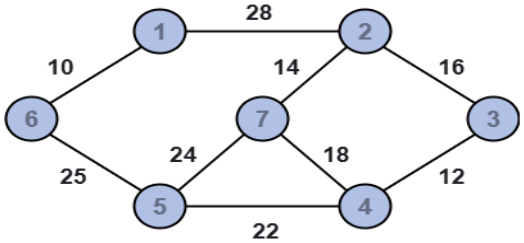
GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 3rd Semester
Subject Name: Design and Analysis of Algorithms Subject
Code: 639401

Assignment Questions

1. Define the following Terms.
    1) Algorithm
    2) Space Complexity
    3) P-type Problem
    4) Optimum Solution
    5) Time Efficiency
    6) Recursion
    7) Pruning
    8) Minimum Spanning Tree
    9) Average Case
    10) Optimum solution
    11) Greedy method
2. What is Time complexity of an algorithm? Explain with example of insertion sort algorithm.
3. What are asymptotic notations? Why are they used? List different asymptotic notations and explain any one in detail.
4. What do you understand by analysis of algorithm? Write a short note on Asymptotic notation Big-Oh, Omega, Theta.
5. What is maximum sub-array problem? How can we find maximum sub-array from an array? Find maximum sub-array from following array : {5,-4,3,4,-5,6}
6. What do you mean by analyzing an algorithm? What is best-case, average-case and worst-case analysis?
7. Differentiate Greedy algorithms and Dynamic algorithms.
8. What is divide and conquer Approach? Explain in context of maximum sub array problem. Also explain in context of binary search method.
9. Explain Strassen's algorithm for matrix multiplication in detail. Also discuss the time complexity of it.
10. Explain Hiring Problem with its analysis.
11. What is recurrence relation? List the different ways of solving recurrence relation? Explain any one with example.
12. Differentiate:
    1. Iteration vs Recursion
    2. Greedy vs Dynamic Programming
13. Using greedy algorithm to find an optimal schedule for following jobs with n=6.
    Profits: (P1,P2,P3,P4,P5,P6) = (20, 15, 10, 7, 5, 3)
    Deadline: (d1,d2,d3,d4,d5,d6) =(3, 1, 1, 3, 1, 3)
14. What are asymptotic notations? List and explain different asymptotic notations.
15. Explain master method for solving recurrence relation. Where and how it can be used? Find solution of recurrence $T(n)=2T(n/2)+\Theta(n)$ using master method.
16. What is dynamic programming? When a problem can be solved using dynamic programming?
17. Discuss rod-cutting problem. Find the most profitable way of cutting the rod giving length n=5 where price and lengths are $L_i=\{1,2,3,4,5\}$ and $P_i=\{11,24,35,50,60\}$
18. Define MST. Explain Prim's algorithm to find MST for the given graph.



19. Explain Dijkstra's shortest path algorithm with example.
20. Discuss Traveling salesman problem with suitable example.
21. Explain backtracking method of problem solving. What is 8-Queen's problem? Solve the 4-Queen's problem using the backtracking method.
22. Find the Largest Common Subsequence of two sets X={A,C,A,D,B} and Y={C,B,D,A} using dynamic programming. Also explain how you find it?
23. What is matrix chain multiplication problem? Find out minimum number of multiplications required for multiplying matrices: A[5 x 4] , B[4 x 6] , C[6 x 2] and D[2 x 7].

24. Explain Matrix chain multiplication briefly using dynamic programming algorithm.
25. Explain pros and cons of Dynamic programming.
26. Explain Optimal binary search trees with suitable example.
27. Discuss greedy algorithm with knapsack problem.
28. Explain Accounting method with suitable example.
29. Discuss Huffman code and prefix codes with proper example.
30. Explain Table expansion algorithm and contraction in detail.
31. Write a short Note on NP Completeness and NP – Hard Problem.
32. Write a note on DFS and explain it giving an example.
33. Explain the longest common sub-sequence problem. Given two strings:
    String 1: BACDB, String 2: BDCB
    Find the LCS using dynamic programming.
34. What is amortized analysis? Explain in detail different methods of amortized analysis using suitable example.
35. What is single-source shortest path problem? Write and explain the Bellman- Ford algorithm to solve the single-source shortest path problem.
36. Write and explain Dijkshtra's algorithm.
37. Sort characters of "ALLISWELL" using merge sort algorithm.
38. Given time complexities of algorithms as $O(2^n)$ and $O(n^2)$, which algorithm will run faster? Why?
39. What is dynamic programming? Write steps to solve a problem using dynamic programming? Also discuss the elements of dynamic programming. How it affects the time complexity of a problem?
40. Write short note on accounting method.
41. Explain bubble sort algorithm with suitable example.
42. Write a note on BFS and explain it giving an example.
43. Explain Merge sort algorithm with suitable example.
44. Explain Rod Cutting problem. Find the maximum profit for the following data.

Length	1	2	3	4	5	6	7	8
Price	1	5	8	9	10	17	17	20

45. Explain Kruskal's algorithm with suitable example.
46. Discuss Bellman-Ford algorithm with suitable example.
47. Explain Prim's algorithm with suitable example.
48. What is Huffman coding? Write and explain the algorithm for Huffman coding.
49. What is activity selection problem? How can we solve it using greedy strategy? Explain with example.
50. What is probabilistic analysis? How it can be used to estimate the cost of hiring problem?
51. What is minimum spanning tree? Write and explain Krushkal's algorithm how to find minimum spanning tree. Also explain how to use union-find data structure for finding minimum spanning tree using Krushkal's algorithm.
52. Write short-note on different proofs of shortest-paths properties.
53. What is activity selection problem? How can we solve it using greedy strategy? Explain with example.