

- 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) Ω -notation provides an asymptotic _____ bound.
 a) upper
 b) both upper and lower
 c) lower
 d) none of these
- ii) Which of the following statement is true.
 i. Quicksort, like merge sort, is based on the divide-and-conquer paradigm.
 ii. ω -notation to denote a lower bound that is asymptotically tight.
 a) i-true, ii-false
 b) i-true, ii-true
 c) i-false, ii-true
 d) i-false, ii-true
- iii) In binary search trees, _____ tree walk prints the key of the root of a subtree between the values in its left subtree and those in its right subtree.
 a) postorder
 b) preorder
 c) inorder
 d) none of these
- iv) Which of the following holds true for Prim's algorithm?
 i. The edges in the set A always form a single tree.
 ii. It follows a greedy strategy.
 a) Only i
 b) Both i and ii
 c) Only ii
 d) Neither i nor ii
- v) An acyclic graph contains _____ cycles.
 a) no
 b) many
 c) one
 d) none of these

B) Fill in the blanks:

(5M)

{ lower, halts, upper, moves, recurrence, efficient, $\Omega(n^2)$, $\Theta(n^2)$ }

- i) O -notation describes a _____ bound.
 ii) An algorithm is said to be correct if, for every input instance, it _____ with the correct output.
 iii) An algorithm that is asymptotically more _____ will be the best choice for all but very small inputs.
 iv) A _____ is an equation or inequality that describes a function in terms of its value on smaller inputs.
 v) The worst-case running time of insertion sort is _____.

- C) Explain the following terms in one or two lines (5M)
- Rate of growth
 - Running time of Algorithm
 - Correctness of Algorithm
 - Expression Trees
 - Weighted graphs

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

- Define Algorithm. Explain why analysis of algorithm important?
- Briefly describe the Master method for solving recurrences of the form $T(n) = aT(n/b) + f(n)$
- How do we compare two algorithms? Explain.
- Write a note on Method of Guessing and Confirming.
- Briefly describe the “Big-Omega” and “little-omega” in algorithmic analysis.
- Write a note on divide-and-conquer approach.

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

- What are the type of binary tree? Explain any two.
- Write a note on binary tree traversal.
- What is an AVL tree? Explain.
- Define Graph. What are its applications? Explain.
- What is a minimum spanning tree? Explain with suitable example.
- Write a note on median-of-median algorithm.

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

- What is greedy technique? What are its advantages and disadvantages?
- Write a note on computer algorithms that are based on divide-and-conquer programming approach. What are the advantages of divide and conquer based algorithms?
- Write a note on Master theorem.
- Briefly describe Dynamic Programming Strategy. Also give the Steps of Dynamic Programming Approach.
- Briefly describe the longest common subsequence (LCS) problem.
- State the examples of Dynamic Programming Algorithms. Explain any one.

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

- What is Analysis of Algorithm? Why is it important? Explain.
- List the various properties of binary tree.
- What is a threaded binary tree? Explain.
- Write a note on Partition-based Selection Algorithm.
- What is a Topological Sort? Explain it with a suitable example.