# University of Central Punjab

Faculty of Information Technology

## Final-Term Exam Spring-2022

### Data Structures and Algorithms – Lab

## Instructions for Invigilators:

1. Students will have 90 minutes to finish the whole exam. It is up to the students to manage their time.

## Instructions for Students:

1. Please create file with appropriate name.
2. Submit only **.h** and **.cpp** files.
3. Late submissions will **NOT** be considered.
4. Create as many classes and functions as required. Remember one function for one functionality.
5. Take care, plagiarism will not be tolerated at any case.
6. **No .RAR** files are accepted.
7. The paper is close book and close notes. No cheat sheet allowed.
8. Use meaningful variable names, take care of naming conventions and indentation. **5 Marks will be deducted for each thing if not followed.**
9. Format of the name of your submission should be *RegisterionNumber_Name_Course_Section*.
   For eg: ***L1F13BSCS2124_MBilalIshfaq_DSA_SEC_D***

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**Question 1 - unordered_map** **50 Marks**

Write a function which finds the frequency of words in an input text file: "***input.txt***" (already given in the exam folder) using **unordered_map** and stores the frequency of every word in an output text file: "***output.txt***".

**You should test the function on the input file provided.**

**Question 2 – Binary Search Tree** **70 Marks**

Code of BST class is already provided. Your task is to write a function which tells if a BST is height balanced or not. You have to use the provided BST class and write the required additional code to perform the task.

**Remember:**

Following conditions should be checked to determine if a binary tree is balanced:

- An empty tree is height-balanced. A non-empty binary tree T is balanced if:
  1. Left subtree of T is balanced
  2. Right subtree of T is balanced
  3. The difference between heights of left subtree and the right subtree is not more than 1.