

Data Structures and Object-oriented Programming

Instructor: Prof. Liwei Chan

Quiz2 Date:2021/05/31

Student ID:

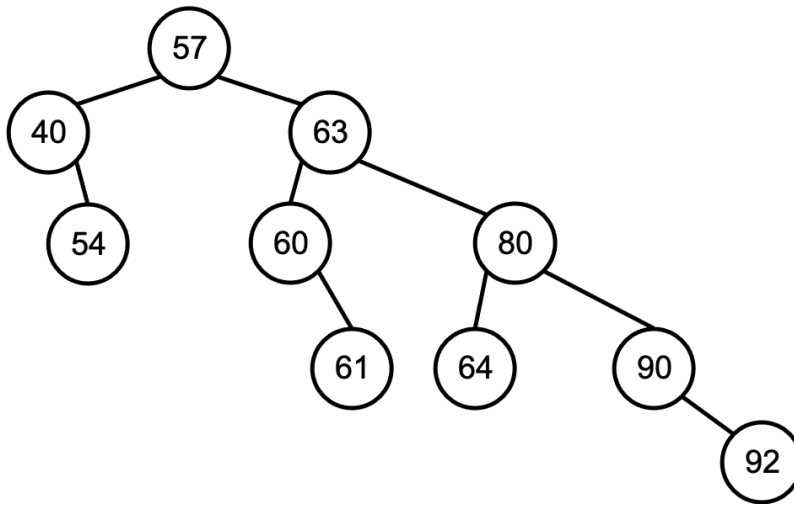
Student Name:

Part I

1. Given the following keys 79, 68, 106, 39, 118, 99, please write down the result if the hash function $h(X) = (X \bmod 7)$ is used. Assume that each bucket only has one slot.
 - A. (10%) Open addressing hash table using linear probing ($F(i) = i$). What is the number in bucket 3?
 - a. 106
 - b. 79
 - c. 99
 - d. 68
 - e. none
 - B. (10%) Open addressing hash table using quadratic probing ($F(i) = 3 * i^2$). What is the number in bucket 3?
 - a. 68
 - b. 118
 - c. 99
 - d. 39
 - e. none.
2. Which of the following statements about Kruskal algorithm and Prim's algorithm is correct?
 - a. Kruskal algorithm's concentration is on vertices.
 - b. Prim's algorithm is better when there are many more edges than vertices.
 - c. Kruskal algorithm can't use on negative-weighted-undirected graph.
 - d. For Prim's algorithm, choose different vertex as start vertex may get different total weight of the minimum spanning tree.

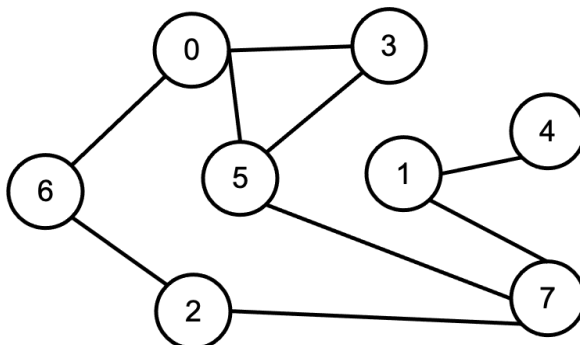
Part II

1. Please answer the following questions according to the given tree.



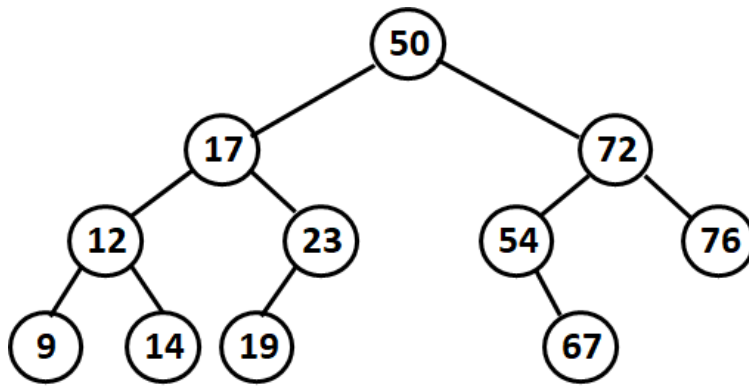
- a. Traverse the tree in post-order.
54 40 61 60 64 92 90 80 63 57
- b. Is this tree a binary search tree?
Yes.
- c. Is this tree an AVL tree?
No.

2. According to the graph, please traverse the whole graph from node 0 in the assigned method. If there are multiple routes on a vertex, choose the smaller one to print out first.

