Student ID: Student Name:

Part I (30%)

1. (20%) Given the following keys 79, 68, 106, 39, 118, 99, please write down the result if the hash function **h(X) = (X mod 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. (10%) 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 (70%)

1. (20%) Please answer the following questions according to the given tree.
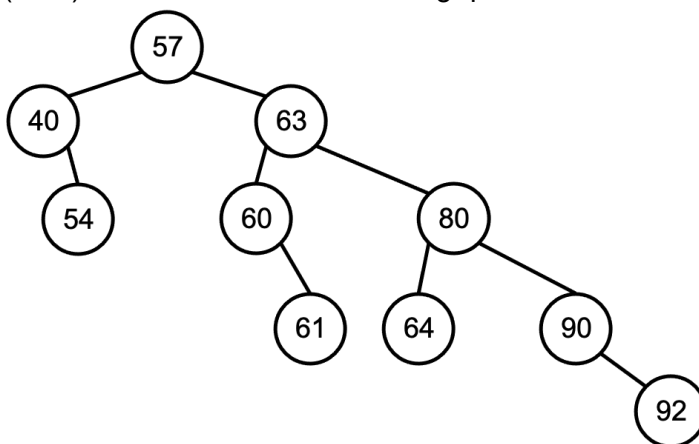
a. (10%) Traverse the tree in post-order.

b. (5%) Is this tree a binary search tree?

c. (5%) Is this tree an AVL tree?

2. (20%) 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.
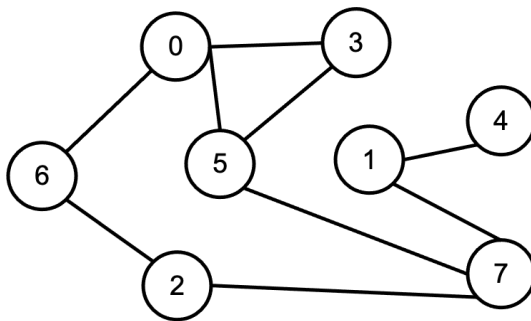
a. (10%) Depth-First Search

b. (10%) Breadth-First Search

3. (30%)Given the following AVL tree, please answer the following questions and **draw the processing details as much as possible**.
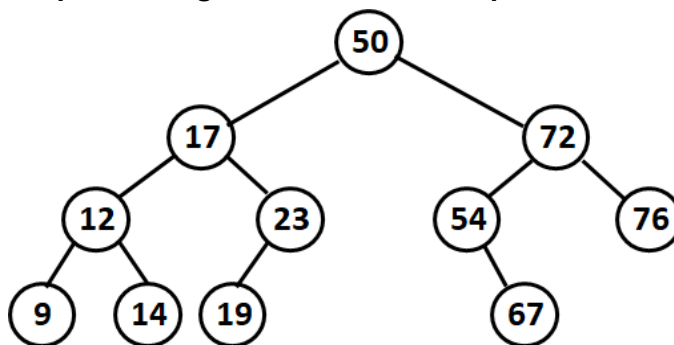
a. (10%, 2%each)What are the balance factors of node 50, node 17, node 72, node 23, and node 54? (Hint: For node T in a binary search tree is defined to be HL-HR, where HL and HR respectively, are the heights of the left and right subtree of T.)

b. (6%)Follow the result of (a),insert 18 to the AVL tree. Draw the **processing details** and **results** next to each node.

c. (7%)Follow the result of (b),insert 10 to the AVL tree. Draw the **processing details** and **results** next to each node.

d. (7%)Follow the result of (c),insert 66 to the AVL tree. Draw the **processing details** and **results** next to each node.