Data Structure Assignments _2 Feb 20

1. **Differentiate between file and structure storage structure.**

Ans-

File Structure	Data Structure
Representation of items in secondary memory.	Structural representation of data items in primary memory to do storage & retrieval operations efficiently.
Data stored on disk	Data stored on both RAM and disk
The file structures are more standardised	Data structures can change between app versions and there is no need for compatibility.
Standard file storage policies	Customized storage policies
Low compatibility with external apps	High compatibility with external apps.

2. **When is a binary search best applied?**
3. **What is a linked list?**
4. **How do you reference all the elements in a one-dimension array?**
5. **In what areas do data structures are applied?**
6. **What is LIFO?**

Ans- LIFO stands for Last-in-first-out access order. Here, the element which is placed (inserted or added) last, is accessed first.It is directly corresponding to how the data can be worked on and modified. The data entity that is stored or pushed in last is the first one to be worked on at any point in time. If there is a requirement to access the very first element stored, then first you have to retrieve all of the data that came in after that element.

7. What is a queue?

Ans- A queue is a widely used data structure that is used to denote the ordered access and manipulation of an element. Queue is an abstract data structure, somewhat similar to Stacks. Unlike stacks, a queue is open at both its ends. One end is always used to insert data (enqueue) and the other is used to remove data (dequeue). Queue follows First-In-First-Out methodology, i.e., the data item stored first will be accessed first.

The operation of this data structure is exactly the same as a literal queue in the real world like queue at bus stops or ticket window. Elements are added one after the other and are processed on the front end.

8. What are binary trees?

Ans- Binary Tree is a special datastructure used for data storage purposes. A binary tree has a special condition that each node can have a maximum of two children. A binary tree has the benefits of both an ordered array and a linked list as search is as quick as in a sorted array and insertion or deletion operation are as fast as in linked list.

A binary tree, as the name suggests, is a tree data structure with two nodes, which are the nodes on the left and the right sides of the root note. In usage, binary trees are considered to be an extended linked list.

9. Which data structures are applied when dealing with a recursive function?

10. What is a stack?

Ans-A stack is another widely used data structure that provides users with the ability to work with data at one point only. A stack is an Abstract Data Type (ADT), commonly used in most programming languages. It is named stack as it behaves like a real-world stack, for example – a deck of cards or a pile of plates, etc

11. Explain Binary Search Tree

Ans- Binary Search tree exhibits a special behavior. A node's left child must have a value less than its parent's value and the node's right child must have a value greater than its parent value. A binary search tree is a data structure that stores data in a very efficient manner. It consists of two primary nodes from the root node. The main thing here is that the values of the nodes in the left sub-tree are less in number than the value of the root node, and the values of the nodes on the right of the root node are correspondingly higher than the root. Also, individually both of these left and right sub-trees are their own binary search trees at all points of time.

12. What are multidimensional arrays?

Ans- In C/C++, we can define multidimensional arrays in simple words as array of arrays. Data in multidimensional arrays are stored in tabular form (in row major order).Multi-dimensional arrays are arrays that span across more than one dimension. This means that they will have more than one index variable for every point of storage. This is primarily used in cases where data cannot be represented or stored using only one dimension.

13. Are linked lists considered linear or non-linear data structures?

Ans- Linked lists are considered to be the best of both worlds here. Based on usage, if it is a storage policy, then it can be considered as non-linear. Whereas, if a person is considering it based on retrieval strategies, then it can be considered linear.
According to Access strategies Linked list is a linear one.
According to Storage Linked List is a Non-linear one.

14. How does dynamic memory allocation help in managing data?

Ans- Dynamic memory allocation is when an executing program requests that the operating system give it a block of main memory. The program then uses this memory for some purpose. Usually the purpose is to add a node to a data structure.

15. What is FIFO?

Ans- FIFO, also known as First in, First out, is a way of representing a data operation on factors such as how data is accessed and in what order. Here, the data that is first put into the list will be the first entity to exit from the ordered data structure.
It is a method for handling data structures where the first element is processed first and the newest element is processed last.

16. What is an ordered list?

Ans- In an *ordered list* the order of the items is significant. Consider a list of the titles of the chapters in this book. The order of the items in the list corresponds to the order in which they appear in the book. However, since the chapter titles are not sorted alphabetically, we cannot consider the list to be sorted. Since it is possible to change the order of the chapters in book, we must be

able to do the same with the items of the list. As a result, we may insert an item into an ordered list at any position.

17. What is merge sort?

Ans- Merge sort is a sorting technique based on divide and conquer technique. With worst-case time complexity being O(n log n), it is one of the most respected algorithms. Merge sort first divides the array into equal halves and then combines them in a sorted manner. Here, data entities adjacent to each other are first merged and sorted in every iteration to create sorted lists. These smaller sorted lists are combined at the end to form the completely sorted list.

18. Differentiate NULL and VOID

Ans- Void is a data type identifier in data structures, while null is considered to be a value with no physical presence. When void is used, it indicates that there is no size while initializing the data structure.

