1Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

THIRD SEMESTER M.C.A DEGREE EXAMINATION (Regular), DECEMBER 2022
(2021 SCHEME)

Course Code: **21CA302**

Course Name: **Design and Analysis of Algorithms**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Find the solution of the following recurrence equation using Master's theorem.
   a) T (n) = 2T (n/2)+ n log n
   b) T (n) = 3 T (n/2) + n^2
2. What is an algorithm? Explain its characteristics.
3. Compare linear search and binary search.
4. Write pseudocode for Strassen's matrix multiplication.
5. Describe job sequencing problem with the help of an algorithm.
6. Specify the difference between divide and conquer strategy and dynamic programming.
7. Differentiate between depth first and breadth first tree in branch and bound method.
8. State sum of subset problem.
9. Distinguish between deterministic and non-deterministic algorithm.
10. Compare SAT and 3-SAT problem.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

11. Explain time and space complexity with relevant examples. (6)

OR

12. With suitable examples, explain various methods of solving recurrence equations. (6)

MODULE II

13. Write down an algorithm for finding minimum and maximum element from a list of numbers. Explain the concept with an example. (6)

OR

14. Write the merge sort algorithm. Validate the algorithm and analyze its time complexity with an appropriate example. (6)

MODULE III

15. Find an optimal solution to the fractional Knapsack problem for an instance with number of items 7, capacity of the sack, W=15, profit associated with the items, (p1, p2, …, p7) = (10,5,15,7,6,18,3) and weight associated with each item, (w1, w2, …, w7) = (2,3,5,7,1,4,1). Also write down the Knapsack algorithm. (6)

OR

16. What is travelling salesperson problem? Write down TSP algorithm by dynamic programming method. (6)

MODULE IV

17. Explain the concept of backtracking. Explain how N-Queens problem can be solved using backtracking. Draw the state space tree corresponding to 4-Queen problem. (6)

OR

18. Explain N^2 -1 puzzle problem in detail. (6)

MODULE V

19. a) Prove that the travelling salesperson problem is NP-Complete. (4)

    b) State Max-flow Min-cut theorem. (2)

OR

20. Explain NP-Hard and NP-Complete problems with examples. (6)

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