



SIDDAGANGA INSTITUTE OF TECHNOLOGY, TUMKUR-572103

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Analysis and Design of Algorithms Laboratory (5CSL01)

Student Name:		USN:		Batch No:
Evaluation:				
Write up for the mentioned pre-requisites (05 M)	Execution and results (10 M)	Write up of the completed program along with results (5 M)	Viva (15 M)	Total (35 M)
Sl. No	Name of the Faculty In-Charge			Signature
1.				
2.				
Question No: 1 Use divide and conquer method to recursively implement the following algorithms. a. Binary Search b. To find the maximum and minimum in a given list of n elements.				
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm• What is the design technique used?• Write complete analysis of the algorithm (best case, worst case and average case)• List applications (at least 3) of the algorithm.				



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2.				
Question No: 2 Sort a given set of elements using the Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.				
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm• What is the design technique used?• Write complete analysis of the algorithm (best case, worst case and average case)• List applications (at least 3) of the algorithm.				



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Question No: 3 Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.				
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm• What is the design technique used?• Write complete analysis of the algorithm (best case, worst case and average case)• List applications (at least 3) of the algorithm.				



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Question No: 4 a. Obtain the Topological ordering of vertices in a given digraph. b. Sort a given set of elements using Insertion sort method.				
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm• What is the design technique used?• Write complete analysis of the algorithm (based on data structure used)• List applications (at least 3) of the algorithm.• Write at least 5 input graphs for 4.a.				



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Question No: 5 a. Print all the nodes reachable from a given starting node in a given digraph using Depth First Search method. b. Print all the nodes reachable from a given starting node in a digraph using Breadth First Search method.				
Pre-requisites: 1. Algorithms for DFS & BFS with complexity in both the data structures of the graph 2. Data structures used in DFS & BFS 3. Applications of DFS & BFS 4. At least 3 different graphs with more than 5 nodes.				



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Question No: 6 Sort a given set of elements using the Heap sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.				
Pre-requisites: <ul style="list-style-type: none">Write the algorithmMention the design technique used.Data structure used.Write complete analysis of the algorithm (best case, worst case and average case)List applications (at least 3) of the algorithm.				



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2.				
Question No: 7 a. Implement Horspool algorithm for String Matching. b. For a given set of elements construct an AVL Tree and also display balance factor for each node.				
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm (Include algorithm name, input, output along with data structures).• Mention the design technique used .• Analyze the Time Complexity based on the Data Structure used in the algorithm.(Include best, average and worst cases)• Take a sample input and show the complete tracing.• Show the input and output in the form of tree for Q.no. 7b.• List applications (at least 3) of the algorithm.				



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2.				
Question No: 8 a. Implement 0/1 Knapsack problem using dynamic programming. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.				
Pre-requisites: <ul style="list-style-type: none"> Write the algorithm (Include algorithm name, input, output along with data structures). Mention the design technique used to design the algorithm and describe the general approach/working of it? Analyze the Time Complexity based on the Data Structure used in the algorithm. Take a sample input and show the complete tracing .Show the input and output in the form of graphs also for 8b. List applications (at least 3) of the algorithm. 				



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2.				
Question No: 9 a. Implement all Pair Shortest paths problem using Floyd's algorithm. b. Find the Binomial Co-efficient using Dynamic Programming.				
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm• Mention the design technique used.• Write the time complexity for the algorithm (best case, worst case and average case)• List at least three applications of the algorithm.• Trace the algorithm for a graph having at least 5 nodes for Q.no. 9.a.				



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2.					
Question No: 10 From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.					
Pre-requisites: <ul style="list-style-type: none">• Write the algorithm• What is the design technique used?• Write the time complexity for the algorithm (best case, worst case and average case)• List at least three applications of the algorithm.• Trace the algorithm for a graph having at least 5 nodes.					



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2.				
Question No: 11				
Find Minimum Cost Spanning Tree of a given undirected graph using Prims algorithm.				
Pre-requisites:				
<ul style="list-style-type: none">• Write the algorithm.• What is the design technique used?• Write the time complexity of the algorithm (based on data structure used)• List applications (at least 3) of the algorithm.• Write at least 5 input graphs for Q 11.				



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2.				
Question No: 12				
Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.				
Pre-requisites:				
<ul style="list-style-type: none">• Write the algorithm• What is the design technique used?• Write the time complexity of the algorithm (based on data structure used)• List applications (at least 3) of the algorithm.• Write at least 5 input graphs for Q12.				



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Question No: 13					
<p>Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d. For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance doesn't have a solution.</p>					
Pre-requisites:					
<ul style="list-style-type: none">• Write the algorithm• How Back Tracking design technique is used to solve this problem?• Write the Tree Organization to the solution of sum of subset problem.• List applications (at least 3) of the algorithm• Write at least 3 inputs and outputs for this problem.					



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2.				
Question No: 14 Implement N Queen's problem using Back Tracking.				
Pre-requisites: <ul style="list-style-type: none"> Write the algorithm How the concept of Back Tracking design technique is used to solve this problem? Trace the problem for $N = 4$ by writing all the 4×4 chess boards including final optimal solution. Write the Tree Organization of the 4-queens solution space. List applications (at least 3) of the algorithm. 				