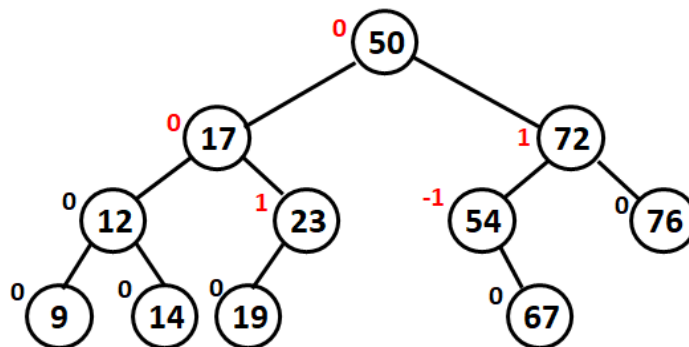


- a. (5%) Depth-First Search
0 3 5 7 1 4 2 6
- b. (5%) Breadth-First Search
0 3 5 6 7 2 1 4

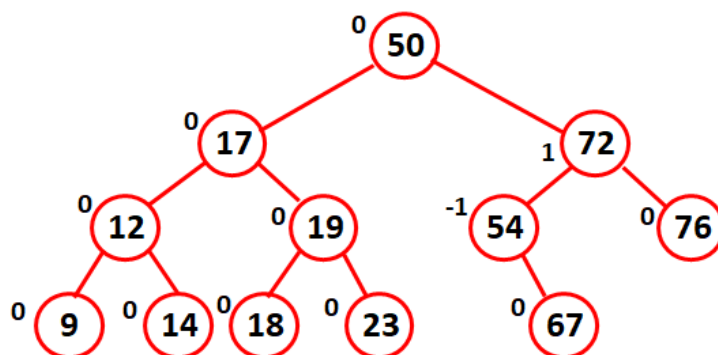
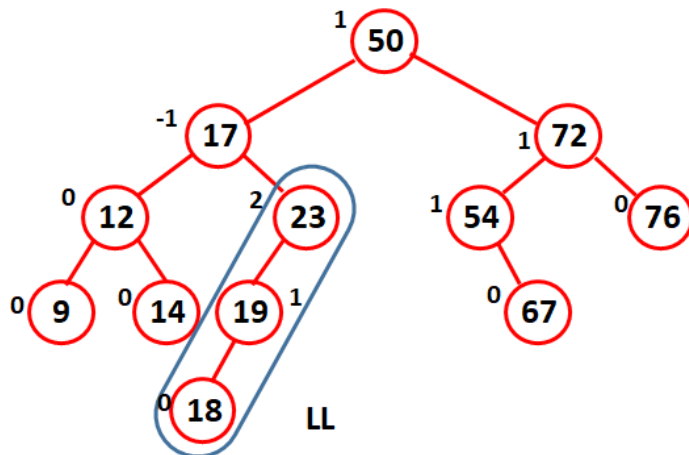
3. Given the following AVL tree, please answer the following questions and **draw the processing details as much as possible**.



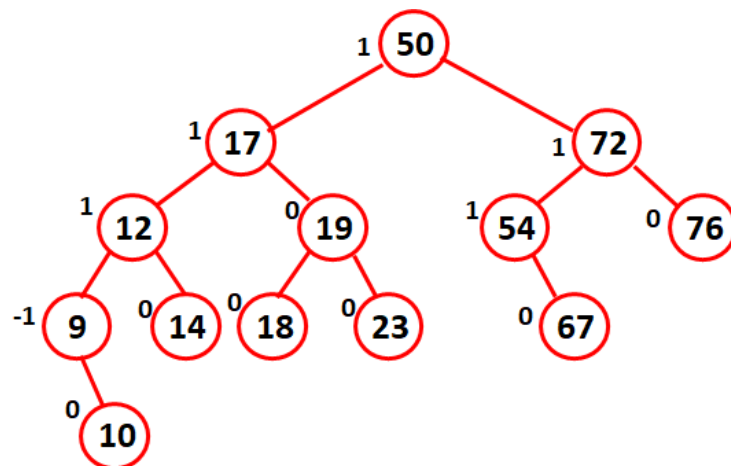
- a. What are the balance factors of node 50, node 17, node 72, node 23, and node 54? (Hint: For node T in a binary search tree is defined to be HL-HR, where HL and HR respectively, are the heights of the left and right subtree of T.)



- b. Follow the result of (a), insert 18 to the AVL tree. Draw the **processing details** and **results**.



- c. Follow the result of (b), insert 10 to the AVL tree. Draw the **processing details** and **results**.



- d. Follow the result of (c), insert 66 to the AVL tree. Draw the **processing details** and **results**.

