Course Code: 20CS0523 **R20**

SIDDARTHA INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583
QUESTION BANK (DESCRIPTIVE)

Subject with Code: Design and Analysis of Algorithms (**20CS0523**)
Course & Branch: B.Tech – CSE, CSM, CIC & CSIT
Year & Sem : III B.Tech & II-Sem **Regulation:** R20

UNIT –I
INTRODUCTION, DISJOINT SETS

1	**a)**	What do you mean by algorithm? List some of the properties of it.	[L1][CO1]	**[04M]**
	b)	Classify the rules of Pseudo code for Expressing Algorithms.	[L2][CO1]	**[08M]**
2		Simplify steps involved in performance analysis with example.	[L2][CO1]	**[12M]**
3	**a)**	Explain space complexity and time complexity in detail with example.	[L2][CO1]	**[08M]**
	b)	Illustrate an algorithm for Finding sum of natural number	[L2][CO1]	**[04M]**
4		What is asymptotic notation? Explain different types of notations with examples.	[L2][CO1]	**[12M]**
5		Discuss briefly with suitable example about Big 'O' notation and Theta notation	[L3][CO1]	**[12M]**
6	**a)**	Solve the given function If $f(n)= 5n^2+ 6n+ 4$ then prove that f(n) is $0(n^2)$.	[L3][CO1]	**[04M]**
	b)	Explain two types of recurrences in detail with suitable example.	[L2][CO1]	**[08M]**
7	**a)**	Apply the Master's theorem to Solve the following Recurrence relations i) $T(n) = 4T(n/2) + n$ ii) $T(n) = 2T(n/2) + n1og\ n$	[L3][CO1]	**[06M]**
	b)	What is iterative substitution method? Apply the Iterative substitution method to Solve the following Recurrence relations. $T(n) = 2T(n/2) + n$	[L3][CO1]	**[06M]**
8		Demonstrate Towers of Hanoi with algorithm and example.	[L3][CO1]	**[12M]**
9	**a)**	Define disjoint set. Explain any four types of disjoint sets operations with Examples.	[L2][CO1]	**[06M]**
	b)	Explain the weighted union algorithm for union algorithm with example.	[L2][CO1]	**[06M]**
10	**a)**	Explain the collapsing rule for Find algorithm with example.	[L2][CO1]	**[06M]**
	b)	Determine steps of Union and Find algorithms with example.	[L5][CO1]	**[06M]**

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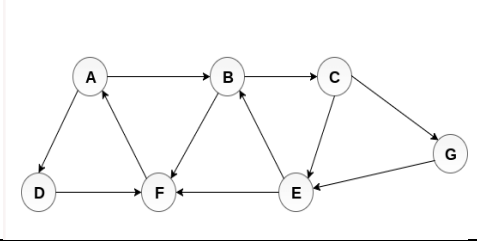
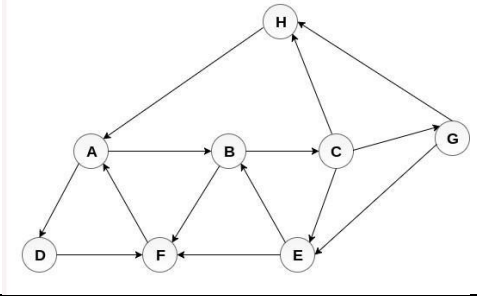
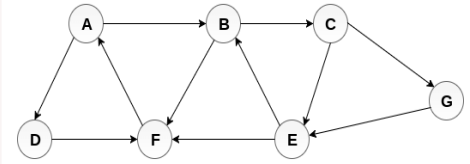
UNIT –II
BASIC TRAVERSAL AND SEARCH TECHNIQUES, DIVIDE AND CONQUER

1		Explain techniques of binary trees with suitable example	[L2][CO2]	**[12M]**
2		Elaborate BFS algorithm and trace out minimum path for BFS for the following example. 	[L6][CO2]	**[12M]**
3		Explain DFS algorithm and trace out minimum path for DFS for the following example. 	[L5][CO2]	**[12M]**
4		What is connected component and spanning tree? Draw the spanning tree for the following graph using DFS algorithm 		
5	**a)**	Compare between BFS and DFS techniques.	[L4][CO2]	**[04M]**
	b)	What is divide and conquer strategy? Write briefly about general method and its algorithm	[L3][CO2]	**[08M]**
6		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]**
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		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]**
9	**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)	Analyze the time complexity of merge sort using recurrence relation	[L2][CO2]	**[6M]**
10		Explain the Strassen's algorithm for matrix multiplication and analyze time complexity.	[L5][CO2]	**[12M]**

