

PART - A QUESTIONS WITH ANSWERS

1. Define Graph.

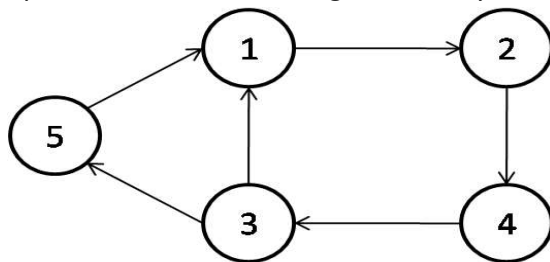
A graph G consist of a nonempty set V which is a set of nodes of the graph, a set E which is the set of edges of the graph, and a mapping from the set for edge E to a set of pairs of elements of V . It can also be represented as $G=(V, E)$.

2. Define adjacent nodes.

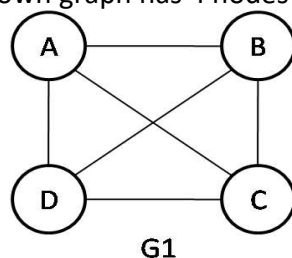
Any two nodes which are connected by an edge in a graph are called adjacent nodes. For example, if an edge $x \in E$ is associated with a pair of nodes (u,v) where $u, v \in V$, then we say that the edge x connects the nodes u and v .

3. What is a directed graph?

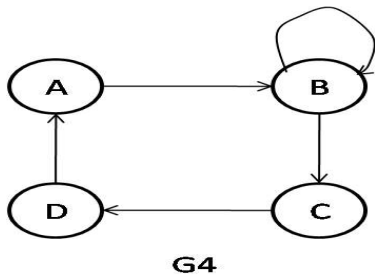
A directed or digraph is a graph which has ordered pair of vertices that is denoted as (V_1,V_2) , where V_1 is the tail and V_2 is the head of the edge. In this type of graph , each edge has direction means, (V_1, V_2) and (V_2,V_1) will represent different edges. The below shown graph has 5 nodes and 6 edges and they are,

**4. What is an undirected graph?**

A graph, which has unordered pairs of vertices, is called undirected graph. Suppose there is an edge between V_0 and V_1 , then it can be represented as (V_1, V_2) or (V_1, V_0) also. The below shown graph has 4 nodes and 6 edges.

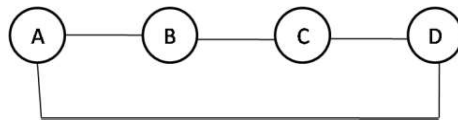
**5. What is a loop?**

An edge of a graph which connects to itself is called a loop or sling. An edge will be called loop (or) self-edge if it starts and ends on the same node. (i.e) if a node has a vertex to itself, it is called loop. Here, graph has a loop at node B.



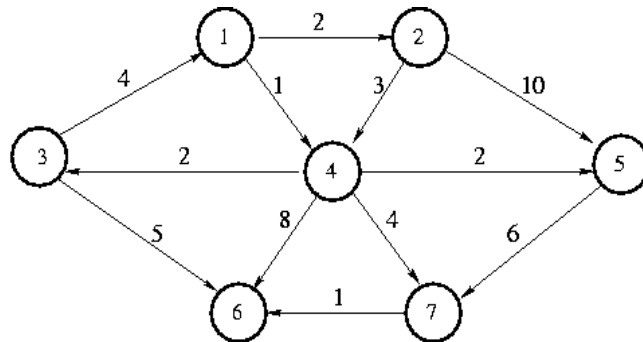
6. What is a simple graph?

A simple graph is a graph, which has not more than one edge between a pair of nodes than such a graph is called a simple graph.



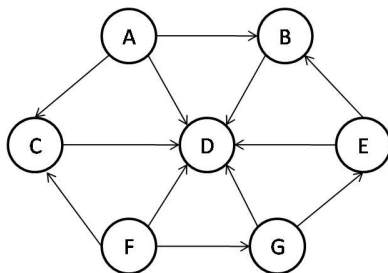
7. What is a weighted graph?

A graph in which weights are assigned to every edge is called a weighted graph.



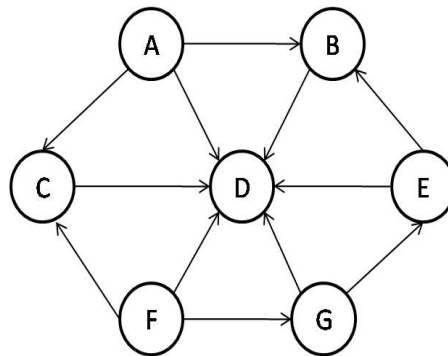
8. Define outdegree of a graph?

