COMP - 4433 WA
Assignment 4
Due Date: March 23, 2024 @ 23:55
Total Marks: 100

(2,4) Trees Implementation

This assignment is an implementation of insertion and deletion operations for 2-4 trees in the C++ programming language. Your implementation should include functions for inserting a new value into the tree and deleting a specified value from the tree. Below are the details and requirements for your implementation:

Data Structure Definition:

Define a suitable data structure to represent nodes in a 2-4 tree. Each node should contain fields to store the values and pointers to child nodes.

Insertion Function (insert_24_tree): (30 marks)

- Write a C function named **insert_24_tree** that takes the following parameters:
  - A pointer to the root node of the 2-4 tree.
  - The value to be inserted into the tree.
- The reference tree will be the example we have discussed in class for (2,4) Trees insertion.
- Implement the insertion operation by modifying the tree structure to maintain the 2-4 tree properties.
- Ensure that the function handles cases where the tree needs to be split due to a node becoming overflow after insertion.

Deletion Function (delete_24_tree): (30 marks)

- Write a C function named **delete_24_tree** that takes the following parameters:
  - A pointer to the root node of the 2-4 tree.
  - The value to be deleted from the tree.
- The reference tree will be the example we have discussed in class for (2,4) Trees deletion.

- Implement the deletion operation by modifying the tree structure to maintain the 2-4 tree properties.
- Ensure that the function handles cases where the deletion operation may cause underflow in a node, leading to borrowing or merging with sibling nodes.

Testing and Validation: [30 marks]

The implementation will be tested by providing the same values (insertion and deletion) as we have discussed in class. These values will validate the correctness of your implementation.

Submission Guidelines [10 marks]:

- Submit all source code files, documentation (if any) and test cases, in a well-organized manner.
- Ensure that the code is properly commented and follows best coding practices.
- Provide clear instructions on how to compile and execute the code.
- Copy all files in a folder and give it a name 4433-WA-A4-[STUDENT-FIRST-NAME] compress it and upload it on D2L by the specified deadline .
- Submit the assignment by the specified deadline.
- **Not adherence** to the submission guidelines will result in marks deduction by 20%.

Late Penalty

The late penalty for assignment is [2.5^i] (2.5 to the i-th power, rounded to the nearest integer), where i>0 is the number of days you are late. So, if you hand-in your assignment 1 day late, you will be penalized 3%, a delay of 2 days will decrease your grade by 6%, 3 days is penalized 16% and 4 days takes 39% off your grade. You cannot be more than 4 days late, Extensions will be granted only by the course instructor. If you have serious medical or compassionate grounds for an extension, you should take supporting documentation to the office of the Dean of your faculty, who will contact the instructor.

Important Note:

- Plagiarism will lead to serious consequences and a grade of zero for the assignment. The similarity check will be used to detect possible cheating cases where both students will be awarded **ZERO** if found guilty.
- No support from Chat GPT or any other source is allowed and, **IF** will be detected by in place sophisticated softwares **THEN** will be dealt with by University prescribed rules.
- Feel free to seek assistance from the instructor or teaching assistants if you encounter any difficulties during the assignment.

********** **END of ASSIGNMENT 4** **********