

(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) $O(n \log n)$
 - b) $O(n)$
 - c) $O(\log n)$
 - 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)

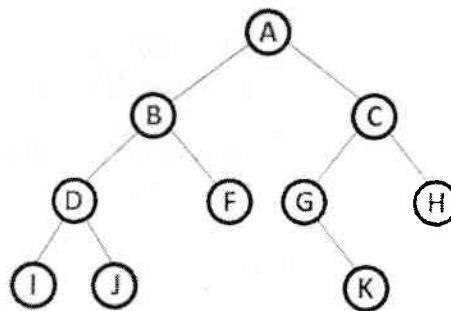
- A) What is Asymptotic analysis of an algorithm? Explain.

- B What is divide-and-conquer method of problem solving? Give 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.