Printed Pages:02 **Sub Code: RCS-502**

Paper Id: 231282 **Roll No.** | | | | | | | | | | |

B. TECH.
(SEM V) THEORY EXAMINATION 2022-23
DESIGN & ANALYSIS OF ALGORITHM

Time: 3 Hours ***Total Marks: 70***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

(a) Explain the different cases for analyzing the algorithm performance.
(b) Justify why Quick sort is better than merge sort?
(c) What is the maximum height of red-black tree with 10, 00,000 nodes?
(d) Explain Binomial tree with properties.
(e) Explain Backtracking method in brief.
(f) Discuss P, NP and NP-hard problem.
(g) Write naïve string matching algorithm.

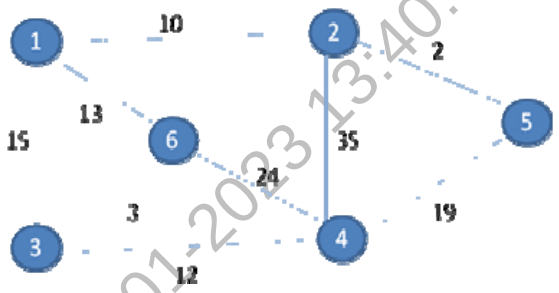
SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

(a) Solve the following recurrence relation

i. $T(n) = T(n-1) + n^4$
ii. $T(n) = 2T(n/2) + n$

(b) Write and explain an algorithm for Decrease key operation in Fibonacci heap with suitable example.
(c) Write Kruskal algorithm to generate a Minimum Spanning Tree (MST) for any given weighted graph. Generate MST for the following graph using Kruskal algorithm.



(d) Write down Floyd Warshal algorithm and also write its time complexity.
(e) Explain randomized algorithm. Write randomized quick sort algorithm.

SECTION C

3. Attempt any *one* part of the following: **7 x 1 = 7**

(a) Sort the following elements in increasing order, using **quick sort** { **14, 23, 41, 35, 67, 9, 40, 16, 9, 12}**

(b) Write merge sort algorithm and analyze its time complexity in all cases.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Write down Red Black tree properties also write algorithm for insertion in RB tree.

(b) Write and explain an algorithm to find a node with minimum key value in Binomial Heaps and also write its time complexity.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Compare the dynamic programming with greedy approach.

(b) Discuss Bellman Ford algorithm to solve single source shortest path problem.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) What is knapsack problem? Discuss the branch & bound method to solve 0/1 knapsack problem. Given Knapsack Capacity=12.

Weight	5	7	4	2
Profit	30	28	20	24

(b) Write an algorithm for graph coloring problem. Draw a state space tree for graph coloring problem using backtracking? Let **n=4 and m=3**.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Write KMP algorithm for string matching? Compute the prefix function for the pattern "abababababca" for the alphabet set {a, b, c} and also write its time complexity.

(b) Define vertex cover. What is vertex cover problem? Provide the approximation algorithm for vertex cover problem.