Assignment 8

Due on 2020-07-25, 11:59 PM

Week 8

1. Consider a weighted simple undirected graph where each edge has a weight. Explain how you would determine the shortest path from a given node to all other nodes in the graph using Dijkstra's algorithm. What is the time complexity of this algorithm?

2. In a complete graph with n vertices, how many edges are there? Explain your reasoning.

3. Consider a weighted, directed graph G. Describe an algorithm for finding the shortest path from a given source node to all other nodes in G using the Bellman-Ford algorithm. What is the time complexity of this algorithm?

4. A graph G with vertices A, B, C, D, E, and F is given. Draw the graph and identify any cycles in it. Explain your reasoning.

5. Consider a graph with vertices A, B, C, D, E, and F. Describe an algorithm for finding the shortest path from a given source node to all other nodes in the graph using the Floyd-Warshall algorithm. What is the time complexity of this algorithm?

6. In a weighted graph, what is the difference between a minimum spanning tree and a longest path?

7. Describe a situation where Dijkstra's algorithm would be more efficient than the Bellman-Ford algorithm.

GROUP A

8. In a directed graph, explain the concept of transitive closure.

9. Prove that the transitive closure of a directed acyclic graph (DAG) is also a DAG.

10. Consider a directed graph with vertices A, B, C, D, E, and F. Identify any strongly connected components in the graph. Explain your reasoning.

GROUP B

11. Explain the concept of transitive reduction in graph theory.

12. Prove that the transitive reduction of a graph is unique.

13. Consider a graph with vertices A, B, C, D, E, and F. Describe an algorithm for finding the most important vertices in the graph using the PageRank algorithm. What is the time complexity of this algorithm?

GROUP C

14. Explain the concept of cliques in graph theory.

15. Consider a graph with vertices A, B, C, D, E, and F. Identify any cliques in the graph. Explain your reasoning.

16. Prove that the maximum clique problem is NP-hard.

17. Consider a graph with vertices A, B, C, D, E, and F. Describe an algorithm for finding the minimum vertex cover in the graph. What is the time complexity of this algorithm?