Question Paper

Exam Date & Time: 25-Jul-2022 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH END SEMESTER MAKE-UP EXAMINATIONS, JULY - AUGUST 2022

DESIGN AND ANALYSIS OF ALGORITHMS [ICT 2257]

Ма	rks: 50	Duration	: 180 mins.		
Α					
Answer all the questions.					
Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed					
1)		Write a function for selection sort and find its asymptotic time complexity using step count method.	(5)		
	A)				
	B)	Is it possible to use BFS and DFS for finding minimum cost spanning tree? Justify.	(3)		
	C)	Prove that $2^n + 2^n \log n \neq O(2^n)$	(2)		
2)		Write a pseudocode/code for partition procedure of quick sort. Give the step by step explanation of partition procedure using the array $A = [2 \ 8 \ 7 \ 1 \ 3 \ 5 \ 6 \ 4]$. Also write the recurrence relation of quick sort algorithm when the partition procedure gives its result in worst case. [Assume first element as	(5)		

A) pivot element]

B) Construct a minimum spanning tree of the given graph showing all the steps using Kruskal's algorithms. Also calculate the cost of minimum spanning tree. (3)





- C) How can it be proved that a new problem is NP hard? Whether P is subset of NP ? Justify your answer.
- What is collision? For each of the following types of hash-tables, insert the following values in order: 3, 2, 9, 6, 11, 13, 12. Assume the table size is 7 (5) and that the primary hash function is h(k) = k % 7. You do not need to resize the tables. If an element cannot be successfully inserted, state why. You have to show the step by step insertion procedure.
 - i. Separate chaining hash table
 - ii. Hash table with a secondary hash function of h2(k) = 7 (k % 7)
 - B) Write the approximation algorithm for Traveling salesman problem
 - C) Suppose that we represent the graph G = (V,E) as an adjacency matrix. Give an $O(V^2)$ algorithm which constructs minimum spanning tree by (2) expanding the tree constructed in every iteration.
- 4) Find the max clique for the graph given below using branch and bound (Max profit approach) along with time complexity analysis. (5)

A)



	B)	Construct Binary Search Tree (BST) for the following sequence of numbers (Show Each Step). 20, 60, 10, 8, 15, 32, 46, 58, 65	(3)
	C)	Explain the process of searching a solution space tree using backtracking.	(2)
5)		Construct the B-Tree of order m=5 for the data given below. Show each step of B-Tree construction by inserting the keys in the following sequence :	(5)
	A)	3, 7, 9, 23, 45, 1, 5, 14, 25, 24, 13, 11, 8, 19, 4, 31, 35, 56	
	B)	Write a dynamic programming recurrence relation for 0/1 Knapsack. Solve the 0/1 Knapsack instance n=4, capacity=8, w=[2,3,4,5], p=[1,2,5,6] by applying dynamic programming technique.	(3)
	C)	Explain the types of rotations performed on AVL trees with an example	(2)

-----End-----

(2)

(3)