

Discrete Mathematics MCQs on Diagraphs

Based on the provided search results, here are the multiple-choice questions and answers from the Sanfoundry page on Discrete Mathematics focused on diagraphs:

Question 1

A directed graph or digraph can have directed cycle in which _____

- a) starting node and ending node are different
- b) starting node and ending node are same
- c) minimum four vertices can be there
- d) ending node does not exist

Answer: b) starting node and ending node are same

Explanation: If the start node and end node are same in the path of a graph then it is termed as directed cycle. For instance, a c b a is a simple cycle in which start and end nodes are same (a). But, a c b b a is not a simple cycle as there is a loop $\langle b, b \rangle$.^[1]

Question 2

Let, $D = \langle A, R \rangle$ be a directed graph or digraph, then $D' = \langle A', R' \rangle$ is a subgraph if _____

- a) $A' \subset A$ and $R' = R \cap (A' \times A')$
- b) $A' \subset A$ and $R \subset R' \cap (A' \times A')$
- c) $R' = R \cap (A' \times A')$
- d) $A' \subseteq A$ and $R \subseteq R' \cap (A' \times A')$

Answer: a) $A' \subset A$ and $R' = R \cap (A' \times A')$

Explanation: A directed graph or digraph is an ordered pair $D = \langle A, R \rangle$ where A is a set of nodes of D and R is a binary relation on A . A digraph is a subgraph of D if i) $A' \subset A$ and ii) $R' = R \cap (A' \times A')$. If $D' \subset D$, D' is a proper subgraph of D .^[1]

Question 3

The graph representing universal relation is called _____

- a) complete digraph
- b) partial digraph
- c) empty graph
- d) partial subgraph

Answer: a) complete digraph

Explanation: Consider, A is a graph with vertices {a, b, c, d} and the universal relation is $A \times A$. The graph representing universal relation is called a complete graph and all ordered pairs are present there.^[1]

Question 4

What is a complete digraph?

- a) connection of nodes without containing any cycle
- b) connecting nodes to make at least three complete cycles
- c) start node and end node in a graph are same having a cycle
- d) connection of every node with every other node including itself in a digraph

Answer: d) connection of every node with every other node including itself in a digraph

Explanation: Every node should be connected to every other node including itself in a digraph is the complete digraph.^[1]

Question 5

Disconnected components can be created in case of _____

- a) undirected graphs
- b) partial subgraphs
- c) disconnected graphs
- d) complete graphs

Answer: c) disconnected graphs

Explanation: By the deletion of one edge from either connected or strongly connected graphs the graph obtained is termed as a disconnected graph. It can have connected components separated by the deletion of the edges. The edge that has to be deleted called cut edge.^[1]

Question 6

A simple graph can have _____

- a) multiple edges
- b) self loops
- c) parallel edges
- d) no multiple edges, self-loops and parallel edges

Answer: d) no multiple edges, self-loops and parallel edges

Explanation: If a graph say $G = \langle V, E \rangle$ has no parallel or multiple edges and no self loops contained in it is called a simple graph. An undirected graph may have multiple edges and self-loops.^[1]

Question 7

Degree of a graph with 12 vertices is _____

- a) 25
- b) 56
- c) 24
- d) 212

Answer: b) 56

Explanation: Number of edges incident on a graph is known as degree of a vertex. Sum of degrees of each vertex is called total degree of the graph. Total degree = $2 * \text{number of vertices}$.^[1]

Question 8

In a finite graph the number of vertices of odd degree is always _____

- a) even
- b) odd
- c) even or odd
- d) infinite

Answer: a) even

Explanation: In any finite graph, sum of degree of all the vertices = $2 * \text{number of edges}$. Sum of degree of all the vertices with even degree + sum of degree of all the vertices with odd degree = even number. It is possible if and only if number of odd degree vertices are even.^[1]

Question 9

An undirected graph has 8 vertices labelled 1, 2, ..., 8 and 31 edges. Vertices 1, 3, 5, 7 have degree 8 and vertices 2, 4, 6, 8 have degree 7. What is the degree of vertex 8?

- a) 15
- b) 8
- c) 5
- d) 23

Answer: b) 8

Explanation: Let x = degree of vertex 8

$$8 + 7 + 8 + 7 + 8 + 7 + 8 + x = 2 * 31$$

$$53 + x = 61$$

$$x = 8$$

Hence, degree of vertex 8 is 8.^[1]

Question 10

G is an undirected graph with n vertices and 26 edges such that each vertex of G has a degree at least 4. Then the maximum possible value of n is _____

- a) 7
- b) 43
- c) 13
- d) 10

Answer: c) 13

Explanation: Let m be min degree and M be a max degree of a graph, then $m \leq 2E/V \leq M$. Here, $m=4$, $E=26$, $v=?$

So, $4 \leq (2*26)/V$

$V \leq (52/4)$

$V \leq 13 \Rightarrow V = 13$.^[1]

