National Institute of Technology Calicut
Department of Computer Science and Engineering

B. Tech. (CSE) – Third Semester
CS2092D: Programming Laboratory
Assignment – 3

General Instructions

- Programs should be written in C language and compiled using C compiler in Linux platform.
- Invalid input should be detected and suitable error messages should be generated.
- Sample inputs are just indicative.
- Please do the programs in your free time either from System Software Lab (SSL) / Network Systems Lab (NSL), when the lab is not used for regular lab hours or do the programs using your own computer. Even if the programs work in your own computer, there is a chance that they may not work properly in the computers in SSL / NSL, due to some compatibility issues of the C compiler or the machine. Hence, before the evaluation day, check that your programs are ready for execution in the computers in NSL/SSL.
- Evaluation of few random questions from the following questions will be conducted on **06, September 2018 (Thursday).**

PART A: Linear and Binary search, Bubble, Insertion, Selection and Merge sorts

1. Write a program to perform binary search on a sorted array of 'n' integers using recursion. Assume that the array elements are sorted in non-decreasing order. Input of the program should be read from the file ***1.txt*** and print the output onto the console.

   Input

   (a) The first line of the input file contains the number of elements in the array
   (b) The second line contains the array elements (separated by space).
   (c) The third line contains the key to be searched.

   Output

   (a) Print the number of elements in the array.
   (b) The elements of the array.
   (c) If the key is present in the array, print the position of the first occurrence of key in the array, otherwise print NOT FOUND.

   Note: Assume that the array index as well as position of elements in the array starts from 0.

   Input 1

   5
   10 25 32 42 57
   42

   Output 1

   The number of elements in the array is: 5
   The array elements are: 10 25 32 42 57
   The key is found in the position: 3

Input 2
6
10 25 32 42 57 60
0

Output 2
The number of elements in the array is: 6
The array elements are: 10 25 32 42 57 60
NOT FOUND

2. Write a program to implement the linear search algorithm that reads input from the file **2.*t*x*t*** and prints the output onto the console. The file contains an integer 'k', the input size 'n' and a list of 'n' integers. The program prints the location of the first occurrence of 'k' in the input list if it is present, otherwise print "NOT FOUND".

Input file format:
The first line contains the search element 'k'.
The next line contains a positive integer 'n' indicating the length of input array.
The next line contains 'n' integers each of which are separated by space.

Output Format:
In a new line, print i (between 1 and n) if k is the i^{th} element in the list, otherwise print "NOT FOUND"

Input 1
34
11
45 78 39 90 30 0 45 46 43 87 34
Output 1 10

Input 2
5
10
23 76 89 3 8 0 789 123 2789 25
Output 2 NOT FOUND

3. Write a program to implement the bubble sort algorithm, that reads its input from the file ***3.txt*** and prints its output in the console. The file contains the input size 'n' and a list of 'n' integers. The program sorts the list of integers in non-decreasing order.

Input file format:
The first line contains a positive integer 'n' indicating the length of input array.
The next line contains 'n' integers each of which separated by space.
Output Format:
The output should contain integers (separated by space) in non-decreasing order.

Input
10
23 76 89 3 8 0 789 123 2789 25
Output 0 3 8 23 25 76 89 123 789 2789

4. Write a program to implement the selection sort algorithm, that reads input from the file ***4.txt*** and prints the output onto the console. The file contains the input size ‘n’ and a list of ‘n’ integers. The program sorts the list of integers in non-decreasing order. Each iteration of sorting has to be printed in the console.

   Input file Format:
   The first line contains a positive integer ‘n’ indicating the length of input array.
   The next line contains ‘n’ integers each of which separated by space.

   Output Format:
   The output contains n’ integers each of which separated by space. The next n-1 lines contains the output of each iteration.

   Input

   7
   5 9 7 2 4 3 6

   Output

   The sorted list is 2 3 4 5 6 7 9
   First iteration: 2 9 7 5 4 3 6
   Second iteration: 2 3 7 5 4 9 6
   Third iteration: 2 3 4 5 7 9 6
   Fourth iteration: 2 3 4 5 7 9 6
   Fifth iteration: 2 3 4 5 6 9 7
   Sixth iteration: 2 3 4 5 6 7 9

5. Write a program to implement the insertion sort algorithm, that reads its input from the file ***5.txt*** and prints its output in the console. The file contains the input size ‘n’ and a list of ‘n’ integers. The program sorts the list of integers in non-decreasing order.

   Input file format:
   The first line contains a positive integer ‘n’ indicating the length of input array.
   The next line contains ‘n’ integers each of which separated by space.

   Output Format:
   The output contains ‘n’ integers each of which separated by space.

   Input

   10
   23 76 89 3 8 0 789 123 2789 25

   Output

   0 3 8 23 25 76 89 123 789 2789

Note: This assignment has also included 5 questions from Assignment_2_Part-B(Q.2, Q.4, Q.6, Q.8, Q.9)

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