

Unit 5

Graph Theory

Choose the Correct Answer

1. A graph is made up of:

- A) Only vertices
- B) Only edges
- C) Vertices and edges
- D) Numbers and equations

Answer: C) Vertices and edges

2. The degree of a vertex is:

- A) Number of vertices in the graph
- B) Number of edges incident with the vertex
- C) Number of cycles
- D) Number of components

Answer: B) Number of edges incident with the vertex

3. Two graphs are isomorphic when they have:

- A) Different structures
- B) The same number of vertices only
- C) The same structural relationship between vertices
- D) The same drawing

Answer: C) The same structural relationship between vertices

4. Which of the following is a subgraph?

- A) A graph formed using some vertices and edges of another graph
- B) A graph with no vertices
- C) A graph with only loops
- D) A graph with additional vertices

Answer: A) A graph formed using some vertices and edges of another graph

5. A connected graph without any cycle is called:

- A) Complete graph
- B) Tree

- C) Multigraph
- D) Planar graph

Answer: B) Tree

6. A tree containing n vertices has:

- A) n edges
- B) $n + 1$ edges
- C) $n - 1$ edges
- D) $2n$ edges

Answer: C) $n - 1$ edges

7. A spanning tree of a connected graph contains:

- A) Some of the vertices
- B) All vertices of the graph
- C) No edges
- D) Only cycles

Answer: B) All vertices of the graph

8. A binary tree is a tree in which each node has at most:

- A) 1 child
- B) 2 children
- C) 3 children
- D) 4 children

Answer: B) 2 children

9. A graph is planar if:

- A) It has no vertices
- B) It has no edges
- C) It can be drawn without crossing edges
- D) Every vertex has degree 2

Answer: C) It can be drawn without crossing edges

10. Euler's formula for a connected planar graph is:

- A) $V + E + F = 2$
- B) $V - E + F = 2$
- C) $V + E - F = 2$
- D) $V - E - F = 2$

Answer: B) $V - E + F = 2$

11. A graph containing multiple edges between the same pair of vertices is called:

- A) Simple graph
- B) Multigraph
- C) Tree
- D) Planar graph

Answer: B) Multigraph

12. An Euler circuit visits:

- A) Every vertex exactly once
- B) Every edge exactly once and returns to the starting vertex
- C) Only one edge
- D) Every vertex twice

Answer: B) Every edge exactly once and returns to the starting vertex

13. A Hamiltonian circuit visits:

- A) Every edge exactly once
- B) Every vertex exactly once and returns to the starting vertex
- C) Only half of the vertices
- D) No vertices

Answer: B) Every vertex exactly once and returns to the starting vertex

14. The chromatic number of a graph represents:

- A) Maximum number of edges
- B) Number of vertices
- C) Minimum number of colors needed for proper vertex coloring
- D) Number of cycles

Answer: C) Minimum number of colors needed for proper vertex coloring

15. The Four-Color Problem states that every planar map can be colored using at most:

- A) 2 colors
- B) 3 colors
- C) 4 colors
- D) 5 colors

Answer: C) 4 colors

Fill in the Blanks

1. A graph consists of a set of _____ and a set of edges.
2. The vertices connected by an edge are called _____ vertices.
3. The number of edges incident with a vertex is called its _____.
4. Two graphs having the same structure are called _____ graphs.
5. A graph obtained by deleting some vertices and edges from another graph is called a _____.
6. A connected graph with no cycles is called a _____.
7. A tree with n vertices has exactly _____ edges.
8. A tree that contains all vertices of a graph is called a _____ tree.
9. A tree in which the edges have a direction is called a _____ tree.
10. A tree in which each node has at most two children is called a _____ tree.
11. A graph that can be drawn on a plane without any edges crossing is called a _____ graph.
12. Euler's formula for a connected planar graph is $V - E + F =$ _____.
13. A graph in which more than one edge can connect the same pair of vertices is called a _____ graph.
14. A graph containing a closed path that visits every vertex exactly once is called a _____ graph.
15. The minimum number of colors required to color the vertices of a graph so that adjacent vertices have different colors is called its _____ number.

Answers

1. Vertices
2. Adjacent
3. Degree
4. Isomorphic
5. Subgraph
6. Tree
7. $n - 1$

8. Spanning
9. Directed
10. Binary
11. Planar
12. 2
13. Multigraph
14. Hamiltonian
15. Chromatic