



**SIDDHARTHA 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

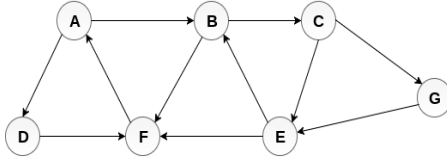
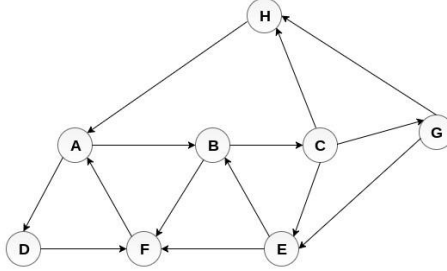
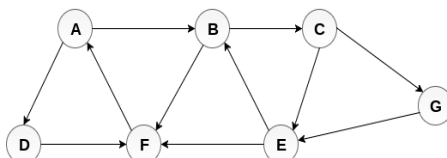
Year & Sem : III B.Tech & II-Sem

Regulation: R20

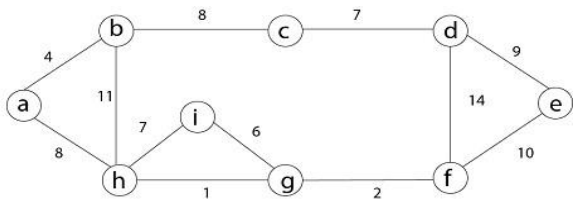
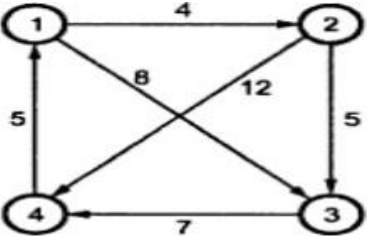
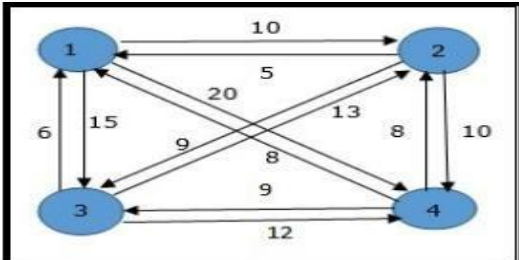
**UNIT –I
INTRODUCTION, DISJOINT SETS**

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 $O(n^2)$.	[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) $T(n) = 2T(n/2) + n \log n$	[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]

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. <div style="text-align: center; margin-top: 20px;">  </div>	[L6][CO2]	[12M]
3	Explain DFS algorithm and trace out minimum path for DFS for the following example. <div style="text-align: center; margin-top: 20px;">  </div>	[L5][CO2]	[12M]
4	What is connected component and spanning tree? Draw the spanning tree for the following graph using DFS algorithm <div style="text-align: center; margin-top: 20px;">  </div>		
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, 77 and 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]

**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. <table border="1" data-bbox="347 526 1045 712" style="margin: 10px auto;"> <thead> <tr> <th>Jobs</th> <th>J1</th> <th>J2</th> <th>J3</th> <th>J4</th> <th>J5</th> <th>J6</th> </tr> </thead> <tbody> <tr> <td>Deadlines</td> <td>5</td> <td>3</td> <td>3</td> <td>2</td> <td>4</td> <td>2</td> </tr> <tr> <td>Profits</td> <td>200</td> <td>180</td> <td>190</td> <td>300</td> <td>120</td> <td>100</td> </tr> </tbody> </table>	Jobs	J1	J2	J3	J4	J5	J6	Deadlines	5	3	3	2	4	2	Profits	200	180	190	300	120	100	[L6][CO3]	[12M]
Jobs	J1	J2	J3	J4	J5	J6																		
Deadlines	5	3	3	2	4	2																		
Profits	200	180	190	300	120	100																		
3	Construct an optimal solution for Knapsack problem, where $n=7, M=15$ and $(p_1, p_2, p_3, p_4, p_5, p_6, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, w_3, w_4, w_5, w_6, w_7) = (2, 3, 5, 7, 1, 4, 1)$ 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]																					

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 \left[\begin{array}{ccccc} \infty & 20 & 30 & 10 & 11 \\ 2 & 15 & \infty & 16 & 4 & 2 \\ 3 & 3 & 5 & \infty & 2 & 4 \\ 4 & 19 & 6 & 18 & \infty & 3 \\ 5 & 16 & 4 & 7 & 16 & \infty \end{array} \right] \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 $n = 4, (p_1, p_2, p_3, p_4) = (10, 10, 12, 18), (w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ 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 $p_i=\{10,10,12,18\}, w_i=\{2,4,6,9\}$ 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]

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 satisfiability 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]