

Lab Assignment 6: CS2233

27th September, 2024

Kindly adhere to the following instructions.

- Please write a C/C++ program corresponding to each problem. Your code should be well commented and variable names should be appropriately chosen. Also, prepare a `readme` text file where you can mention instructions to run the program/how to take input, etc.
 - Create a folder and put all the code files and `readme` text file in it, give a name to the folder as “`yourName_yourRollNo`”, zip the folder and submit it to the Google Classroom portal.
 - Your code will also be checked against plagiarism (both from web and peer).
 - Any form of plagiarism (web/chatGPT/with peers) will be severely penalised and will result in an F grade.
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Question:

Construct a Red-Black tree over the following keys (assuming you read the numbers from left to right).

9, 8, 5, 4, 99, 78, 31, 34, 89, 90, 21, 23, 45, 77, 88, 112, 32.

The Red-Black tree should be constructed by calling the `insert (root, key)` listed below.

Each `internal node` of the tree should use the following `struct` data type:

```
struct node
{
    int data;
    struct node *left;
    struct node *right;
    struct node *parent;
    bool color;
    int black_depth;
```

```
 } ;
```

Note: Using parent pointers and black depth in the above structure is optional.

You can assume that you have stored the pointer to the `root` node. Please, write the functions for:

1. `search (root, key)` – this function takes the pointer to the `root` node, and `key` as input, and returns the pointer to the node where `key` is present. If `key` is not present in the Red-Black tree, then the code should output an error message. Please run your function for searching nodes 32, 56, 90.
2. `insert (root, key)` – this function takes the pointer to the `root` node, and `key` as input, and inserts the node at the appropriate position. Please run your function for inserting nodes 132, 156, 11, 7. Print `inorder` and `preorder` traversal of the respective trees upon each insertion.