Self-Assessment Quiz: Introduction to Graph Theory

Ungraded Quiz – For Practice and Understanding

Q1. A graph G is formally defined as:

    (a) A set of numbers

    (b) A pair (V, E) where V is a set of vertices and E is a set of edges

    (c) A collection of matrices

    (d) A sequence of ordered pairs only

Q2. In a graph, vertices are also commonly referred to as:

    (a) Edges

    (b) Nodes

    (c) Degrees

    (d) Paths

Q3. Which of the following best describes an **undirected graph**?

    (a) Edges have a direction

    (b) Edges are ordered pairs

    (c) Edges have no direction

    (d) Every vertex has the same degree

Q4. A graph is called **simple** if it has:

    (a) Directed edges

    (b) Multiple edges between vertices

    (c) Loops and parallel edges

    (d) No loops and no multiple edges

Q5. The degree of a vertex in an undirected graph is:

    (a) The number of vertices connected to it

    (b) The number of edges incident to it

    (c) The number of paths through it

    (d) Always an even number

Q6. Which of the following is always true in any undirected graph?

    (a) The number of vertices is even

    (b) The sum of degrees of all vertices is twice the number of edges

    (c) Every vertex has degree at least two

    (d) The graph must be connected

Q7. A **path** in a graph is:

    (a) A set of isolated vertices

    (b) A sequence of vertices where each adjacent pair is connected by an edge

    (c) A closed loop only

    (d) A graph with no edges

Q8. A **cycle** is a path that:

    (a) Has no repeated vertices

    (b) Ends at a different vertex than it starts

    (c) Starts and ends at the same vertex

    (d) Contains no edges

Q9. A graph is said to be **connected** if:

    (a) Every vertex has degree one

    (b) There is a path between every pair of vertices

    (c) It has no cycles

    (d) It is complete

Q10. Which of the following graphs has an edge between every pair of distinct vertices?

    (a) Bipartite graph

    (b) Tree

    (c) Complete graph

    (d) Simple graph

Q11. The famous Königsberg bridge problem helped establish the field of:

    (a) Calculus

    (b) Probability

    (c) Graph theory

    (d) Linear algebra

Q12. An **Euler path** in a graph is a path that:

    (a) Visits every vertex exactly once

    (b) Uses every edge exactly once

    (c) Has minimum length

    (d) Contains no cycles

Q13. A connected graph has an Euler circuit if and only if:

    (a) All vertices have odd degree

    (b) Exactly two vertices have odd degree

    (c) All vertices have even degree

(d) The graph is complete

Q14. A **weighted graph** is a graph where:

(a) Vertices have labels

(b) Edges are directed

(c) Edges are assigned numerical values

(d) All vertices have the same degree

Q15. Which algorithm is commonly used to find the shortest path in a weighted graph?

(a) Depth-First Search

(b) Breadth-First Search

(c) Dijkstra's Algorithm

(d) Kruskal's Algorithm

Q16. Breadth-First Search (BFS) is most suitable for:

(a) Weighted graphs

(b) Finding cycles only

(c) Unweighted shortest paths

(d) Directed acyclic graphs only

Q17. An adjacency matrix of a graph with n vertices is of size:

(a) $n \times 1$

(b) $1 \times n$

(c) $n \times n$

(d) $2n \times 2n$

Q18. An adjacency list representation is generally preferred when:

(a) The graph is dense

(b) The graph has many vertices but few edges

(c) Matrix operations are required

(d) The graph is complete

Q19. A tree is a graph that is:

(a) Connected and contains cycles

(b) Disconnected and acyclic

(c) Connected and acyclic

(d) Complete and connected

Q20. If a tree has n vertices, then the number of edges is:

(a) n

(b) $n+1$

(c) $2n$

(d) $n-1$

Answers (for self-check):
1(b), 2(b), 3(c), 4(d), 5(b), 6(b), 7(b), 8(c), 9(b), 10(c),
11(c), 12(b), 13(c), 14(c), 15(c), 16(c), 17(b), 18(c), 19(d)