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Subject: Advanced Algorithm

Practical 7

Aim: Implement insertion of red-black Tree

Theory:

Red Black Tree is a type of Binary search Tree, in which a color is assigned to each node.
Some properties associated with red-black tree are:

1) Each node can have either red or black colour. The root node will have black colour as well as the leaf nodes will have black colour

2) The length of path from a node u to any leaf node is constant and is called as black height of the node.

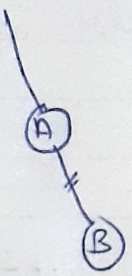
3) The difference between max height &

is constant.

4) There cannot be 2 consecutive red nodes. While Inserting a new node the edge to the new node should be red colour.

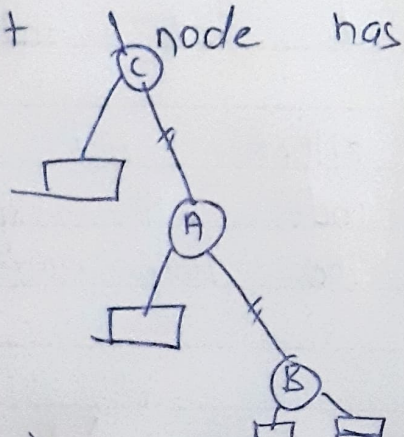
Some cases which may arise when Inserting a node are

1) Parent node has black incoming edge.

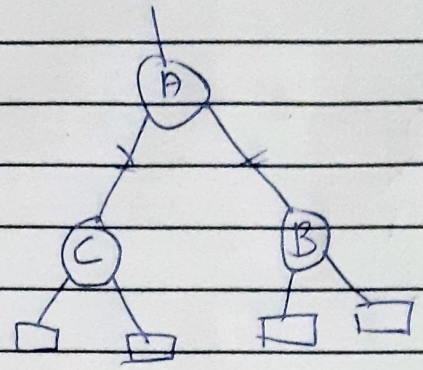


There is no Issues in this case

2) Parent node has red incoming edge

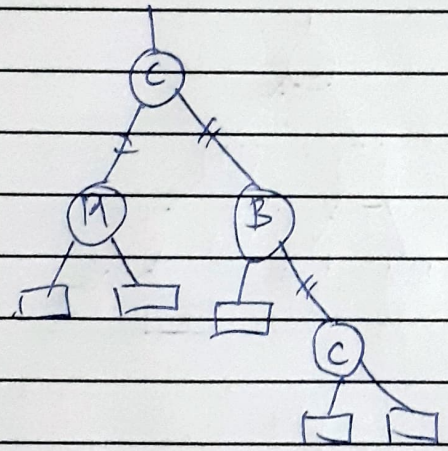


In this case we need to single left rotate the node A

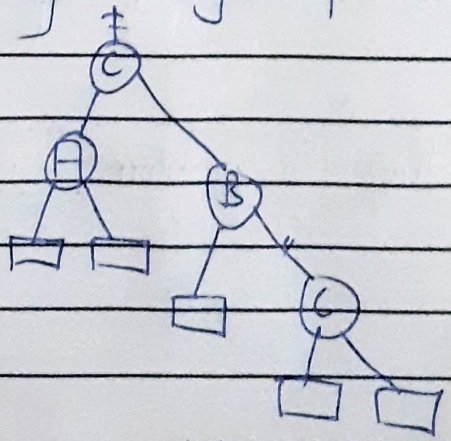


Now the problem is solved and the properties of red black tree are preserved.

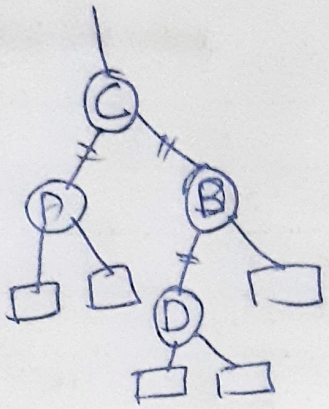
B)



In this case we need to promote the node C by just converting the edge C & B & C & A to black colour & that of incoming edge of C to red colour.

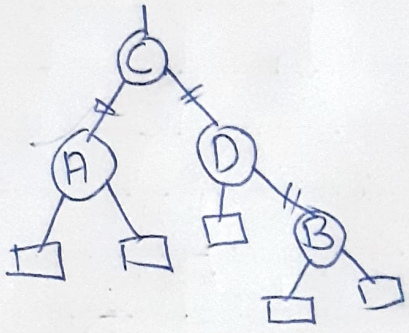


4)

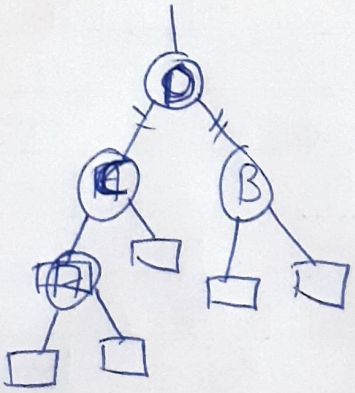


Now in this case we need to Double rotation. b

1st rotation:



2nd rotation



Now the problem is solved.

Date :

Conclusion: The Insertion of node in Red Black Tree is studied. The Insertion of node takes O(1) time as any operation just take change of pointers.