Introduction to Programming

MTech CS, First Year, Indian Statistical Institute

Assignment 1 : Problem Solving using C

Posted on 8 August 2014 | Due on 18 August 2014

Submission Policy

Write the theoretical part(s) of the solution(s) in LaTeX, and submit individual codes separately. Your solution set should be in a compressed folder `{RR}_assign1_solutions.zip`, where `{RR}` is your roll number (e.g., `mtc1421`). It should contain a single PDF file for the theoretical part(s) of the solution(s), and individual C source file(s) for each solution.

In the theoretical part(s) of the solution(s), you must provide an (basic and informal) sketch of the algorithm that you use, along with a (naive and rough) complexity analysis of your chosen algorithm. You must also justify the C data-types that you use while writing the program.

The PDF file should provide a README portion for each C file, including the compilation and execution commands, and the input formats that a user should follow to execute the program.

Problem 1

Write a simple C program, without exploiting the power of special libraries, that takes as user input three positive integers – base x (max 32 bits), exponent n (max 32 bits), modulus m (max 32 bits) – and outputs the value of $x^n \bmod m$.

Problem 2

Write a simple C program, without exploiting the power of special libraries, that takes as user input two positive integers – value x (max 32 bits), precision p (max 60 bits) – and outputs the value of $\sin(x)$, considering x in radians, correct upto p bits after the decimal point.

Problem 3

Write a simple C program, without exploiting the power of special libraries, that takes as user input two positive integers – value x (max 32 bits), precision p (max 60 bits) – and outputs the value of $\sqrt{x}$, correct upto p bits after the decimal point.

Bonus Problem

Write a C program that takes as user input one positive integer x (max 16 bits), and outputs the value of $x!$. Special credit will be given for algorithms with better-than-naive time complexity.

Good Luck! ☺