Course Code: 19CS0519 **R19**

SIDDARTHA INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
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QUESTION BANK (DESCRIPTIVE)

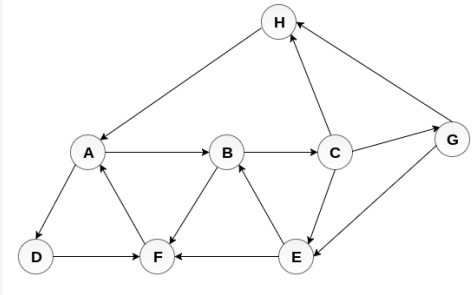
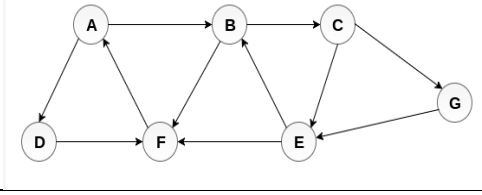
Subject with Code: Design and Analysis of Algorithms (**19CS0519**) **Course &Branch: B.Tech** - CSE
Year &Sem : III B.Tech& I-Sem **Regulation:** R19

UNIT –I
INTRODUCTION, DISJOINT SETS

1	**a**	What is asymptotic notation? Explain different types of notations with examples?	[L2][CO1]	**[6M]**
	b	Illustrate an algorithm for (i) Finding factorial of n number (ii)Sum of n natural numbers	[L2][CO1]	**[4M]**
2		Simplify steps involved in performance analysis with example.	[L2][CO1]	**[12M]**
3	**a**	What do you mean by algorithm? List some of the properties of it?	[L1][CO1]	**[6M]**
	b	Apply the Master's theorem. Solve the following Recurrence relations i) T(n) = 4T(n/2) + n i000i) T(n) = 2T(n/2) + n1og n	[L3][CO1]	**[6M]**
4	**a**	Classify the rules of Pseudo code for Expressing Algorithms?	[L2][CO1]	**[8M]**
	b	Solve the given function -If $f(n)= 5n^2+ 6n+ 4$ then prove that f(n) is $0(n^2)$.	[L3][CO1]	**[4M]**
5	**a**	Explain the collapsing rule for Find algorithm with example.	[L6][CO1]	**[6M]**
	b	Solve the following Recurrence relation i) $T(n) = 4T(n/3) + n^2$ii) $T(n) = 6T(n/3) + n^2 \log n$	[L3][CO1]	**[6M]**
6		Estimate the recurrence relations: i) x(n) = x(n-1) + 5 for n>1, x(1) = 0 ii) x(n) = 3x(n-1) for n>1, x(1) = 4 iii) x(n)= x(n/2) + n for n>1, x(1) = 1(solve for $n = 2^k$) iv) x(n)= x(n/3) + 1 for n>1, x(1) = 1(solve for $n = 3^k$)	[L6][CO1]	**[12M]**
7	**a**	Determine in steps of Union and Find algorithms with example.	[L5][CO1]	**[6M]**
	b	Explain space complexity in detail.	[L2][CO1]	**[6M]**
8	**a**	Define disjoint sets? Explain different types of disjoint sets operations with examples?	[L2][CO1]	**[7M]**
	b	Solve the following recurrence: i) $T(n)=7T(n/3)+n^2$ ii) T(n)=3T(n/2) + n	[L3][CO1]	**[5M]**
9		Explain two types of recurrences in detail with suitable example.	[L6][CO1]	**[12M]**
10		Demonstrate Towers of Hanoi with algorithm and example.	[L3][CO1]	**[12M]**

