1. Given a list of input data: 12, 2, 6, 7, 9, 5, 17, 7, 1, 56, 33, 6, 25, 3, 24
   A. (3%) Construct a Binary Search Tree.
   B. (4%) Construct a B tree (of order 2).
   C. (3%) Why is B tree better than Binary Search Tree? Please list the reasons.

2. Given the following tree T, please visit nodes in T with three traversal methods.
   A. (4%) What is the POSTORDER traversal of T?
   B. (4%) What is the INORDER traversal of T?
   C. (4%) What is the Depth First Search (DFS) of T?
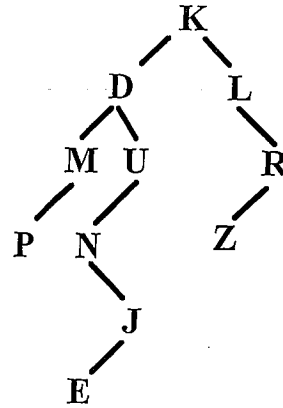
3. Given a list of input data: 12, 3, 4, 2, 8, 24, 9
   A. (4%) Perform Quick Sort (partition sort) step by step and provide its complexity.
   B. (4%) Perform Heap Sort step by step and provide its complexity.

4. In the following graph, nodes are represented as alphabets and links contain costs.
   A. (4%) Please perform a branch-and-bound search to find the optimal (minimum) path from R to E. Please draw a tree to show your process.
   B. (4%) Can you perform a best first search on the above graph? Why?
   C. (4%) What are the similarities and differences between genetic algorithms and hill climbing?
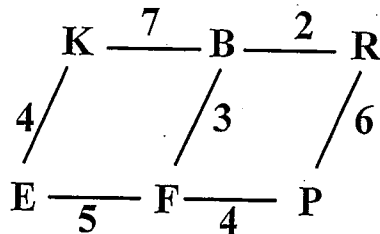
5. In the following graph, nodes are represented as alphabets and links contain costs.

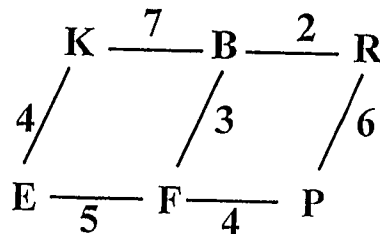A. (4%) Please use the Prim's algorithm to develop a minimal spanning tree and a dendrogram, respectively. You should show the process.

B. (4%) Please use the Kruskal's algorithm to develop a minimal spanning tree and a dendrogram, respectively. You should show the process.

$$K \xrightarrow{7} B \xrightarrow{2} R$$

$$4 \diagup \quad 3 \diagup \quad 6 \diagup$$

$$E \xrightarrow{5} F \xrightarrow{4} P$$

6. (8%) Write a procedure to determine whether two linked lists A and B are identical.

7. (8%) Write a recursive algorithm to duplicate a binary tree T.

8. (5%) Is the linear array a suitable data structure for a queue? Why?

9. For a graph $G = (V, E)$, $V = \{0, 1, 2, 3, 4, 5, 6, 7\}$, $E = \{(0, 1), (0, 2), (0, 7), (1, 2), (2, 3), (2, 7), (3, 4), (3, 5), (3, 7), (4, 5), (5, 6), (6, 7)\}$, and the cost for above edges are $\{13, 16, 27, 11, 20, 22, 19, 18, 29, 15, 26, 11\}$, respectively.

   A. (8%) Use a Depth First Search-based and a Breadth First Search-based algorithm to determine the minimal spanning tree.

   B. (7%) How do you detect a cycle in a MST algorithm?

10. A. (7%) Write a recursive program to calculate the n-th number of the Fibonacci sequence ($F_n = F_{n-1} + F_{n-2}$, with the seed values $F_0 = 1$ and $F_1 = 1$)

    B. (7%) Write a non-recursive program to solve the above problem.