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

Assignment 1

Submission deadline (on or before):

24th January 2015, 05:00:00 PM (for both Main and Advanced Batches)

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>_<FIRST-NAME>.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>_<FIRST-NAME>_<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.cpp

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 reverse a positive integer in decimal form using a recursive function.

   Input: number in the range of $0 – 2^{31}$
   Output: reverse of the number

   Example
   Input:
   Enter the value of number
   155
   Output:
   551

   Input:
   Enter the value of number
   1234567895
   Output:
   5987654321

2) Given two strings, say s1 and s2, consisting of letters from the English alphabet only [a-zA-Z]. Write a program to check whether s2 is a substring of s1. If yes, print the starting indices of s2 in s1.
   Note: String index should start from 0 and the strings are case-sensitive.

   Input: Two strings s1 and s2
   Output: Starting index of substring in s1

   Example
   Input:
   Enter string s1
   abababab
   Enter string s2
   aba
   Output:
   Yes
   0
   2
   4

Input:
Enter string s1
abababab
Enter string s2
abb
Output:
No

3) Write a program to create a structure with the following members.
Name, Age, Id-number
Id-number is of type union with the following fields:
Aadhaar-Number: long long int
Voters-ID: String of 7 characters consisting of uppercase letters and decimal digits [0-9A-Z]

The program should read the Name and Age of a person. If the age is less than 18, the program should ask for the Aadhaar-Number and store it in the union. Otherwise the program should ask for the Voters-ID and store it in the union. After reading the input, your program should print the Name, Age, Id-Number of the person.

Input : Name, Age, Aadhaar-Number/Voters-ID
Output : Name, Age, Id-Number

Example
Input:
Enter name:
Krithika
Enter age:
25
Enter Voter- ID:
ABR1286
Output:
Krithika, 25, ABR1286

Input:
Enter name:
Aysha
Enter age:
14
Enter Aadhaar-Number:
876054189623
Output:
Aysha, 14, 876054189623

4) Write a program to calculate area and perimeter of a rectangle using two functions. The program should ask for a choice and based on the choice, corresponding function should be called using a function pointer.
Input: Length, Breadth and choice.
Output: Area or Perimeter based on the choice.

Example
Input:
Enter Length:
12
Enter Breadth:
8
Menu:
1. Area
2. Perimeter
3. Exit

Enter the choice:
1
Area:
96
Menu:
1. Area
2. Perimeter
3. Exit

Enter the choice:
2
Perimeter:
40
Menu:
1. Area
2. Perimeter
3. Exit

Enter the choice:
3

5) Write a program to check whether a given matrix is a magic square or not.
Input: A square matrix of size 'n'
Output: “Yes” or “No”

Example
Input:
Enter the value of n
3

Enter the elements
4
9
2
3
5
7
8
1
6
Output:
Yes

6) Write a program to create a file by reading the name of a file from the command line. The purpose of the file is to store student records, with the following fields:
Name, Roll number, Branch, Marks of 5 subjects.

Your program should allow the user to perform the following operations.

1) Append student record into the file
2) Display all the records in the file (Output should be as per the format given in sample input & output, case 3)
3) Count the number of records in the file
4) Calculate and print average total-marks in the console

Note: *File-handling,* is the name of the program written for the above mentioned task, STUDENT.dat is the name of the file that your program should create.

File-handling STUDENT.dat

Menu:
a) Append record
b) Display all the records
c) Count the records and calculate the average total-marks
d) Exit

Enter your choice: a
Enter Name, Roll number, Branch, Marks of 5 subjects:
Ram
B130123CS
CS
72
40
56
60
41

```
Menu:
a) Append record
b) Display all the records
c) Count the records and calculate the average total-marks
d) Exit

Enter your choice: a
Enter Name, Roll number, Branch, Marks of 5 subjects:
Athira
B130567ME
ME
67
89
37
55
49

Menu:
a) Append record
b) Display all the records
c) Count the records and calculate the average total-marks
d) Exit
Enter your choice: b

Ram          B130123CS      CS              72 40 56 60 41
Athira       B130567ME      ME              67 89 37 55 49

Menu:
a) Append record
b) Display all the records
c) Count the records and calculate the average total-marks
d) Exit
Enter your choice: c

Total number of records = 2
Average total marks = 283

Menu:
a) Append record
b) Display all the records
c) Count the records and calculate the average total-marks
d) Exit
Enter your choice: d
```