

# EC6301 OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES

## 2Mark Questions with Answers

### UNIT-IV

#### NON-LINEAR DATA STRUCTURES

##### 1. Define tree.

Trees are non-linear data structure, which is used to store data items in a sorted sequence. It represents any hierarchical relationship between any data item. It is a collection of nodes, which has a distinguished node called the root and zero or more non-empty sub trees  $T_1, T_2, \dots, T_k$  each of which are connected by a directed edge from the root.

##### 2. Define Height of tree.

The height of  $n$  is the length of the longest path from root to a leaf. Thus, all leaves have height zero. The height of a tree is equal to a height of a root.

##### 3. Define Depth of tree.

For any node  $n$ , the depth of  $n$  is the length of the unique path from the root to node  $n$ . Thus for a root the depth is always zero.

##### 4. Define Degree of a node.

It is the number of sub trees of a node in a given tree.

##### 5. Define Degree of a tree.

It is the maximum degree of a node in a given tree.

##### 6. Define Terminal node or leaf?

Nodes with no children are known as leaves. A leaf will always have degree zero and is also called as terminal node.

##### 7. Define Non-terminal node?

Any node except the root node whose degree is a non-zero value is called as a non-terminal node. Non-terminal nodes are the intermediate nodes in traversing the given tree from its root node to the terminal node.

##### 8. Define sibling?

Nodes with the same parent are called siblings.

##### 9. Define binary tree?

A Binary tree is a finite set of data items which is either empty or consists of a single item called root and two disjoint binary trees called left sub tree. Max degree of any node is two.

### 10. Define expression tree?

Expression tree is also a binary tree in which the leaf terminal nodes or operands and nonterminal intermediate nodes are operators used for traversal.

### 11. Define Construction of expression trees

1. Convert the given infix expression into postfix notation
2. Create a stack and read each character of the expression and push into the stack, if operands are encountered.
3. When an operator is encountered pop 2 values from the stack.

### 12. Define lazy deletion?

When an element is to be deleted it is left in the tree itself and marked as being deleted. This is called as lazy deletion and is an efficient procedure if duplicate keys are present in the binary search tree, because the field that keeps count of the frequency of appearance of the element can be decremented of the element can be decremented.

### 13. Define AVL tree?

AVL tree also called as height balanced tree. It is a height balanced tree in which every node will have a balancing factor of 1,0,1. Balancing factor of a node is given by the difference between the height of the left sub tree and the height of the right sub tree.

### 14. What is priority queue?

A priority queue is a data structure that allows at least the following two operations: insert which does the obvious thing; and Detetermine, which finds, returns, and removes the minimum element in the priority queue. The Insert operation is the equivalent to enqueue.

### 15. Application of priority queues?

1. for scheduling purpose in operating system used for external sorting
2. important for the implementation of greedy algorithm, which operates by repeatedly finding a minimum.

### 16. What are the main properties of a binary heap?

1. Structure property
2. Heap order property

### 17. Define tree traversal and mention the type of traversals?

Visiting of each and every node in the tree exactly is called as tree traversal  
Three types of tree traversal

1. inorder traversal
2. preoder traversal
3. postorder traversal.

### 18. What is a graph?

A graph consists of a set of vertices  $V$  and set of edges  $E$  which is mathematically represented as  $G=(V,E)$ . Each edge in a pair  $(V,W)$  where  $V,W$ , belongs to  $E$ , edges are sometimes referred to as arcs.

### 19. What are Directed graphs?

If a pair of vertices for any edge is ordered, then that graph is called as Digraph or directed graph.

### 20. Define Path.

A path in a graph is a sequence of vertices  $w_1, w_2, w_3, w_N$  such that  $W_i, W_{i+1}$  belongs to  $E$  for a value  $1 \leq i \leq N$ . The length of such a path is the number of edges on the path, which is equal to  $n-1$ .

### 21. Define Cycle

A cycle is a path in which the first and last vertices are the same.

### 22. Define Acyclic graph.

A graph with no cycles is called Acyclic graph. A directed graph with no Edges is called as a directed Acyclic graph (or) DAG. DAGS are used for Compiler Optimization process.

### 23. Define Connected graph.

An undirected graph is connected if there is a path from every vertex to every other vertex. A directed graph with this property is called as strongly connected graph. If a directed graph is not strongly connected but the underline graph. Without direction is connected it is called as a weakly connected graph.

### 24. What are the conditions for a graph to become a tree?

A graph is a tree if it has two properties.

1. If it is a connected graph.
2. There should not be any cycles in the graph.

### 25. Define a Weighted Graph.

A graph is said to be a weighted graph if every edge in the graph is assigned some weight or value. The weight of the edge is a positive value that represents the cost of moving the edge or the distance between two vertices.

### 26. Give the types of representation of graphs.

1. Adjacency matrix
2. Adjacency linked list

**27. What is a minimum spanning tree?**

A minimum spanning tree of an undirected graph G is a tree formed from graph edges that connect all the vertices of G at lowest total cost.

**28. Explain about Adjacency Matrix**

Adjacency matrix consists of a  $n \times n$  matrix where n is the no. of vertices present. In the graph, which consists of values either 0 or 1.

**29. Explain about Adjacency linked list.**

It consists of a table with the no. of entries for each vertex for each entry a Linked List is initiated for the vertices adjacent to the corresponding table entry.

**30. What is a single source shortest path problem?**

Given as an input, a weighted graph,  $G = \langle V, E \rangle$  and a distinguished vertex, "S" as the source vertex. Single source shortest path problem finds the shortest weighted path from s to every other vertex in G.

**31. Explain about Unweighted shortest path.**

Single source shortest path finds the shortest path from the source to each and every vertex present in a unweighted graph. Here no cost is associated with the edges connecting the vertices. Always unit cost is associated with each edge.

**32. Explain about Weighted shortest path**

Single source shortest path finds the shortest path from the source to each and every vertex present in a weighted graph. In a weighted graph some cost is always associated with the edges connecting the vertices.

**33. What are the methods to solve minimum spanning tree?**

1. Prim's algorithm
2. Kruskal's algorithm

**34. explain briefly about Prim's algorithm**

Prim's algorithm creates the spanning tree in various stages. At each stage, a node is picked as the root and an edge is added and thus the associated vertex along with it.

**35. Define a depth first spanning tree.**

The tree that is formulated by depth first search on a graph is called as depth first spanning tree. The depth first spanning tree consists of tree edges and back edges.

**36. What is a tree edge?**

Traversal from one vertex to the next vertex in a graph is called as a tree edge.

**37. What is a back edge?**

The possibility of reaching an already marked vertex is indicated by a dashed line, in a graph is called as back edge.

**38. Define double linked list?**

It is linear data structure which consists of two links or pointer fields Next pointer points to the address of the next (successor) node. Previous pointer points to the address of the previous (predecessor) node.