The out-degree of node is the number of edges going outside from that node or in other words the edges incident from it. From the graph, Out-degree(B)= 1, Out-degree(D) = 0,



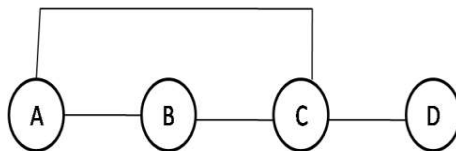
9. Define indegree of a graph?

The indegree of a node is the number of edges coming to that node or in other words edges incident on it. From the above graph, Indegree(A)= 0, Indegree(B) = 2, Indegree(D) = 6, Indegree(G) =1.



10. Define path in a graph.

A path from node U_0 to node U_n is a sequence of nodes such that U_0 is adjacent to U_0, U_1, U_2, \dots . U_1 is adjacent to U_2, \dots . U_{n-1} is adjacent to U_n .



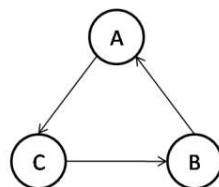
In the above graph path $(A,D) = \{A-B-C-D\}, \{A-C-D\}$

11. What is a simple path?

A path in a diagram in which the edges are distinct is called a simple path. It is also called as edge simple.

12. What is a cycle or a circuit?

A path which originates and ends in the same node is called a cycle or circuit.



Cycle = $A \rightarrow B \rightarrow C \rightarrow A$

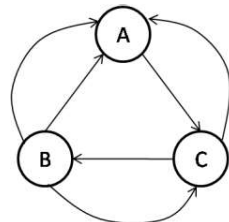
13. What is an acyclic graph?

A graph is said to be acyclic, if the edges in the graph does not form a cycle and it shown below,



14. What is meant by strongly connected in a graph?

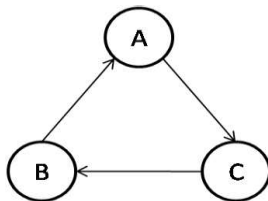
If there is a path from every vertex to every other vertex in a directed graph then it is said to be strongly connected graph. That is there should be path from any node to any other node.



Strongly
Connected Graph

15. When is a graph said to be weakly connected?

When a directed graph is not strongly connected but the underlying graph is connected, then the graph is said to be weakly connected.



Weakly
Connected Graph

16. Name the different ways of representing a graph?

- a. Adjacency matrix
- b. Adjacency list

17. What is an undirected acyclic graph?

When every edge in an acyclic graph is undirected, it is called an undirected acyclic graph. It is also called as undirected forest.

18. Define graph traversals.

Traversing a graph is an efficient way to visit each vertex and edge exactly once.

19. What are the two traversal strategies used in traversing a graph?

- a. Breadth first search
- b. Depth first search

20. List the two important key points of depth first search.

- i) If path exists from one node to another node, walk across the edge – exploring the edge.
- ii) If path does not exist from one specific node to any other node, return to the previous node where we have been before – backtracking.

21. Differentiate BFS and DFS.

No.	DFS	BFS
1.	Backtracking is possible from a dead end	Backtracking is not possible
2.	Vertices from which exploration is incomplete are processed in a	The vertices to be explored are organized as a
3.	Search is done in one particular direction	The vertices in the same level are maintained

22. What do you mean by tree edge?

If w is undiscovered at the time vw is explored, then vw is called a tree edge and v becomes the parent of w .

23. What do you mean by back edge?

If w is the ancestor of v , then vw is called a back edge.

24. Define biconnectivity.

A connected graph G is said to be biconnected, if it remains connected after removal of any one vertex and the edges that are incident upon that vertex. A connected graph is biconnected, if it has no articulation points.

25. What do you mean by articulation point?

If a graph is not biconnected, the vertices whose removal would disconnect the graph are known as articulation points.

26. What do you mean by shortest path?

A path having minimum weight between two vertices is known as shortest path, in which weight is always a positive number.

27. Define Activity node graph.

Activity node graphs represent a set of activities and scheduling constraints. Each node represents an activity (task), and an edge represents the next activity.

28. Define adjacency list.

Adjacency list is an array indexed by vertex number containing linked lists. Each node V_i the i^{th} array entry contains a list with information on all edges of G that leave V_i . It is used to represent the graph related problems.

29. How to find all articulation points in a given graph?

- A simple approach is to one by one remove all vertices and see if removal of a vertex causes disconnected graph. Following are steps of simple approach for connected graph.
 - ✓ For every vertex v , do following,
 - ✓ Remove v from graph
 - ✓ See if the graph remains connected (We can either use BFS or DFS)
 - ✓ Add v back to the graph

30. Define Euler circuit.

An Euler circuit is a circuit that uses every edge of a graph exactly once. An Euler circuit starts and ends at the same vertex.