Question Paper

Exam Date & Time: 16-Jun-2022 (02:00 PM - 05:00 PM)



FOURTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, JUNE 2022 DESIGN AND ANALYSIS OF ALGORITHMS [ICT 2257]

Marks	s: 5	30 Duration:	180 n	nins
		Α		
Answ	er	all the questions.		
Instrue Answe Missir	ctic er / ng c	uns to Candidates: ALL questions data may be suitably assumed		
1)		Write a function for insertion sort and find its asymptotic complexity. In which scenario insertion sort is better than other sorting techniques? Justify.	(5)	
А	()			
В	3)	As per space complexity which is best and worst case for DFS and BFS? Explain with suitable examples. What will be the time complexity of DFS and BFS for the cases considered?	(3)	
C	C)	Show that $\sum_{1}^{n} i^2 = o(n^4)$ (o is small oh).	(2)	
2)		Write an algorithm for merge procedure used in the merge sort. Give the step by step explanation of merge procedure using the array B= [2, 4, 15, 20] and C= [1, 16, 100, 120]. Also analyze the time complexity of merge procedure.	(5)	
A	()			
В	3)	Construct a minimum spanning tree for the graph given in Figure Q.2B, step by step using Prim's algorithm. Also write the steps and calculate the cost of minimum spanning tree.		(3)



C) Differentiate between class P and NP complete problems. Whether all the NP problems are NP complete? Justify with suitable example.

What is hashing? 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 and that the primary hash function (5) 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.

3.

3)

A)

- i. Hash table using linear probing
- ii. Hash table using quadratic probing
- B) Trace the approximation algorithm for vertex cover using graph given in Figure Q.3B.

(3)

(2)



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One way to perform topological sorting on a directed acyclic graph G = (V, E) is to repeatedly find a vertex of in-degree 0, output it, and remove it with all of it's outgoing edges from (2) the graph. Explain how to implement this idea so that it runs in time O(V + E).

4)

C)

A)

Find the optimal cost tour for travelling salesperson for the graph given in Figure Q.4A. using backtracking technique [Mention route information and bound values at all the relevant (5) nodes] along with time complexity analysis.



Construct AVL tree for the given sequence of numbers: 50, 20, 60, 10, 8, 15, 32, 46, 11, 48 B) (3) C) Provide comparison between backtracking technique and Branch and bound technique. (2) 5) Construct the following B-Tree of order m=5. Show each step of B Tree by inserting the keys in the following sequence: 2, 3, 44, 45, 10, 55, 66, 50, 68, 5, 70, 7, 22, 17, 6, 21, 67 (5) A) Write a dynamic programming recurrence relation for getting matrix multiplication chain. Obtain the sequence for q=5 and r = {5,4,6,2,7} by applying dynamic programming. B) (3) C) Write an algorithm to insert an item into an binary search tree (Duplicate item not allowed) (2)

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