

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

V SEMESTER B.TECH.(INFORMATION TECHNOLOGY) MAKEUP EXAMINATIONS, DECEMBER 2016

SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS [ICT 309]

REVISED CREDIT SYSTEM (27/12/2016)

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitable assumed.

1A.	Write a function for inserting an element into a sorted array and find its best, average and worst and case time complexity.	5
1 B .	Write Kruskal's algorithm for finding minimum spanning tree and find its time complexity.	3
1C.	Write an approximation algorithm for TSP and find its time complexity.	2
2A.	Find shortest path from vertex 1 to all other vertices in the graph shown in Figure	5
2 B .	Using backtracking method solve the TSP problem shown in Figure Q.2B. Make use of appropriate bounding function	3
2C.	With a suitable example prove the following : i) $0 \le e \le n(n-1)$ (for directed graph)	
	i) $\Sigma^{n}_{i=0} d_i = 2e$ (for undirected graph)	2
3A.	Create an AVL tree with the following elements. Show each insertion step clearly	
	and find its time complexity. $100 \ 90 \ 80 \ 70 \ 150 \ 200 \ 250 \ 300 \ 50 \ 350 \ 75 \ 325$	5
3B.	Solve the following 0/1 knapsack problem using greedy heuristics. N = 4, C = 15, W = [12, 4, 7, 9], P = [45, 15, 35, 40]	3
3C.	Solve the following recurrence equation using substitution method. $T(n) = T(\sqrt{n}) + c$, Assume $n = 2^k$ and $T(1) = T(2) = 1$	2
4 A.	Store the values given below in a hash table (size 13) using the hash function $H(x) = x \mod 13$. Use double hashing technique to avoid the collision with the hashing	
	function $H_2(x)=7 - x \text{ md } 7$	5
4R	12, 78, 129, 40, 100, 233, 90, 09, 91 Write the steps involved in merge sort technique to sort elements and derive its time	
ч D,	complexity.	3
4C.	What are NP problems? Prove that set of P problems is the subset of NP problems.	2

- **5A.** Find the optimal way to multiply $A_1^* A_2^* A_3^* A_4^* A_5$ where $A_1, A_2, A_3 A_4$ and A_5 are matrices with order 5 x 9, 9 x 20, 20 x 10, 10 x 17 and 17 x 13 respectively. **5**
- 5B. Apply quick sort technique by selecting pivot element as a median for the data given below. Also find its worst case time complexity.
 15, 20, 5, 1, 50, 43, 18, 55, 60, 25, 14, 29
- 5C. Write a recurrence relation for finding time complexity of binary search and solve it. 2
- **6A.** Derive the time complexity of Strassen's matrix multiplication method.
- **6B.** Write the recurrence equations for all-pairs-shortest path problem and derive it's time complexity. **3**
- **6C.** Write the greedy criteria to solve single source shortest path problem using Dijkstra's algorithm. Write the time complexity of the algorithm.



Figure Q.2A



Figure Q. 2B

3

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