National Institute of Technology, Calicut
Department of Computer Science and Engineering
CS2094 – Data Structures Lab
Assignment-1

Policies for Submission and Evaluation

You must submit your assignment in the moodle (Eduserver) course page, on or before the submission deadline. Also, ensure that your programs in the assignment must compile and execute without errors in Athena server. During evaluation your uploaded programs will be checked in Athena server only. Failure to execute programs in the assignment without compilation errors may lead to zero marks for that program.

Your submission will also be tested for plagiarism, by automated tools. In case your code fails to pass the test, you will be straightaway awarded zero marks for this assignment and considered by the examiner for awarding F grade in the course. Detection of ANY malpractice regarding the lab course will also lead to awarding an F grade.

Naming Conventions for Submission

Submit a single ZIP (.zip) file (do not submit in any other archived formats like .rar or .tar.gz). The name of this file must be ASSG<NUMBER>_<ROLLNO>_<FIRSTNAME>.zip (For example: ASSG1_BxxyyyyCS_LAXMAN.zip). DO NOT add any other files (like temporary files, input files, etc.) except your source code, into the zip archive.

The source codes must be named as ASSG<NUMBER>_<ROLLNO>_<FIRSTNAME>_<PROGRAM-NUMBER>.<extension> (For example: ASSG1_BxxyyyyCS_LAXMAN_1.c). If there is a part *a* and a part *b* for a particular question, then name the source files for each part separately as in ASSG1_BxxyyyyCS_LAXMAN_1b.c.

If you do not conform to the above naming conventions, your submission might not be recognized by some automated tools, and hence will lead to a score of 0 for the submission. So, make sure that you follow the naming conventions.

Standard of Conduct

Violations of academic integrity will be severely penalized.

Each student is expected to adhere to high standards of ethical conduct, especially those related to cheating and plagiarism. Any submitted work MUST BE an individual effort. Any academic dishonesty will result in zero marks in the corresponding exam or evaluation and will be reported to the department council for record keeping and for permission to assign F grade in the course. The department policy on academic integrity can be found at: http://cse.nitc.ac.in/sites/default/files/Academic-Integrity.pdf.

Assignment Questions

General Instructions for all the questions:

• Invalid input should be detected and suitable error messages should be generated.

• Sample inputs are just indicative.

1. Write a program to encrypt / decrypt a given string S of length N. Encryption of string is performed by shifting up the letters in the string by a fixed number K. While decryption of string is performed by shifting down the letters in the string by a fixed number K.

   Input: Encrypt / Decrypt option along with string S.
   Output: Shifted String

   Example:
   Input: 1. Encryption
   2. Decryption
   Enter your choice: 1
   Enter String length: 11
   Enter String: middle-Outz
   Enter K: 2

   Output: okffng-Qwvb

2. Write a program that accesses the contents of a text file say, "in.txt" , and modifies the each line in it by replacing two or more consecutive blanks in a string by a single blank and writes the output to a new file "out.txt".
   Example:
   Input: Welcome to CS 2094 : Data Structure Lab ("in.txt")

   Output: Welcome to CS 2094 : Data Structure Lab ("out.txt")

3. a. Write a program that reverses a string recursively without using any extra memory (inplace).

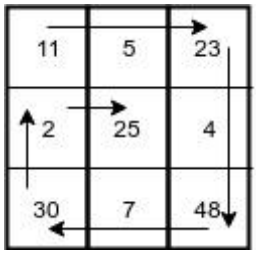
   Example:
   Input: data
   Output: atad

b. Write a C program that accepts a $n \times n$ matrix and recursively finds its transpose (in place). Print the result of the transposed matrix in spiral form (left->right, top->bottom, bottom->left and then left->up).

   Example:
   Input:
   3 3
   11 2 30

5 25 7
23 4 48
Output:
11 5 23 4 48 7 30 2 25

Explanation:



4. Define a Structure **Ratio** with two integer x and y as its members**,** where x is the numerator and y is the denominator of a ratio. Write C programs that can do the following.

a. Input two integer a and b and print it as a ratio a/b.

b. Find the sum of two rational numbers.

c. Find the product of two rational numbers.

d. Sort n rational numbers in ascending order.

e. Print the result in its simplest form.

Example:

Input: 1. Print a/b form

2. Sum of Rational numbers

3. Product of Rational numbers

4. Sort in ascending order

5. Print in Simplest form

Choose your option: 1

Enter a and b: 3 4

>> ¾

Choose your option: 2

Enter a and b: 1 2

Enter a and b: 3 4

>> 5/4

Choose your option: 3

Enter a and b: 4 2

Enter a and b: 3 4

>> 3/2

Choose your option: 4

Number of rational numbers to be sorted: 4

Enter in the form a b: 1 2

Enter in the form a b: 1 4

Enter in the form a b: 1 8

Enter in the form a b: 3 4

>> $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$

Choose your option: 5

Enter a/b: 12/8

>> 3/2