n!.

2. We discussed the case of tail recursion COL100 as well in class last week. The book gives the efficient code for the recursive sum problem [A]. Please write the straightforward assembly program of this recursive routine [B]. Also write the iterative version of the program [C]. Compare your code with the code given in the book. Show a plot which shows how the performance [cycles or time] varies with different values of n for A, B and C.

```
int sum (int n, int acc) {
     if (n > 0)
          return sum(n – 1, acc + n);
     else
          return acc;
}
```

3. [Variant of Prob: 2.34 in my copy of the book] Write a function in RISC-V assembly to convert an ASCII string containing a positive or negative integer decimal string to an integer. The RISC-V *mul* instruction takes two registers as input. There is no "*muli*" instruction. Now call this function to implement a function [program] that can perform [add|mul|sub|div] of two numbers where the input are two strings and the operator [[add|mul|sub|div]]. [You are implementing atoi() function which is available in many Programming Languages].

What you need to submit :

A single tar/zip file containing a Directory containing the following:

- 3 Sub directories : one for each problem
- Each sub directory to contain
  a. Source code .s or .asm file
  b. The screen shot of the RARS window with the edit tab in focus along with the Registers and the output in Third Pane.
  c. Some Visible Identifier in the screenshot which shows identifies You with the screenshot -☺

Please follow this discipline as we will try to auto grade the assignments.