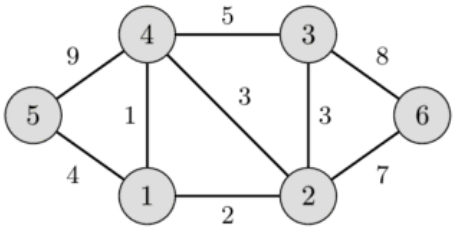
Advanced Data Structures and Algorithms
Mid – II QUESTION BANK

Part-A

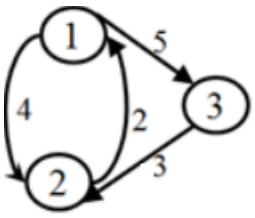
Unit – III

1. Solve Job Sequencing with deadlines problem using Greedy method with the following instances n=5, deadlines (2,1,2,1,3) and profits (100,19,27,15,13)
2. Design an algorithm to sort the given list of elements using Quick Sort incorporating divide and conquer technique. Sort the following list using the same 14, 24, 10, 28, 74, 19, 36, 69.
3. Write merge sort algorithm and trace algorithm for the elements: 12, 9, 3, 0, 5, 10, 7, 2, 6. And derive time complexity of merge sort.
4. Describe Strassen's matrix multiplication algorithm with example.
5. Describe Dijkstra's algorithm for shortest path with example.
6. Define Knapsack problem and solve the following instances of knapsack problem using greedy method n = 3, (W1,W2,W3) = (2,3,4), (P1,P2,P3) = (1,2,5), and m=6.
7. Find Minimum Cost Spanning tree using Prim's and kruskal's algorithm for the following graph:



Unit – IV

1. Solve the following instance of 0/1 KNAPSACK problem using Dynamic programming. n = 3, (W1,W2,W3) = (10,20,30), (P1,P2,P3) = (60,100,120), and m=50.
2. Find all pairs shortest path for the given graph.



3. Describe the Traveling Salesperson Problem and its significance in Dynamic programming with example.
4. Explain how the Bellman-Ford algorithm solves the Single Source Shortest Path problem with general weights with example.
5. Solve sum of subsets problem using recursive algorithms for sum is 30 and elements {3, 34, 4, 12, 5, 2}

6. Solve 0/1 knapsack problem using back tracking when n=3, M=4, (p1,p2,p3) = (1, 2, 3), (w1,w2,w3) = (4, 5, 1)
7. A) Briefly explain 8-Queens problem using backtracking.
   B) What is string editing and explain string editing with a suitable example.
8. Explain the method of constructing optimal binary search tree using dynamic programming with a suitable example.
9. How is backtracking used in graph coloring problems? Draw State Space Tree for graph coloring when n=3 and m=3

Unit – V

1. Describe 0/1 knapsack problem using branch and bound with an example.
2. What is branch and bound and explain various strategies used in branch and bound.
3. Differentiate NP-Hardness and NP-Completeness.
4. Explore travelling salesperson problem using branch and bound.
5. Explain basic concepts of NP Hard and HP Completeness.
6. Compare and Contrast back tracking and branch & bound.
7. State COOKS theorem. Briefly explain it.
8. What is the Clique Decision Problem and Is is NP-Hard or NP-Completer? Justify your answer.
9. Describe the Chromatic Number Decision Problem and its Significance in graph theory.

Part-B

Unit – III

1. Write the basic idea of Merge Sort.
2. What are the three main steps in the Divide and Conquer method?
3. What is the time complexity of Merge Sort, and why is it considered efficient for large datasets?
4. List the algorithms that uses Greedy Method.
5. What is the difference between the 0/1 Knapsack problem and the Fractional Knapsack problem?
6. Mention advantages of merge sort over quick sort.
7. What is a Minimum Cost Spanning Tree. Name two algorithms that are commonly used to find Minimum Cost Spanning Trees.

Unit – IV

1. What is queen attack and what is ruled to follow for identifying diagonal attack in N- Queen problem,
2. Differentiate Dijkstra's and Bellman Ford Algorithms.
3. Define optimal binary search tree.
4. Differentiate greedy and dynamic programming.
5. Define dominance rule.

6. List the applications of dynamic programming,
7. What is the main constraint in the 0/1 Knapsack problem?
8. What is string editing? What are the operations used in string editing.
9. Explain how Backtracking is different from Dynamic Programming.
10. What is the chromatic number of a graph?

Unit – V

1. List out the applications of Branch & Bound.
2. What is the difference between the upper bound and lower bound in the context of Branch and Bound?
3. Define an NP-Complete problem and provide one example.
4. Name the applications of back tracking
5. Write the formula for calculating upper bound and lower bound in the 0/1 Knapsack Branch and Bound approach.
6. Differentiate between fractional and 0/1 Knapsack problems.
7. What is meant by graph coloring?
8. What is the Travelling Salesperson Problem (TSP)