13. What is stack and for what it is used?

A stack is a data type that defines a linear data structure with an order - LIFO (Last in first out) or FILO (first in last out). Three basic operations /functions of the stack are - Pop, peek and push.

Stacks are used for:-

- Backtracking
- Parenthesis check
- Syntax parsing
- String reversal
- Evaluation & conversion of evaluating prefix, postfix, and infix expressions

14. What are the queue data structures? List some of its applications.

The queue data structure is a data type that specifies the ordered list or linear data structure by using the first in first out (FIFO) operation for gaining access to elements. In such a structure, insert operations are done at the end “REAR” and delete operations are done on the other end called “FRONT”.

Here are some of the applications of queue data structures:

- While maintaining (adding or deleting) the songs in the playlist.
- During the asynchronous transfer of data - file, sockets or so.
- As buffers in CD players in MP3 media players.
- As for waiting lists in call center systems, CPUs, printers.

15. What do you mean by Dequeueue?

Dequeue is a data structure that is a double-ended queue, in which data can be deleted and inserted from both ends which are - REAR and FRONT.

16. Where usually stack data structure is used?

Stack structure has its application in -

- Memory management
- Function calling and return
- Expression evaluation
- Backtracking

17. Why is Heap more advantageous than Stack?

Heap and Stack both of them are part of memory and are often required for use in JAVA for multiple needs: But here what makes them incomparable:

- Heap is quite flexible compared to stack because it can easily allocate and deallocate the memory space.
- Stacks contained variables seem visible only to the private owners, while objects gathered in Heap are visible to all threads.
- Stack memory just holds local variables & function calls while heap memory is used to store objects in JAVA.
- While recursion, the stack memory fills-ups quickly, while Heap memory doesn't.

18. What is the difference between PUSH & POP?

PUSH and POP help to define how the data should be stored and retrieved within a stack.

- PUSH explains that data has been put or inserted into the stack.
- While POP defines that the data has been retrieved or deleted from the stack.

19. What do you mean by Postfix expression?

Postfix expression is an expression where the operators follow the operands. The best part of this expression is:

- No grouping of sub-expressions required in parenthesis
- No need to consider operator precedence

For example - If you write - a+b, it will be shown as ab+ in postfix.

20. Which sorting algorithm is the fastest and why?

QuickSort Algorithm has considered the fastest it delivers the best performance with more inputs. Here are the reasons why this algorithm is said to be best & fastest over other sorting algorithms:

- Even if it has a worse-case input set, it will still be efficient as the order is random.
- It is cache efficient as it linearly scans and partitions the input.
- Being slightly sensitive to input, it skips swaps.
- Can easily adapt complete or mostly sorted inputs.

21. What do you mean by merge sort and how does it work?

Merge sort is a type of a divide and conquer algorithm that helps in sorting the data. This merges & sorts the adjacent data and develops bigger sorted lists out of it, these multiple lists are merged recursively to form even bigger sorted lists - until you don't get a final and single sorted list.

22. Explain the graph data structure.

It is a kind of non-linear data structure that contains vertices or nodes connected by arcs to allow storing and retrieval of data. Arcs or edges can be directed or undirected.

23. What are some of the applications of the Graph data structure?

Graph data structures are used for:

- Social network graphs - To understand the flow of information and hotspots.
- Utility graphs for power or water - in which vertices are connection points & edge the wires connecting them.
- Neural networks
- Transport grids

24. Why is binary search advantageous over linear search?

- The binary search runs in 0 (log n) time while the linear search runs on the 0 (n) time. This means if there are more elements in the search array, the binary search would be faster than the linear search.
- Another reason why binary is faster because, in its way, it performs fewer comparisons. During the linear search, only a single element can be eliminated during the per element comparison, while during the binary search, it is possible to eliminate half of the set during each element comparison.

25. What is the difference between NULL and Void?

- The void is a data type identifier while NULL is a value.
- Void indicates that the pointer has no initial size while NULL indicates an empty value for a variable.
- Void means that value exists but is not in effect while Void means that the value never existed.

26. What are the 2 ways to determine whether the linked list has a loop?

- By Floyd's cycle-finding algorithm
- By using the visited nodes method
- By using Hashing

27. Where multilinked structures are commonly used?

Multi linked structures are most used to generate an index and sparse matrix.

28. What is the structure of the max heap data structure?

In max heap data structures, the value of the root node stands as either equal or greater to its child nodes.

29. What is Jagged array?

An array where its elements are itself arrays of different sizes & dimensions.

30. How does dynamic memory allocation help with the management of data?

Dynamic memory allocations carry the simple data structure types during the runtime. It helps to combine the separately allocated blocks to turn them into a composite structure - that could be extended and shrunken as needed. Thus, it helps with data blocks of arbitrary size and arbitrary order.

31. List out of the types of trees.

There is a total of 6 types of trees:

- Tournament tree
- Expression tree
- Binary tree
- Binary search tree
- General tree
- Forests

32. What is bubble sort and how does it work?

Bubble sort is a comparison based algorithm, where every pair of adjacent elements is compared, and these elements are swapped if they are not placed in order.

33. How file structure & storage structure are different?

Storage structures define the data structure in the memory of the computer system while file structure defines the storage structure in the auxiliary memory.

34. What are some of the applications of the Tree-data structure?

The tree data structure has the following applications:

- Syntax analysis
- Symbol table construction
- Hierarchical data model
- Manipulation of an arithmetic expression

35. State the difference between path, cycle, circuit.

- Circuit - it is a closed path where initial vertex and end vertex are identical to each other. And any vertex can be repeated.
- Path - They are the sequence of adjacent vertices that are connected by edges and have no restrictions.
- Cycle - It is also a closed path where the initial vertex is identical to the closed vertex but the vertex in the path cannot be visited twice.

36. What is a spanning tree and how many do such trees a graph have?

Spanning tree is a subset of Graph G that has all the vertices covered with the least number of edges. Such trees do not have a cycle, they cannot be disconnected.

The number of such trees depends on how the graph is connected. Say a complete undirected graph can have n(n-1) number of spanning trees - where n calls for nodes.

37. Which data structures must be used to perform LRU cache?

You can use two data structures to perform LRU cache:

- **Hash**- With page number as key and address of the corresponding queue node as the value.
- **Queue** - This structure is performed using a doubly-linked list. The recently used pages will be found near the REAR end and the least recently used pages near the front end.

38. What are the benefits of Selection sort?

The selection sorts are:

- Quite simple and easy to perform.
- Are 60% more effective than the bubble sort?
- Are suitable for small data sets.

39. What are the limitations of the array implementation of Queue?

The size of the array - If we need to add more elements in the queue, we need to expand the size of the queue, but by chance, if we are using an array to implement a queue, it is not possible to extend the array size, therefore, array implementation of the queue is often a problem.

Waste of memory- The space of the array that is used for storing queue elements cannot be reused to store the queue elements because the elements can only be put in from the front end, and the value of the front end is so high that all the space before that will not be filled completely.

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