National University of Computer and Emerging Sciences

Laboratory Manual

for

Data Structures Lab

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Section	CS-E
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Objectives:

In this lab, students will practice:

1. AVL Tree Implementation

Question#1

a. Create a class Student which has the following data members: rollNumber as int, name as string, and cgpa as float. Also, overload << operator to print the data of student object.

b. Now create a node as follows:

```
struct StdNode
{
        Student* data;
        int height
       StdNode *lChild;
       StdNode *rChild;
//implement any required constructors/getters/setters.
};
```

Note: Roll Number is the key. You will be comparing the roll number when inserting the node.

c. Implement an AVL tree which contains a pointer to the root node of AVL tree of type StdNode. Implement the following functions:

1. AVL(); //default constructor
2. void insertStudent(int rollNumber, string name, float cgpa); //inserts a new node in the AVL tree and maintains the height property of the AVL tree.
3. Student* search(int rollNumber); //returns the pointer to data of the student with the given roll number.
4. bool deleteStudent(int rollNumber); //delete student and the tree should maintain the height property of the AVL tree.
5. inorderPrintStudentRollNumbers(); //prints the roll numbers of students in inorder fashion.
6. ~AVL(); //destructor.

d. Create a global function populateStudentTree(string filename, AVL &stdTree) which is passed as parameter a student file name and an AVL tree object by reference. The function then reads the students one by one and inserts the student objects in the AVL tree.

Pattern in file
rollNo name cgpa

e. Now run the following main program:

```
int main()
{
    AVL stdTree;

    popuateStudentTree("students.txt", stdTree);

    cout << endl << endl << "Tree Before Deletion: " << endl;

    stdTree.inorderPrintStudentRollNumbers();

    //delete any student

    cout << endl << endl << "Tree after Deletion: " << endl;

    stdTree.inorderPrintStudentRollNumbers();

    cout<<"Data of student, whose roll number is 254, is as follows: "<< endl;

    cout << *stdTree.search(254);

}
```