

DESIGN AND ANALYSIS OF ALGORITHMS
(II- B. Tech. – II– Semester)

Assignment-2 Questions

SET-1

1. What is an Optimal Binary Search Tree (OBST)? Write an algorithm and time complexity for OBST. Construct an OBST with the following data.
Let $n=4$, $(a_1, a_2, a_3, a_4) = (\text{do}, \text{if}, \text{int}, \text{while})$, $p[1:4] = (3, 3, 1, 1)$, $q[0:4] = (2, 3, 1, 1, 1)$. The p 's and q 's have been multiplied by 16 for the convenience.
2. Discuss the basic method of backtracking algorithm. Also explain the following: a) Live node b) E-Node c) Answer node d) Answer path e) Dead node f) answer
3. Define Branch and Bound. Discuss LC-Branch-and-Bound algorithm.
4. Draw the portion of state space tree generated by LCBB for the Knapsack instances $n=4, (p_1, p_2, \dots, p_5) = (10, 10, 12, 18), (W_1, W_2, \dots, W_5) = (2, 4, 6, 9)$ and $M=15$
5. Explain P-Class and NP-Class Problems

SET-2

1. A) Describe the Travelling sales person problem. Construct the optimal tour of the following problem using Travelling Salesperson.

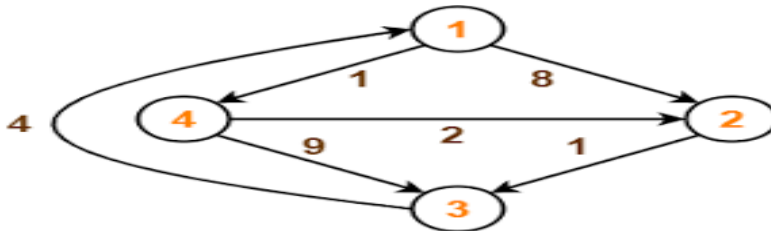
	1	2	3	4
1	0	10	15	20
2	5	0	9	10
3	6	13	0	12
4	8	8	9	0

2. Discuss algorithm of Hamiltonian cycle and Graph Coloring. Also draw the state space tree for $n=4$ and $m=3$ graph coloring problem.
3. Describe FIFO Branch-and-Bund Algorithm. Also Draw the portion of state space tree generated by FIFO-BB for the Knapsack instances $n=5, (p_1, p_2, \dots, p_5) = (10, 15, 6, 8, 4), (W_1, W_2, \dots, W_5) = (4, 6, 3, 4, 2)$ and $M=12$

4. Explain about satisfiability problem with example?
5. Differentiate NP-Hard and NP-Complete Problems

SET-3

1. Explain the concepts of reliability design problem. Design a three-stage system with device types D1, D2 and D3. The costs are \$30, \$15 and \$20 respectively. Reliability is 0.9, 0.8 and 0.5. The total cost of the system must not be more than $c = \$105$.
2. What is the sum-of-subsets problem? Solve the following sum-of-subsets problem using Backtracking. Let $n=6$, $m=30$, and $w[1:6] = (5, 10, 12, 13, 15, 18)$ (Draw the state space tree and the solution tree using fixed-tuple sized format)
3. Draw the portion of state space tree generated by FIFO-BB for the Knapsack instances $n=5, (p_1, p_2, \dots, p_5) = (10, 15, 6, 8, 4), (W_1, W_2, \dots, W_5) = (4, 6, 3, 4, 2)$ and $M=12$
4. Solve the following all pairs shortest path problem and find the shortest distance from each node to each other in the graph.



5. What is non-deterministic algorithm? Write the non-deterministic algorithm for Knapsack problem?

SET-4

1. A) Explain the 0/1 Knapsack Problem with an algorithm. Find an optimal solution for the 0/1 knapsack instance for $n=4$, $m=16$, profits are $(p_1, p_2, p_3, p_4) = (10, 6, 5, 1)$, weights are (w_1, w_2, w_3, w_4) , $w_4 = (9, 6, 7, 3)$ using Dynamic Programming.
B) write an algorithm (Floyd-Warshall algorithm) for all-pairs-shortest path problem
2. Discuss in detail about 4-Queens problem with state space tree and solution tree. Write an algorithm for N-Queen Problem.
3. Draw the portion of state space tree generated by LCBB for the following Travelling Sales Person problem.

	1	2	3	4	5
1	∞	20	30	10	11
2	15	∞	30	10	11
3	3	5	∞	2	4
4	19	6	18	∞	3
5	16	4	7	16	∞

4. Describe FIFO Branch-and-Bund Algorithms. Explain NP-Hard and NP-Complete Problems
5. State the Cook's theorem. And explain its importance.