1. Illustrate a case that using the structure of List is superior to other structures.
   (10%)

2. Write an algorithm to process that case. (7%)

3. Illustrate a case that using the structure of Queue is superior to other structures.
   (10%)

4. Write an algorithm to process that case. (6%)

5. A. What is the minimum height of a binary tree of n-nodes and justify your answer.
   (5%)
   B. Construct the heap tree (max heap in this problem) for the key sequence: 12, 9, 6, 17, 3, 5, 4, 1, 8. (5%)

6. Construct an AVL tree step by step for the input sequence: 50, 90, 100, 80, 10, 60, 70. Indicate the rotations involved with this AVL tree? (7%)

7. Show step by step your construction of a 2-3-tree for inserting 20, 10, 45, 30, 31, 6 and 7, then deleting 30. (8%)

8. Show your hash table, which contains 5 buckets and each bucket containing at most 3 records, after inserting 15, 17, 26, 24, 11, 12, 9, 20, 8, 25, 30 if the hashing function is based on division and the overflow handling is linear open addressing. Calculate the average number of probes associated with your hash table. (8%)
9. Use array to implement the following operations for stack S.
   a. PUSH an item into S (6%).
   b. POP an item from S (6%).

10. Given the following undirected graph:
    a. Show its adjacency matrix (4%).
    b. Show its adjacency list (4%).
    c. Show the depth-first spanning tree, starting from, node 0 and in the alphabetical order (4%).
    d. Show the breadth-first spanning tree, starting from, node 0 and in the alphabetical order (4%).
    e. List all the shortest paths from node 0 to all destinations (6%).

![Graph Diagram]