National University of Computer and Emerging Sciences
Karachi Campus

Data Structures

(CS2001)
April 06th
Date: ~~Mar 11th~~ 2024

Course Instructor(s)

Dr. Anam Qureshi and Mr. Fahad Hussain

Sessional-II Exam

Total Time(Hrs): 1 Hour

Total Marks: 15

Total Questions: 03

Roll Number · · · · · · Section · · · · · · Student Signature

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Attempt all the questions.

CLO #03: Compare different data structures in terms of their relative efficiency and design effective solutions and algorithms that make use of them.

Q1: [marks: 5]

You are given a queue of people standing in a line, numbered from 0 to n - 1 from left to right. Each person in the queue has a distinct height represented by an array called heights, where heights[i] denotes the height of the ith person. A person can see another person to their right in the queue if everybody in between is shorter than both of them. Formally, the ith person can see the jth person if:

- The height of the ith person (heights[i]) is greater than the height of the jth person (heights[j]).
- All people between the ith person and the jth person (exclusive) have heights strictly less than both heights[i] and heights[j].

Write a program in C++/Java to compute an array answer of length n, where answer[i] represents the number of people the ith person can see to their right in the queue. Use appropriate data structure to solve the problem.

Example:

Input: heights = [10,6,8,5,11,9]
Output: [3,1,2,1,1,0]
Explanation:
Person 0 can see person 1, 2, and 4.
Person 1 can see person 2.
Person 2 can see person 3 and 4.
Person 3 can see person 4.

Person 4 can see person 5.
Person 5 can see no one since nobody is to the right of them

CLO #02: Solve recursive problems efficiently using Backtracking

Q2: [marks: 5]

Given an m x n grid of characters board and a string word, return true if the word exists in the grid. The word can be constructed from letters of sequentially adjacent cells, where adjacent cells are horizontally or vertically neighboring. The same letter cell may not be used more than once.

Example.

A	B	C	E
S	F	C	
A	D		

Input: Board= ["A", "B", "C", "E".], ["S", "F", "C", "S"], ["A", "D", "E", "E"]
Word to be Searched = "SEE"·
Output: True
Word to be Searched = "ABCD"
Output: False

CLO #01: Use & explain concepts related to basic and advanced data structures and describe their usage in terms of common algorithmic operations.

Q3: [marks: 5]

Do as Directed

- Given an integer n= 7, return a list of all possible full binary trees with n nodes only.
- In what situation quick sort is considered better than merge sort?
- Write a code in C++/JAVA to check if the given array is a max binary heap?
    array= {59,17,44, 14, 16, 43, 40, 19, 10, 15, 20 }

Good Luck!