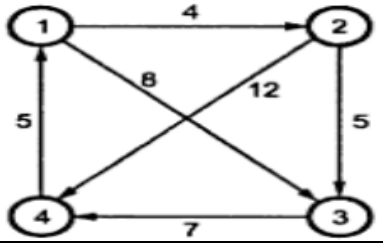
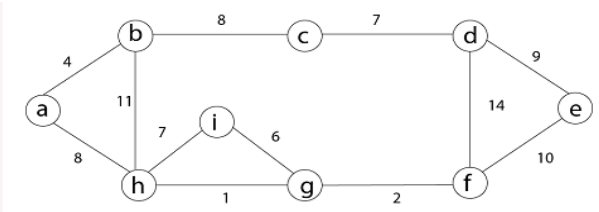
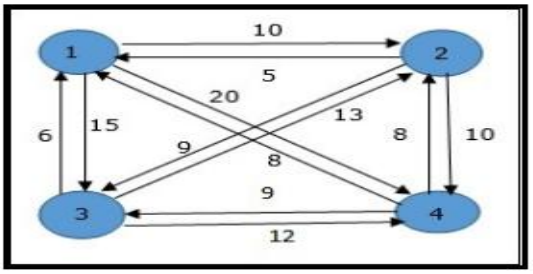
UNIT –II
BASIC TRAVERSAL AND SEARCH TECHNIQUES,DIVIDE AND CONQUER

1	What is divide and conquer strategy? Explain the working strategy of Binary Search and find element 60 from the below set by using the above technique: {10, 20, 30, 40, 50, 60, and 70}. Analyze time complexity for binary search.	[L2][CO2]	**[12M]**
2	Analyze the working strategy of merge sort and illustrate the process of merge sort algorithm for the given data: 43, 32, 22, 78, 63, 57, 91 and 13.	[L4][CO2]	**[12M]**

3		A=$\begin{bmatrix} 9 & 4 & 6 & 7 \\ 7 & 8 & 1 & 4 \\ 4 & 3 & 2 & 6 \\ 5 & 3 & 0 & 2 \end{bmatrix}$ B=$\begin{bmatrix} 7 & 6 & 2 & 1 \\ 3 & 9 & 0 & 3 \\ 2 & 5 & 2 & 9 \\ 3 & 2 & 4 & 7 \end{bmatrix}$.Create Stassen's matrix multiplication on A and B find the Resultant matrix	[L6][CO2]	**[12M]**
4	a	Sort the records with the following index values in the ascending order using quick sort algorithm. 9, 7, 5, 11, 12, 2, 14, 3, 10, 6.	[L2][CO2]	**[6M]**
	b	Write and explain the control abstraction for Divide and conquer.	[L2][CO2]	**[6M]**
5		Explain the Strassen's algorithm for matrix multiplication and analyze time complexity.	[L5][CO2]	**[12M]**
6		Explain DFS algorithm and trace out minimum path for DFS for the following example. 	[L5][CO2]	**[12M]**
7		Summarize an algorithm for quick sort. Provide a complete analysis of quick sort for given set of numbers 12, 33, 23, 43, 44, 55, 64, 77and 76.	[L2][CO2]	**[12M]**
8		Elaborate BFS algorithm and trace out minimum path for BFS for the following example. 	[L6][CO2]	**[12M]**
9	**a**	Compare between BFS and DFS techniques.	[L4][CO2]	**[5M]**
	b	Solve an algorithm for techniques of binary trees with examples.	[L3][CO2]	**[7M]**
10		Describe Binary search algorithm with the following example 5, 9, 17, 23, 25, 45, 59, 63, 71, 89	[L2][CO2]	**[12M]**

UNIT –III
GREEDY METHOD, DYNAMIC PROGRAMMING

1		Construct an optimal solution for Knapsack problem, where n=7,M=15 and (p1,p2,p3,p4,p5,p6,p7)=(10,5,15,7,6,18,3)and(w1,w2,w3,w4,w5,w6,w7)=(2,3,5,7,1,4,1) by using Greedy strategy.	[L3][CO3]	**[12M]**
2		Explain any one application of greedy method with an example?	[L2][CO3]	**[12M]**
3		Elaborate job sequencing with deadlines by using greedy method where given the jobs, their deadlines and associated profits as shown below. Calculate maximum earned profit. **Jobs** | **J1** | **J2** | **J3** | **J4** | **J5** | **J6** **Deadlines** | 5 | 3 | 3 | 2 | 4 | 2 **Profits** | 200 | 180 | 190 | 300 | 120 | 100	[L6][CO3]	**[12M]**
4	a	Explain in detail about greedy method and its applications.	[L2][CO3]	**[6M]**
	b	Simplify the algorithm for Knapsack problem and analyze time complexity.	[L4][CO3]	**[6M]**

