1. Consider the following Binary Search Tree $T$

```
    70
   /  \
  35   90
 / \
20 45
 /  \
10 40
```

(a) (3 %) Show the binary search tree after deletion of the node with key value 35 from $T$

(b) (6 %) Write an algorithm to output the data of a binary search tree in increasing order.

2. A path of a binary tree is defined as a list of nodes traversed from the root node to a leaf node according to the tree pointers. The length of a path is the number of nodes contained in the path. A maximal path is a path that contains the maximal number of nodes.

(a) (5 %) Assume that the length of a maximal path in a binary tree is $H$. What is the maximal number of paths that the binary tree may have?

(b) (8 %) Write a recursive procedure to find the length of the maximal path in a binary tree.

(c) (2 %) Analyze the time complexity of your procedure.

3. (9 %) Do the heap operations: INSERT(16), DELETE(25), INSERT(24), on the following max heap step by step. Show the results after each operation.

```
    25
   /  \
  20 22
 / \
8 10
```

4. Please write an ADD an item to queue procedure. (13%) 

5. Please write a sorting procedure. (20%)

6. Use array or list to implement the following operations for stack S.
   (a) PUSH an item into S. (6%)
   (b) POP an item from S. (6%)

7. For the directed graph given below.
   (a) List all the shortest paths from $V_0$ to all destinations. (5%)

(b) Write an algorithm that can find out the shortest paths for a given graph of $n$ vertices from an assigned starting vertex. (17%)