## Lecture 10-basic graph algorithms

1. What is the main advantage of using an adjacency list representation for graphs compared to an adjacency matrix?

A) Faster edge insertion

B) Faster edge deletion

C) More space-efficient for sparse graphs

D) Better for dense graphs

Answer: C) More space-efficient for sparse graphs

2. In a graph with V vertices, what is the maximum number of edges possible in an undirected graph without self-loops?

A) V^2

B) V(V-1)

C) V(V-1)/2

D) 2V

Answer: C) V(V-1)/2

3. Which data structure is used to implement breadth-first search?

A) Stack

B) Queue

C) Priority Queue

D) Linked List

Answer: B) Queue

4. What is the time complexity of depth-first search for a graph represented using an adjacency list?

A) O(V)

B) O(E)

C) O(V + E)

D) O(V \* E)

Answer: C) O(V + E)

5. Which of the following is NOT a typical application of depth-first search?

A) Finding connected components

B) Topological sorting

C) Cycle detection

D) Finding shortest paths

Answer: D) Finding shortest paths

6. In a breadth-first search, what does the distTo[] array represent?

A) The number of edges in the shortest path from the source to each vertex

B) The total weight of the shortest path from the source to each vertex

C) The number of vertices in the shortest path from the source to each vertex

D) The maximum flow from the source to each vertex

Answer: A) The number of edges in the shortest path from the source to each vertex

7. What is the primary difference between depth-first search and breadth-first search?

A) DFS uses a stack, BFS uses a queue

B) DFS is recursive, BFS is iterative

C) DFS finds shortest paths, BFS doesn't

D) DFS works on directed graphs, BFS on undirected graphs

Answer: A) DFS uses a stack, BFS uses a queue

8. Which graph traversal algorithm is typically used for web crawling?

A) Depth-first search

B) Breadth-first search

C) Dijkstra's algorithm

D) Floyd-Warshall algorithm

Answer: B) Breadth-first search

9. What is a topological sort of a directed graph?

A) Sorting the vertices by their in-degree

B) Sorting the vertices by their out-degree

C) An ordering of vertices such that for every directed edge u->v, u comes before v in the ordering

D) An ordering of vertices by their discovery time in DFS

Answer: C) An ordering of vertices such that for every directed edge u->v, u comes before v in the ordering

10. Which of the following is a necessary condition for a graph to have a valid topological sort?

A) The graph must be connected

B) The graph must be acyclic

C) The graph must be undirected

D) The graph must have at least one source vertex

Answer: B) The graph must be acyclic

11. What is the purpose of the marked[] array in graph traversal algorithms?

A) To store the shortest distance to each vertex

B) To keep track of which vertices have been visited

C) To store the parent of each vertex in the traversal tree

D) To count the number of edges incident to each vertex

Answer: B) To keep track of which vertices have been visited

12. In the context of graph algorithms, what does DAG stand for?

A) Directed Acyclic Graph

B) Doubly Adjacent Graph

C) Depth-first Adjacency Graph

D) Directed Algorithmic Graph

Answer: A) Directed Acyclic Graph

13. Which of the following is NOT a property of connected components in an undirected graph?

A) Reflexivity

B) Symmetry

C) Transitivity

D) Uniqueness

Answer: D) Uniqueness

14. What is the primary purpose of the edgeTo[] array in graph traversal algorithms?

A) To store the weight of each edge

B) To keep track of the path from the source to each vertex

C) To count the number of edges in the graph

D) To store the adjacency list for each vertex

Answer: B) To keep track of the path from the source to each vertex

15. Which graph traversal order visits the root, then the left subtree, and finally the right subtree?

A) In-order

B) Pre-order

C) Post-order

D) Level-order

Answer: B) Pre-order

16. What is the main advantage of using depth-first search for cycle detection in directed graphs?

A) It's faster than breadth-first search

B) It can detect cycles as soon as they are encountered

C) It uses less memory than breadth-first search

D) It can find all cycles in a single pass

Answer: B) It can detect cycles as soon as they are encountered

17. In the context of graph algorithms, what does BFS stand for?

A) Best-First Search

B) Breadth-First Sort

C) Breadth-First Search

D) Binary Field Search

Answer: C) Breadth-First Search

18. Which of the following is a valid application of topological sort?

A) Finding the shortest path in a weighted graph

B) Detecting cycles in an undirected graph

C) Scheduling tasks with dependencies

D) Finding strongly connected components

Answer: C) Scheduling tasks with dependencies

19. What data structure is used to implement depth-first search iteratively?

A) Queue

B) Stack

C) Heap

D) Hash table

Answer: B) Stack

20. Which of the following is NOT a typical application of breadth-first search?

A) Finding shortest paths in unweighted graphs

B) Web crawling

C) Finding strongly connected components

D) Level-order traversal of a tree

Answer: C) Finding strongly connected components