5	Construct an algorithm for All pairs of shortest path and calculate shortest path between all pairs of vertices by using dynamic programming method for the following graph.  	[L6][CO3]	**[12M]**
6	Apply the minimum spanning tree of the following graph using Kruskals algorithm and prims algorithm .  	[L3][CO3]	**[12M]**
7	Explain 0/1 knapsack problem by using dynamic programming with an examples.	[L2][CO3]	**[12M]**
8	Analyze the minimum cost tour forgiven problem using travelling sales person Concepts.  	[L4][CO3]	**[12M]**
9	Build any one application of dynamic programming with an example.	[L6][CO1]	**[12M]**
10	Discuss Optimal binary search tree with an example?	[L2][CO3]	**[12M]**

UNIT –IV
BACKTRACKING,BRANCH AND BOUND

1		Explain sum of subsets by using backtracking with an example.	[L5][CO4]	**[12M]**
2		Discuss the Hamiltonian cycle algorithm with step by step operation with example.	[L6][CO4]	**[12M]**
3	**a**	Explain the principles of FIFO branch and bound.	[L2][CO4]	**[6M]**
	b	Recall the graph coloring. Explain in detail graph coloring with an example.	[L5][CO4]	**[6M]**
4	**a**	Explain the properties of LC-search.	[L2][CO4]	**[6M]**
	b	Give brief description about the general method of branch and bound.	[L2][CO4]	**[6M]**
5		Select any one application of backtracking with an example.	[L3][CO4]	**[12M]**
6		Construct the LC branch and bound search. Consider knapsack instance n=4 with capacity M=15 such that pi={10,10,12,18},wi={2,4,6,9}apply LC branch and bound technique.	[L6][CO4]	**[12M]**
7		Simplify 0/1 knapsack problem and design an algorithm of LC Branch and Bound and find the solution for the knapsack instance of n = 4,(p1, p2, p3, p4) = (10, 10, 12, 18), (w1,w2, w 3, w4) = (2, 4, 6, 9) and M = 15.	[L4][CO4]	**[12M]**
8		Evaluate0/1 knapsack problem using branch and bound with an example.	[L5][CO4]	**[12M]**
9		Distinguish in detail 8-queens problem using back tracking with state space tree.	[L4][CO4]	**[12M]**
10		Implement any one branch and bound application with an example.	[L3][CO4]	**[12M]**

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UNIT –V
NP-HARD AND NP-COMPLETE PROBLEMS

1	Construct the non-deterministic algorithms with example.	[L3][CO5]	**[12M]**
2	Distinguish between deterministic and non-deterministic algorithms.	[L4][CO5]	**[12M]**
3	Construct the non-deterministic sorting algorithm and also analyze its complexity.	[L6][CO5]	**[12M]**
4	Explain the class of P and NP with example?	[L2][CO5]	**[12M]**
5	Differentiate between NP- complete and NP-hard problems?	[L4][CO5]	**[12M]**
6	State and explain cook's theorem?	[L2][CO5]	**[12M]**
7	Estimate the strategy to prove that a problem steps of NP-hard.	[L6][CO5]	**[12M]**
8	Illustrate the satisifiability problem and write the algorithm.	[L2][CO5]	**[12M]**
9	Determine the classes NP-hard and NP-complete problem with example.	[L5][CO5]	**[12M]**
10	With example explain Reduction source problem.	[L4][CO5]	**[12M]**

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