S.No. : 210 NCS4602

No. of Printed Pages : 05

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 43220 Roll No. 1 2 3 0 [redacted]

B. Tech Examination 2026

(Even Semester)

DESIGN & ANALYSIS OF ALGORITHMS

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : $1 \times 8 = 8$

   (a) Discuss the basic steps in the complete development of an algorithm.

   (b) Explain and compare best and worst time complexity of quick sort.

   (c) Discuss the properties of red-black trees.

[P. T. O.

(d) Comapre greedy programming vs dynamic programming vs divide and conquer.

(e) Illustrate the applications of graph coloring problem.

(f) Differentiate back tracking and brand and bound technique.

(g) Define NP, NP Hard, NP complete. Give example of each.

(h) Explain randomized algorithms.

SECTION – B

2. Attempt any two parts of the following : $6 \times 2 = 12$

(a) Explain merge sort algorithm and sort the following sequence

{23, 11, 5, 15, 68, 31, 4, 17} using merge sort.

(b) Design a binomial heap for the following.

A = { 7, 2, 4, 17, 1, 11, 6, 8, 15, 10, 20}

(c) Illustrate the N-queens problem. Draw "State space tree" for 4 queen problem using backtracking.

(d) Write Khuth-Morris-Pratt string matching algorithm. Take a suitable example. Compute the prefix function π for the pattern = ababbabbabbababbabb when the alphabet is $\overline{Z}$ = {a,b}.

SECTION – C

Note:- Attempt all questions. Attempt any two parts from each question. $5 \times 8 = 40$

3. (a) Explain why moster theorem cannot solve T (h) = T(h-1)+n, giving reasons and slove $T(h) = gT(h/3) + h^2$. Using master theorem.

(b) What do you understand by heap sort? Sort the following sequence {25, 57, 48, 36, 12, 91, 86, 32}using heap sort.

(c) Write an algorithm for insertion sort. Find the time complexity of insertion sort in all cases.

4. (a) Discuss the various cases for insertion of key in red black tree for given sequence of ley in an empty red black tree :

{ 15, 13, 12, 16, 19, 23, 5, 8}.

(b) What is knapsack problem? Some fractional knapsack problem using greedy programming for the following four items with their weights W= {3, 5, 9, 5} and values V = {45, 30, 45, 10} with knapsack capacity is 16.

(c) Explain dijkstra's algorithm to solve single source shortest path problem with suitable example.

5. (a) Write LCS algorithm and determine LCS of :

{A, B, C, B, D, A, B} and {B, D, C, A, B, A}.

(b) What is sum of subset problem? Draw a state space tree for sum of subset problem using packtracking? Let n=6, m=30 and w [1:6]= { 5, 10, 12, 13, 15, 10}.

(c) Write Floyd's and Warshal's algorithm to find all pair shortest path in a graph. Discuss its time complexity.

6. (a) Write Robin Karp string matching algorithm. Working modulo q=11, how many spurious hits does the Robin karp matcher in the tent T= 31 41 59 26 53 58 97 93, when looking for the pattern P= 26.

(b) Explain approximation algorithm. Explore vertex set cover problem using approximation algorithm.

(c) Explain and write the naive-string matching algorithm : suppose the given pattern P=aab and given text T= ac aa bc. Apply naive-string matching algorithm on above pattern (p) and text (T) to find the number of occurrances of P in T.

⌘⌘⌘