(2 ½ Hours) **[Total Marks: 75**

N.B. 1) **All** questions are **compulsory.**
2) **Figures** to the **right** indicate marks.
3) **Draw** suitable **diagrams** and illustrations **wherever necessary**.
4) **Mixing** of sub-questions is **not allowed.**

Q. 1 Attempt All the Questions

A) Choose the correct alternative **(5M)**

i) Time taken by a known algorithm to solve a problem with worse case input gives us the _____ bound
   a) lower b) upper
   c) both lower and upper d) None of these

ii) _____ is an unambiguous specification of how to solve a class of problems.
   a) program b) instruction
   c) algorithm d) none of these

iii) BST is the abbreviation for _____
   a) Binary Search Tree b) Binary Search Time
   c) Binary Solution Technique d) None of these

iv) The matching algorithm on a sequence of length n runs in _____ time
   a) $O(nlogn)$ b) $O(n)$
   c) $O(logn)$ d) $O(2n)$

v) A path that starts and ends on the same vertex is called _____
   a) cycle b) tree
   c) spanning tree d) none of these

B) Fill in the blanks(rapidly, longest, shortest, slowly, child, parent, tree, linked-list) **(5M)**

i) Leaf nodes represent the nodes that do not have any _____.
ii) Pre-order and Post-order traversals are operations associated with _____ data structure.
iii) Prim's algorithm is an example of _____ path problem.
iv) The sequential search runs in _____ time.
v) The n-log-n function grow a little more ____ than the linear function.

C) Explain the following terms in one or two lines **(5M)**

i) Big-Omega
ii) Depth-first traversal
iii) Linear search
iv) Binary tree
v) Selection algorithms

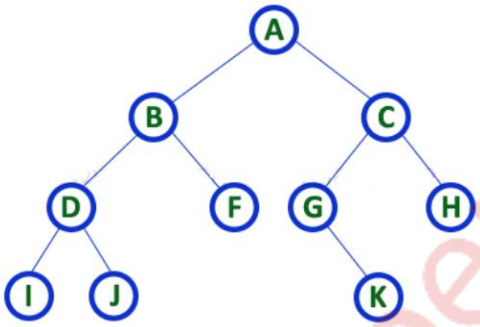
Q.2 Attempt the following: (Any THREE) **(15M)**

A What is Asymptotic analysis of an algorithm? Explain.

B What is divide-and –conquer method of problem solving? Given an example where this method is used.
C Write a note on method of guessing and confirming.
D Write the algorithm for printing lines of a file in reverse order.
E Write a note on commonly used logarithms and summations in algorithmic analysis.
F Explain how to compare algorithms. Give example.

Q.3 Attempt the following: (Any THREE) **(15M)**

A What is an AVL tree? Explain its characteristics.
B What is a traversal of a tree? Compute any two such traversals for the following tree.



C Briefly describe the concept of topological sorting. Give example.
D Explain with suitable example the adjacency list and adjacency matrix representations of a graph. Give example.
E What is a shortest path problem? Explain any one algorithm for finding shortest path in a graph.
F Define graph. Differentiate between directed and undirected graph. Give examples.

Q.4 Attempt the following: (Any THREE) **(15M)**

A What is breadth-first traversal of a tree? Give the algorithm for performing a breadth-first traversal on a tree.
B Write a note on algorithm design techniques.
C Briefly explain the Longest Common Subsequence problem.
D Explain any two problems that can be solved using dynamic programming.
E What are the elements of greedy algorithm? Explain.
F Explain the concept of Classification by Implementation Method.

Q.5 Attempt the following: (Any THREE) **(15M)**

A Write a note on median-of-median algorithm.
B Explain the structure of threaded binary tree? Give suitable example to illustrate the concept.
C Define algorithm. State its essential characteristics.
D Write a note on Master theorem. Give example.
E Write a note on partition based selection algorithms.
F Write a note on upper and lower bounds of algorithm.

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