Subject : Design and Analysis of Algorithms

Course :B.Tech. **Branch :** CSE - B **Year:**III **Semester :**II

Unit I : Introduction

1. a. What is an Algorithm. Explain the characteristics of the algorithm. [5 Marks]
   b. Write an algorithm for factorial and Fibonacci series. [5 Marks]

2. a. What do you mean by Performance Analysis of an Algorithm. [6 Marks]
   b. Define Time and Space complexity of matrix chain multiplication. [4 Marks]

3. a. Describe different Loop Statements used Pseudo code conventions. [6 Marks]
   b. Write an algorithm for given number is Palindrome or not. [4 Marks]

4. a. Show that f(n)+g(n)=O(n^2).where f(n)=3n^2-n+4 anf g(n)=nlogn+5. [4 Marks]
   b. Explain about all Asympotic Notations with three examples. [6 Marks]

5. a. What is Recursion. Explain with example, the Direct and indirect recursive Algorithms. [5 Marks]
   b. Define Time and Space complexity of Armstrong number. [5 Marks]
6. a. Discuaa about Amortized Analysis. [5 Marks]
   b. Prove that f(n)=8n+128=O(n^2). [5 Marks]

Unit II : Divide and Conquer

1. a. Explain the Divide and Conquer .How it can be useful in the problem solving. [4 Marks]
   b. Apply Quick sort to sort the list E,X,A,M,P,L,E in alphabetical order [6 Marks]

2. a. Define Merge sort with an Example. [6 Marks]
   b. Write an algorithm and the running time of Merge sort. [4 Marks]

3. a. Is a Quick sort is a stable sorting method ?Justify your answer. [5 Marks]
   b. Explain the Divide and Conquer algorithm for computing no. of levels in a Binary Tree. [5 Marks]

4. a. Apply Quick sort to sort the list 22,55,33,11,99,77,55,66,54,21,32 in ascending order. [5 Marks]

   b. Write an algorithm for Quick sort. [5 Marks]

5. a. Define Binary Search with an Example. [6 Marks]
   b. Write an algorithm for Binary Search. [4 Marks]

6. a. Explain the concept of Divide and Conquer with example. [5 Marks]
   b. Is a Merge sort is a stable sorting method ? Justify your answer. [5 Marks]

Unit III :Greedy Method

1. a. What is Greedy method. Explain with an example. [5 Marks]
   b. Explain the control abstraction of greedy method compare this with Dynamic programming. [5 Marks]
2. a. Explain the 0/1 knapsack problem algorithm with greedy concept. [5 Marks]
   b. Find the Optimal Solution of the knapsack problem with n=7,M=15, (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) [5 Marks]
3. a. Write an algorithm for Prims minimum spanning tree and give their Time Complexities. [6 Marks]
   b. Define minimum cost spanning tree for every connected undirected graph [4 Marks]
4. a. Write an algorithm for Kruskhal 's minimum spanning tree and give their Time complexities. [4 Marks]

   b. Define minimum cost spanning tree for every connected undirected graph. [6 Marks]
5. a. Explain the Dijkstas algorithm. [5 Marks]
   b. Explain single source shortest path problem with an example. [5 Marks]
6. a. What is Greedy method. Explain about Job-Sequencing with deadline. [4 Marks]
   b. What is the solution generated by the function Job-Sequencing when n=7, P[1:7]=(3,5,20,18,1,6,30) and W[1:7]=(1,3,4,3,2,1,2). [6 Marks]

Unit IV : Dynamic Programming

7. a.Define merging and purging rules in 0/1 knapsack problem. [5 Marks]
   b. Find the Solution of the knapsack problem with n=3,M=20, (p1,p2,p3)=(25,24,15) and (w1,w2,w3)=(18,15,10) [5 Marks]
8. a. Explain the problem of all pairs shortest path problem and write its algorithm using Dynamic Program. [7 Marks]

   b. Explain the difference between Dynamic Programming and Greedy Method. [3 Marks]
9. a. Explain the OBST Algorithm. [3 Marks]
   b. Construct the OBST as a Minimum cost tree. [7 Marks]
10. a. Explain Matrix chain multiplication with an example. [6 Marks]
    b. Write an algorithm for Matrix chain multiplication. [4 Marks]
11. a. Explain about Travelling sales person problem and write its applications . [7 Marks]
    b. Write an algorithm for Travelling sales person problem. [3 Marks]
12. a.What is Dynamic Program. Define the concept of Reliability design. [5 Marks]
    b. Write the difference between Dynamic Programming and Divide and Conquer. [5 Marks]

Unit V: Backtracking

1. a. What is Backtracking. Write the Recursive Backtracking algorithm [5 Marks]
   b. Explain about graph coloring and chromatic number . [5 Marks]

2. a. Describe an algorithm of finding m-coloring graph problem using backtracking. [6 Marks]
   b. Discuss about State space tree and graph coloring. [4 Marks]

3. a. Explain about an algorithm of n-Queens problem. [5 Marks]
   b. Explain about 8-Queen's problem using backtracking concept. [5 Marks]

4. a. Define Backtracking algorithm for 4-Queen's problem. [5 Marks]
   b. There are 5 distinct numbers{1,2,3,4,5}.find the combinations of these numbers such that the sum is 9.Use the backtracking model to arrive at the solution. [5 Marks]
5. a. Compare and contrast Brute force approach and Backtracking. [5 Marks]
   b. What is Hamiltonoan Cycle? Describe with an example. [5 Marks]

6. a. Write an algorithm for Sum of Subsets Problem. [4 Marks]
   b. Solve it for obtaining Sum of Subset for a set S={5,10,12,13,15,18} and D=30. [6 Marks]

Unit VI : Banch and Bound

1. a. Explain the general method of Branch and Bound. [5 Marks]
   b. Write a short note on LC search. [5 Marks]

2. a. Write an algorithm to solve the 0/1 knapsack problem with BB Method. [5 Marks]
   b. Explain the following with an example
      i. FULL Reduction ii. Dynamic Reduction. [5 Marks]
3. a. Explain the principles of FIFO branch and bound. [5 Marks]
   b. Write FIFOBB algorithm for 0/1 knapsack problem. [5 Marks]

4. a. Explain the principles of LIFO branch and bound. [5 Marks]
   b. Write LIFO branch and bound algorithm for 0/1 knapsack problem. [5 Marks]

5. a. Write an algorithm of LCBB to find the minimum cost answer node. [5 Marks]
   b. Explain how the TSP is solved by using LCBB. [5 Marks]

6. a. Write an algorithm of TSP. [3 Marks]
   b. Describe Travelling sales person Problem with example. [7 Marks]