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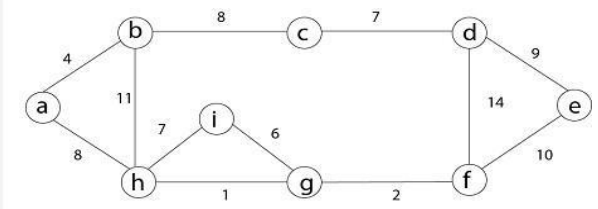
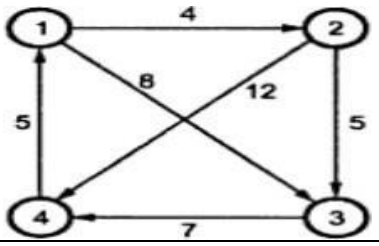
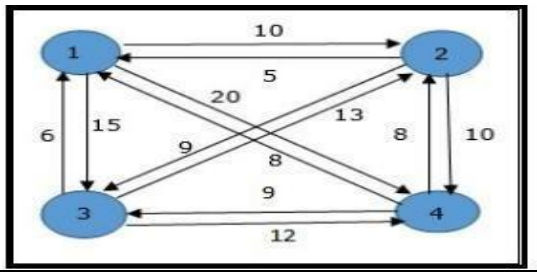
UNIT –III
GREEDY METHOD, DYNAMIC PROGRAMMING

1		Explain in detail about general method of greedy method with algorithm and list the few applications of greedy method.	[L2][CO3]	**[12M]**
2		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]**
3		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]**
4	**a)**	Simplify the algorithm for Knapsack problem and analyze time complexity.	[L4][CO3]	**[6M]**
	b)	What is minimum cost spanning tree and write the algorithm of pseudo code for kruskals algorithm	[L3][CO3]	**[6M]**
5		Apply the minimum spanning tree of the following graph using Kruskals algorithm and prims algorithm. 	[L3][CO3]	**[12M]**
6	a	Write short notes about general method of dynamic programming.	[L3][CO3]	**[3M]**
	b	Build any one application of dynamic programming with an example.	[L6][CO1]	**[9M]**
7		Discuss about Optimal binary search tree with suitable example.	[L2][CO3]	**[12M]**
8		Explain 0/1 knapsack problem by using dynamic programming with an examples.	[L2][CO3]	**[12M]**
9		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]**
10		Analyze the minimum cost tour for given problem in travelling sales person Concepts by using dynamic programming. 	[L4][CO3]	**[12M]**

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UNIT –IV
BACKTRACKING, BRANCH AND BOUND

1	Distinguish in detail 8-queens problem using back tracking with state space tree.	[L4][CO4]	**[12M]**
2	Explain sum of subsets by using backtracking with an example.	[L5][CO4]	**[12M]**
3	**a)** Recall the graph coloring. Explain in detail about graph coloring with an example.	[L5][CO4]	**[9M]**
	b) Discuss about General method of backtracking	[L3][CO4]	**[3M]**
4	Discuss the Hamiltonian cycle algorithm with step by step operation with example.	[L6][CO4]	**[12M]**
5	Give brief description about the general method of branch and bound.	[L2][CO4]	**[6M]**
6	Find the LC branch and bound solution for the traveling sale person problem whose cost matrix is as follows: $\begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array}\begin{array}{c} \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix} \end{array}$	[L4][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	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 FIFO branch and bound technique.	[L6][CO4]	**[12M]**
9	**a)** Explain the principles of FIFO branch and bound.	[L2][CO4]	**[6M]**
	b) Explain the principles of LIFO branch and bound.	[L2][CO4]	**[6M]**
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		Explain the following i) P class ii) NP class iii) NP complete iv) NP Hard v) Non-deterministic problem	[L2][CO5]	**[12M]**
2		Construct the non-deterministic algorithms with suitable example.	[L3][CO5]	**[12M]**
3		Build the non-deterministic sorting algorithm and also analyze its complexity.	[L6][CO5]	**[12M]**
4		Determine the classes NP-hard and NP-complete problem with example.	[L5][CO5]	**[12M]**
5		State and explain cook's theorem.	[L2][CO5]	**[12M]**
6		Illustrate the satisifiability problem and write the algorithm.	[L2][CO5]	**[12M]**
7		Explain Reduction source problem With example.	[L4][CO5]	**[12M]**
8		Explain the following: (a) decision problem (b) clique (c) non deterministic machine (d) satisfiability	[L4][CO5]	**[12M]**
9		How to make reduction for 3-sat to clique problem? and Explain	[L3][CO5]	**[12M]**
10	**a)**	Statement the following with examples a) Optimization problem b) Decision problem	[L4][CO5]	**[6M]**
	b)	Explain and shows the relationship between P,NP,NP Hard and NP Complete with neat diagram	[L3][CO5]	**[6M]**

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