

201

(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) 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)

- i) Rate of growth
- ii) Running time of Algorithm
- iii) Correctness of Algorithm
- iv) Expression Trees
- v) Weighted graphs

Q.2 Attempt the following: (Any THREE)

(15M)

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

Q.3 Attempt the following: (Any THREE)

(15M)

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

Q.4 Attempt the following: (Any THREE)

(15M)

- A What is greedy technique? What are its advantages and disadvantages?
- B 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?
- C Write a note on Master theorem.
- D Briefly describe Dynamic Programming Strategy. Also give the Steps of Dynamic Programming Approach.
- E Briefly describe the longest common subsequence (LCS) problem.
- F State the examples of Dynamic Programming Algorithms. Explain any one.

Q.5 Attempt the following: (Any THREE)

(15M)

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