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**Question:** What is a graph in the context of data structures?

- A) A visual representation of data trends.
- B) A data structure that uses keys to organize elements.
- C) A collection of vertices connected by edges.
- D) A hierarchical data structure with a root node.

**Correct Answer:** C

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**Question:** What does the notation  $(v, w)$  represent in graph terminology?

- A) A vertex labeled 'v'.
- B) An edge connecting vertices 'v' and 'w'.
- C) The weight of edge 'vw'.
- D) The degree of vertex 'v'.

**Correct Answer:** B

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**Question:** Which of the following is NOT a method of representing a graph?

- A) Adjacency Matrix
- B) Adjacency List
- C) Binary Tree
- D) None of the above

**Correct Answer:** C

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**Question:** What is the primary disadvantage of representing a graph using an adjacency matrix?

- A) It is complex to implement.
- B) It requires  $O(n^2)$  space, making it inefficient for large graphs.

C) It cannot represent weighted graphs.

D) It cannot represent directed graphs.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** Which graph representation is generally more space-efficient for sparse graphs (graphs with relatively few edges)?

A) Adjacency Matrix

B) Adjacency List

C) Both are equally efficient

D) Neither is suitable for sparse graphs

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** What characterizes a directed graph (digraph)?

A) Edges have no direction.

B) Edges have a specific direction.

C) It cannot contain cycles.

D) It must contain cycles.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** In an undirected graph, if there is an edge from vertex 'A' to vertex 'B', what is always true?

A) There is also an edge from vertex 'B' to vertex 'A'.

B) Vertex 'A' has a higher degree than vertex 'B'.

C) Vertex 'B' has a higher degree than vertex 'A'.

D) The graph is a complete graph.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** What distinguishes a weighted graph from an unweighted graph?

- A) Weighted graphs have directions assigned to edges.
- B) Weighted graphs have values associated with each edge.
- C) Weighted graphs cannot contain cycles.
- D) Weighted graphs must be directed graphs.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** A complete graph with 'n' vertices will always have how many edges?

- A)  $n$
- B)  $n - 1$
- C)  $n * (n - 1) / 2$
- D)  $n^2$

**\*\*Correct Answer: C\*\***

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**\*\*Question:\*\*** What defines a strongly connected graph?

- A) There is a path between every pair of vertices.
- B) There are no cycles in the graph.
- C) All vertices have the same degree.
- D) The graph is a complete graph.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** What is the length of a path in a graph?

- A) The number of vertices in the path.
- B) The number of edges in the path.
- C) The sum of the weights of the edges in the path.
- D) The difference between the degrees of the starting and ending vertices.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** What is a simple path in a graph?

- A) A path that visits the same vertex multiple times.
- B) A path that visits each vertex only once, except potentially the first and last vertices.
- C) A path that includes all vertices of the graph.
- D) A path with only two vertices.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** A cycle in a graph is characterized by:

- A) The starting and ending vertices being the same.
- B) The path visiting each vertex only once.
- C) The path having an even number of edges.
- D) The path having an odd number of edges.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** What does the degree of a vertex in a graph signify?

- A) The number of edges incident to that vertex.
- B) The length of the longest path starting from that vertex.
- C) The weight of the edges connected to that vertex.
- D) The level of the vertex in a hierarchical graph.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** What is the key characteristic of an acyclic graph?

- A) It has no edges.
- B) It has only one vertex.
- C) It contains no cycles.
- D) It is a complete graph.

**\*\*Correct Answer: C\*\***

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**\*\*Question:\*\*** What is the primary goal of graph traversal algorithms?

- A) To find the shortest path between two vertices.
- B) To visit all vertices in a graph in a systematic way.
- C) To sort the vertices of the graph.
- D) To determine the degree of each vertex.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** Which data structure does Breadth First Search (BFS) utilize to manage the order of visited vertices?

- A) Stack
- B) Queue
- C) Linked List
- D) Binary Tree

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** Depth First Search (DFS) uses which data structure to keep track of visited vertices?

- A) Stack
- B) Queue
- C) Linked List
- D) Binary Tree

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** What is the primary application of topological sort?

- A) Finding the shortest path in a graph.
- B) Determining the connected components of a graph.
- C) Ordering vertices in a directed acyclic graph (DAG) based on dependencies.
- D) Finding the minimum spanning tree of a graph.

**\*\*Correct Answer: C\*\***

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**\*\*Question:\*\*** Which of the following is a requirement for a topological sort to be possible on a graph?

- A) The graph must be undirected.
- B) The graph must be acyclic.
- C) The graph must be complete.
- D) The graph must be weighted.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** What is a biconnected graph?

- A) A graph with exactly two connected components.
- B) A connected graph that remains connected even after removing any one vertex.

- C) A graph that becomes disconnected if any two vertices are removed.
- D) A graph with no cycles.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** What is an articulation point in a connected graph?

- A) A vertex with the highest degree.
- B) A vertex whose removal disconnects the graph.
- C) A vertex with the lowest degree.
- D) A vertex that is part of a cycle.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** What is an Euler path in a graph?

- A) A path that visits every vertex exactly once.
- B) A path that traverses every edge exactly once.
- C) The shortest path between two vertices.
- D) A path that forms a cycle.

**\*\*Correct Answer: B\*\***

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**\*\*Question:\*\*** An Euler circuit is an Euler path with what additional constraint?

- A) It must start and end at the same vertex.
- B) It must visit every vertex at least twice.
- C) It cannot contain any cycles.
- D) It must be in a weighted graph.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** According to Euler's theorem, if a graph has more than two odd vertices, what is true about Euler paths?

- A) It has at least one Euler path.
- B) It has exactly one Euler path.
- C) It has no Euler path.
- D) It has an infinite number of Euler paths.

**\*\*Correct Answer: C\*\***

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**\*\*Question:\*\*** What is a minimum spanning tree (MST) of a graph?

- A) A tree that connects all vertices with the minimum total edge weight.
- B) A tree that includes all edges of the original graph.
- C) A tree that contains all cycles of the original graph.
- D) A tree with the maximum possible height.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** Which of the following is NOT an algorithm for finding the minimum spanning tree of a graph?

- A) Prim's algorithm
- B) Kruskal's algorithm
- C) Dijkstra's algorithm
- D) None of the above

**\*\*Correct Answer: C\*\***

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**\*\*Question:\*\*** What is the purpose of Dijkstra's algorithm?



- A) Finding the shortest path between any two vertices in a graph.
- B) Determining if a graph is connected or not.
- C) Finding the minimum spanning tree of a graph.
- D) Sorting vertices in topological order.

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** What type of graph is a social network typically represented as?

- A) Directed graph
- B) Undirected graph
- C) Weighted graph
- D) Acyclic graph

**\*\*Correct Answer: A\*\***

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**\*\*Question:\*\*** Which of the following is NOT a common application of graph data structures?

- A) Social networks
- B) Transportation networks
- C) Image processing
- D) Utility networks

**\*\*Correct Answer: C\*\***