NORTH SOUTH UNIVERSITY
Department of Electrical and Computer Engineering
B.Sc. in Computer Science and Engineering Program
Final Assessment
Fall 2021 Semester

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Course:	**CSE 225 Data Structure and Algorithms, Section-10**
Instructor:	**Mohammad Rezwanul Huq (MRH1), PhD, Associate Professor (Part-time)**
Full Marks:	**100**
Duration:	**1 hour and 30 minutes [Last time of Submission: 11-20 AM]**

Note: There are **5** (**FIVE**) questions. Answer ALL of them. The Mark of each question is mentioned at the right margin.

1. Given a postorder and inorder sequence of a Binary Tree, **write a program in C/C++ to** [20] construct the Binary Tree. While constructing the Binary Tree, you may consider the following Node class.

```
class Node{
   public:
       int key;
       Node* leftChild;
       Node* rightChild;
}
```

2. Consider the following Binary Search Tree. [20]
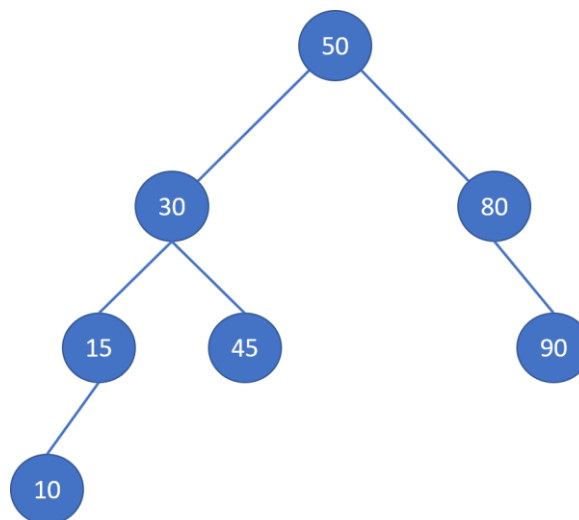
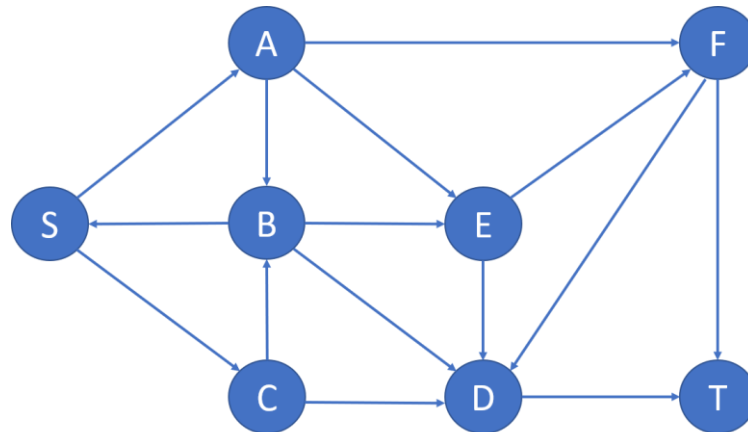**(a) Mark** the nodes as KH, EH, or RH, whichever is applicable. (5 points)

(b) Consider the following sequence of values.

12, 13, 14, 100, 85

After inserting each of these values, **show the resulting AVL Tree.** Please note that these values are inserted sequentially one after another on the resulting AVL Tree. (15 points)

**3.** Consider the following directed graph. [20]

(a) Find the order of the nodes after applying the BFS algorithm over the given graph. Assume that the source node is S and when visiting multiple nodes are possible, always visit the nodes in alphabetic order. Also, draw the predecessor sub-graph or the BFS Tree. (10 points)

(b) Find the order of the nodes after applying the DFS algorithm over the given graph. Start the traversal from node S and when visiting multiple nodes are possible, always visit the nodes in alphabetic order. Also, draw the predecessor sub-graph or the DFS Tree. (10 points)

4. Consider the following directed graph. [20]
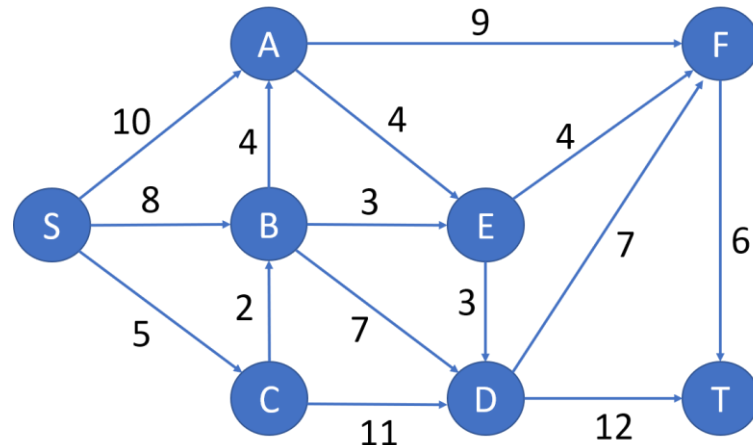
(a) Find the shortest path from S to all other nodes using Dijkstra's algorithm. Show detailed computation of your answer. (15 points)

(b) Given an undirected graph, how can you determine that the given graph also satisfies the condition of a Tree. Justify your answer with a suitable example. (5 points)

5. Assume that the size of the hash table is 7 and the hash function is h(k) = k mod 7. [20]

Draw the contents of the hash table using both **Linear probing** and **Quadratic probing** for the following sequence of values.

$$17, \ 35, \ 18, \ 10, \ 42, \ 26$$