National Institute of Technology, Calicut
Department of Computer Science and Engineering
Monsoon2021
CS2092D – PROGRAMMING LABORATORY (MCA-I A)
Assignment-5

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: ASSG4_BxxyyyyCS_LAXMAN.zip). DO NOT add any other files (like temporary files, inputfiles, 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: ASSG4_BxxyyyyCS_LAXMAN_1.c). If there are multiple parts for a particular question, then name the source files for each part separately as in
ASSG4_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 an F grade in the course. The department policy on academic integrity can be found at:

http://minerva.nitc.ac.in/cse/sites/default/files/attachments/news/Academic-Integrity_new.pdf .

Assignment_5
Questions

1. Arjun had got lots of homework and he have to do it fast. So, he wants your help Can u help him?He has given a sentence and her teacher wants him to reverse that sentence , you are the only hope of him.
   Constraint : you have to reverse the sentence using recursion only.
   Input Format:
   A string consists of upper/lower-case alphabets and empty space characters .
   Output Format
   The reversed string containing upper/lower-case alphabets and empty space characters
   Sample Input1
   My Business is my Business None of your Business
   Sample Output1
   ssenisuB ruoy fo enoN ssenisuB ym si ssenisuB yM
   Sample Input2
   Let's Watch a Movie together
   Sample Output2
   rehtegot eivoM a hctaW s'teL

2. Write a program that uses the Merge-Sort algorithm for sorting a given input sequence of integers present in an array A and prints the number of comparisons performed during sorting. Your program must contain the following functions. (In what follows, the notation A[p..r] denotes the sub-array of A, contained within the p^{th} and r^{th} indices, both inclusive.)
   • A recursive function Merge-Sort(A, p, r) that takes as input an array A and sorts the elements in the sub-array A[p..r].
   • A function Merge(A, p, q, r) that takes as input an array A in which the sub-arrays A[p..q] and A[q + 1..r] are sorted. It then merges these sub-arrays such that the the sub-array A[p..r] is sorted.
   • A function Print(A, n) that takes as input an array A of size n, and prints its contents in order, with a single space separating the elements. This function should only be called from the main() function.

   Input Format:
   • The first line contains an integer n, the size of the array A.
   • The second line lists the n elements in A, as space-separated integers .
   Output Format:
   • The first line contains the elements of A in sorted order, separated by space.
   • The second line contains the number of comparisons performed during sorting.
   Sample Input 1
   10
   23 76 89 3 8 0 789 123 889 25
   Sample Output 1:
   0 3 8 23 25 76 89 123 789 889
   34

Sample Input 2:
6
12 9 8 23 45 111
Sample Output2:
8 9 12 23 45 111
16

3. Nick is very fond of horses. He enjoys watching them race. As expected, he has a stable full of horses. He, along with his friends, goes to his stable during the weekends to watch a few of these horses race. Nick wants his friends to enjoy the race and so he wants the race to be close. This can happen only if the horses are comparable on their skill i.e. the difference in their skills is less.
There are N horses in the stable. The skill of the horse i is represented by an integer arr[i]. Nick needs to pick 2 horses for the race such that the difference in their skills is minimum. This way, he would be able to host a very interesting race. Your task is to help him do this and report the minimum difference that is possible between 2 horses in the race.
Assumption: Solve the problem using recursive Quick sort.
Input Format:
• The first line contains an integer N, the number of horses
• The second line lists the N elements in arr[i] as space-separated integers ,the skill of the horses
Output Format:
• The integer showing minimum difference that is possible between 2 horses in the race
Sample Input 1
6
12, 15, 29, 13, 19, 25
Sample Output 1
1
Sample Input 2
8
102,302,51,25,95,14,36,45
Sample Output 2
6

4. We define super digit of an integer x using the following rules:
Given an integer x, we need to find the super digit of the integer.
• If x has only 1 digit, then its super digit is x.
• Otherwise, the super digit of x is equal to the super digit of the sum of the digits of x.
Implement task using recursion.
Input Format:
• The first line contains an integer x
Output Format:
• The first line contains an integer which is the super digit of the integer,x
Sample Input 1
9875
Sample Output 1
2
Sample Input 2
12345
Sample Output 2
6