DESIGN AND ANALYSIS OF ALGORITHMS

PART A

1. What is the knapsack problem? **(Frequency: 2)**
2. Distinguish the best-case, average-case, and worst-case efficiency of an algorithm. **(Frequency: 1)**
3. Write down the control abstraction for the divide and conquer strategy. **(Frequency: 1)**
4. Mention the Properties of Greedy method. **(Frequency: 1)**
5. Time Complexity of job sequencing with deadlines. **(Frequency: 1)**
6. List the difference between an optimal solution and a feasible solution. **(Frequency: 1)**
7. Define State Space Tree. **(Frequency: 1)**
8. Define E node and live node. **(Frequency: 1)**
9. When can a path be terminated in a branch and bound algorithm? **(Frequency: 1)**
10. Define P and NP problems. **(Frequency: 1)**
11. What are the characteristics of an algorithm. **(Frequency: 1)**
12. Determine the descending order for the following functions O(n!), O(n), $O(n^3)$, O(1), O(nlogn), O(logn). **(Frequency: 1)**
13. Describe minimum cost spanning tree. **(Frequency: 1)**
14. Which algorithm is used for all pair shortest path problem? **(Frequency: 1)**
15. List the applications of dynamic programming. **(Frequency: 1)**
16. Describe N-Queen's problem. **(Frequency: 1)**
17. State the sum of subsets problem. **(Frequency: 1)**
18. What are the applications of branch and bound approach. **(Frequency: 1)**
19. Draw the relationship between P, NP, NP-Hard and NP-Complete. **(Frequency: 1)**

PART B

1. Write the algorithm for merge sort and Trace 76, 23, 45, 13, 98, 52, 84 and 18. **(Frequency: 2)**
2. Apply Strassen's algorithm for matrix multiplication to multiply the matrices with an example and justify how the Strassen's algorithm is better. **(Frequency: 2)**
3. Write the Dijkstra's Algorithm. **(Frequency: 2)**
4. Solve the following instance of Knapsack problem by Greedy Method. W=15, n=6. (p1, p2, p3, p4, p5, p6) = (40, 35, 18, 4, 10, 2) (w1, w2, w3, w4, w5, w6) = (5, 7, 2, 4, 5, 1) **(Frequency: 2)**

5 Write the Kruskal's algorithm for finding minimum Spanning tree. **(Frequency: 2)**

6 Solve the All Pair shortest Path problem for the following graph. **(Frequency: 2)**

7 Apply the Least Cost Branch and Bound (LCBB) algorithm to solve the travelling salesman problem for the graph below. **(Frequency: 2)**

8 Write the non-deterministic sorting algorithm and also analyze its complexity? **(Frequency: 2)**

9 Illustrate briefly on Big oh Notation, Omega Notation and Theta Notations. Depict the same graphically and explain. **(Frequency: 1)**

10 Apply quick sort technique and arrange the records with the following index values in the ascending order. 2, 3, 8, 5, 4, 7, 6, 9, 1. Explain with algorithm and analyze time complexity. **(Frequency: 1)**

11 Apply primes algorithm to find Minimum spanning Tree. **(Frequency: 1)**

12 Plan the following instance of the 0/1 knapsack problem given the knapsack capacity in W=5 using dynamic programming and explain it. **(Frequency: 1)**

13 Describe the Travelling salesman problem and discuss how to solve it using dynamic Programming. **(Frequency: 1)**

14 Use function OBST to compute w(i,j), r(i,j), and c(i,j), $0 \le i < j \le 4$, for the identifier set (a1,a2,a3,a4) = (cout, float, if, while) with p(1) = 1/20, p(2) = 1/5, p(3) = 1/10, p(4) = 1/20, q(0) = 1/5, q(1) = 1/10, q(2) = 1/5, q(3) = 1/20, q(4) = 1/20. Using the r(i,j)s, construct the optimal binary search tree. **(Frequency: 1)**

15 Construct the State space tree for 4 Queens Problem (Show at least one solution). **(Frequency: 1)**

16 Find the solution for subset sum problem and represent the solution via state space tree Where n = 4, w = {3, 4, 5, 6}, d = 9. **(Frequency: 1)**

17 Write generic template backtracking algorithm. **(Frequency: 1)**

18 Discuss Graph coloring problem. Draw the state space tree for 'm' coloring when n=3 and m=3. **(Frequency: 1)**

19 Define the following with an example: i. Class P ii. Class NP iii. NP-Complete iv. NP-Hard **(Frequency: 1)**

20 Explain the Quick sort algorithm. **(Frequency: 1)**

21 Discuss briefly about various asymptotic notations with examples. **(Frequency: 1)**

22 Apply Greedy method to find an optimal solution generated by Job Sequencing when n=7, (P1,P2...P7) = (20,15,10,7,5,3,10) and (D1,D2...D7)=(3,1,1,3,1,3,2). **(Frequency: 1)**

23 Construct OBST for n=3, identifiers (a1, a2, a3)=(do, if, while), probabilities p(1:3)=(3,3,1) and q(0:3)=(2,3,1,1). **(Frequency: 1)**

24 Using Dynamic Programming, find the fully parenthesized matrix product for multiplying the chain of matrices < A1 A2 A3 A4 A5 > whose dimensions are <30X35>, <35X15>, <15X5>, <5X10> and <10X20> respectively. **(Frequency: 1)**

25 Draw and explain the tree organization of the 4-queen solution space? **(Frequency: 1)**

26 Apply backtracking to solve the following instance of the subset-sum problem: S={3, 5, 6, 7} and d=15. **(Frequency: 1)**

27 Write an algorithm to find Hamiltonian Cycles in given graph. **(Frequency: 1)**

28 Construct knapsack instance for the following data n=3, m=21, P=(25,24,18) and W=(18,15,10) using backtracking? **(Frequency: 1)**

29 Solve the following instance of the knapsack problem using the branch and bound technique for W-15.
(Frequency: 1)