19. What is the primary advantage of a linked list?

Ans- Advantages of linked lists:

1. Linked lists are dynamic data structures. i.e., they can grow or shrink during the execution of a program.
2. Linked lists have efficient memory utilization. Memory is allocated whenever it is required and it is de-allocated (removed) when it is no longer needed.
3. Insertion and Deletions are easier and efficient. Linked lists provide flexibility in inserting a data item at a specified position and deletion of the data item from the given position.
4. Many complex applications can be easily carried out with linked lists.

20. What is the difference between a PUSH and a POP?

Ans- Both push and pop operations denote how data can be stored and used when required in a stack. The push operation denotes that users are adding data into the structure, and the pop operation denotes that the data is being pulled or removed from the structure. Usually, the top-most element is considered when performing push and pop operations.

- push() − Pushing (storing) an element on the stack.
- pop() − Removing (accessing) an element from the stack.

21. What is a linear search?

22. How does variable declaration affect memory allocation?

23. What is the advantage of the heap over a stack?

Ans- The heap is more flexible than the stack. That's because memory space for the heap can be dynamically allocated and de-allocated as needed. However, memory of the heap can at times be slower when compared to that stack.Stack memory allocation is very fast, and guaranteed to be immediately available if the function is invoked successfully.

24. What is a postfix expression?

Ans- An expression is called the postfix expression if the operator appears in the expression after the operands. Simply of the form (operand1 operand2 operator).

E.g. A+B In Postfix Form Is AB+

Post-fix expressions are used in a scenario where every operator is preceded by its operands. Using this ensures to eliminate the need for parentheses or sub-expressions when it comes to the concept of operator precedence.

25. What is Data abstraction?

Ans- Data abstraction refers to providing only essential information to the outside world and hiding their background details, i.e., to represent the needed information in program without presenting the details.Data abstraction is one of the widely used tools in data structures. The goal is to break down complex entities into smaller problems and solve these by using the concepts of data structures. This provides users with the advantage of being focused on the operations and not worried about how the data is stored or represented in the memory.

26. How do you insert a new item in a binary search tree?

27. How does a selection sort work for an array?

28. How do signed and unsigned numbers affect memory?

29. What is the minimum number of nodes that a binary tree can have?

Ans- Minimum no. of node is h nodes.

If a tree consisting of only one node is considered to have height of 0.

if you consider a tree with one node to be a height of one, then the minimum nodes is (2^(h-1)) 1 nodes.

Minimum number of nodes in a binary tree of height h is 2h+1.

30. What are dynamic data structures?

Ans- Dynamic data structures provide users with a lot of flexibility in terms of the provision of data storage and manipulation techniques, which can change during the operation of the algorithm or the execution of the program.

31. In what data structures are pointers applied?

Ans- Pointers are used in a variety of data structures. Following are the data structures where pointers are used-

- Linked Lists
- Stacks
- Queues
- Binary trees

32. Do all declaration statements result in a fixed reservation in memory?

33. What are ARRAYs?

Ans- Array is a container which can hold a fix number of items and these items should be of the same type. Most of the data structures make use of arrays to implement their algorithms. Following are the important terms to understand the concept of Array.

• Element − Each item stored in an array is called an element.

• Index − Each location of an element in an array has a numerical index, which is used to identify the element.

34. What is the minimum number of queues needed when implementing a priority queue?

35. Which sorting algorithm is considered the fastest?

Among the many types of algorithms such as bubble sort, quick sort, merge sort, and more, it is not right to put one method on the podium for performance as this greatly varies based on data, the reaction after the algorithm processes the data, and how it's stored. The concept of time complexity is considered here.

36. Differentiate STACK from ARRAY.

37. Give a basic algorithm for searching a binary search tree.

38. What is a dequeue?

Ans-Deque or Double Ended Queue is a generalized version of Queue data structure that allows insert and delete at both ends. A deque is a queue that is double-ended. This means that elements can be added or removed from any one of the two ends. It can be used both as a regular queue and as a stack. It performs better than both linked lists and stacks in general.

39. What is a bubble sort and how do you perform it?

40. What are the parts of a linked list?

41. How does selection sort work?

42. What is a graph?

43. Differentiate linear from a nonlinear data structure.

Ans-

Linear DS	Non-Linear DS
Sequential Access	Direct/Guided Access
Data elements are stored next to each other	Data elements can be separated by other entities in memory
They are Simple In Nature	They need certain rule or method.
Theyre Slow.	Theyre fast.
Theyre easy to code	Theyre Complex To code.
E.g.: Arrays, linked lists, stacks, and queues	E.g.: Trees and graphs

44. What is an AVL tree?

Ans- Named after their inventor Adelson, Velski & Landis, AVL trees are height balancing binary search tree. AVL tree checks the height of the left and the right sub-trees and assures that the difference is not more than 1. This difference is called the Balance Factor.

An AVL tree is a type of a binary search tree where the tree is only slightly balanced. Balance is the unit of comparison between the heights of the subtrees from the main (root) node.

45. What are doubly linked lists?

Ans- Doubly Linked List is a variation of Linked list in which navigation is possible in both ways, either forward and backward easily as compared to Single Linked List.

46. What is Huffman's algorithm?

47. What is Fibonacci search?

48. Briefly explain recursive algorithm.

49. How do you search for a target key in a linked list?