

(b) Differentiate between traditional Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT).

(5)

6. (a) Explain simplex algorithm to solve linear programming problems. (10)

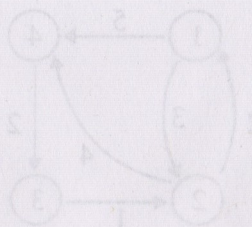
(b) Define NP-completeness and give an example of an NP-complete problem. (5)

7. Write a short note on : (15)

(a) Randomized Algorithms.

(b) Approximation Algorithms.

(c) Interior Point Method.



May 2024

M.Tech. (CE/CSE) – II SEMESTER

Advance Algorithms (MCS-18-201)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any four questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

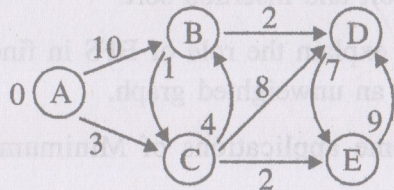
PART-A

1. (a) Compare time and space complexities of merge sort, quick sort and insertion sort. (1.5)
- (b) Briefly explain the role of BFS in finding the shortest path in an unweighted graph. (1.5)
- (c) List some applications of Minimum Spanning Tree (MST). (1.5)
- (d) Explain what constitutes an augmenting path in graph matching. (1.5)
- (e) What is the significance of Strassen's algorithm in matrix computations? (1.5)
- (f) Summarize the principle behind the Floyd-Warshall algorithm. (1.5)

- (g) Differentiate between dynamic programming and greedy programming paradigm. (1.5)
- (h) Define NP-hard problems. (1.5)
- (i) Describe the basic concept of a randomized algorithm and give one example where such an algorithm might be used. (1.5)
- (j) How does the Interior Point Method differ from the Simplex Method in solving linear programming problems? (1.5)

PART-B

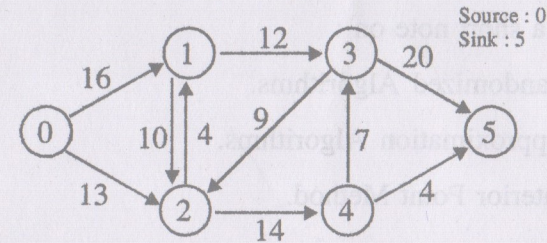
2. (a) Given a weighted graph $G=(E,V)$ and source vertex $v \in V$, such that all edge weights are non-negative. Write an algorithm for determining the shortest path between any two vertices. Apply Dijkstra's algorithm to compute the shortest path from node 'A' to node 'E' in the provided graph. (10)



- (b) Write a short note on strongly connected components. (5)
3. (a) Write an algorithm to compute a maximum weight maximal independent set. Explain the algorithm by taking suitable example. (8)

- (b) What is maximum matching problem in graph theory? Write Edmond's Blossom algorithm to find maximum matching. (7)

4. (a) Determine the maximum amount of flow that can be sent from a source vertex to a sink vertex in a given directed weighted graph, subject to capacity constraints on the edges. (8)



- (b) Discuss divide and conquer approach in context of Matrix computation. (7)

5. (a) Write an algorithm for finding the shortest path between all the pairs of vertices in a weighted graph and also analyze its time complexity. Given Graph $G=(V,E)$ apply Floyd Warshall algorithm to find all pair shortest path. (10)

