H Roll No. .....

TMC–301

M. C. A. (THIRD SEMESTER)

MID SEMESTER EXAMINATION, 2022

DESIGN AND ANALYSIS OF ALGORITHM

Time : 1½ Hours

Maximum Marks : 50

Note : (i) Answer all the questions by choosing any ***one*** of the sub-questions.

(ii) Each question carries 10 marks.

1. (a) What do you understand by recursive and non-recursive algorithms ? Write steps to analyze time complexity of recursive algorithms with the help of an example. (CO1)

OR

(b) Explain loop invariant in Quick Sort partition algorithm and implement Quick Sort on the given array : (CO1)

15	28	12	7	6	20	48	25

2. (a) Define Red-Back tree and its properites. Explain why sentinel value is used in RB tree. (CO1, CO2)

OR

(b) What do we use asymptotic notation in the study of algorithm ? Explain in brief various asymptotic notations and give their significance. (CO1, CO2)

3. (a) Write an algorithm for in-order and pre-order traversal. Also analyze its time and space complexity. (CO1, CO2)

OR

(b) Let A [1 ..... n] be an array of n distinct number. If $i < j$ and A [i] > A [j], then pair (i, j) is called inversion of A.

Write an algorithm to determine the number of inversions in A in Θ (n log n) worst case time. (CO1, CO2)

4. (a) Explain a search procedure using divide and conquer technique. Prove that the procedure works correctly. Give the time complexity of the algorithm. (CO1)

OR

(b) Write Master's method for solving recurrence relation of different types. (CO1)

5. (a) Sort the following array using merge sort. Show all computations : (CO1)

15	28	12	7	6	20	48	25	10

OR

(b) Prove that any comparison sort algorithm require Ω (n log n) comparison in worst case. (CO1)