1. What is data structure?

A data structure is a way of organizing data that considers not only the items stored, but also their relationship to each other. Advance knowledge about the relationship between data items allows designing of efficient algorithms for the manipulation of data.

2. List out the areas in which data structures are applied extensively?

1. Compiler Design,
2. Operating System,
3. Database Management System,
4. Statistical analysis package,
5. Numerical Analysis,
6. Graphics,
7. Artificial Intelligence,
8. Simulation

3. What are the major data structures used in the following areas: RDBMS, Network data model and Hierarchical data model.

1. RDBMS = Array (i.e. Array of structures)
2. Network data model = Graph
3. Hierarchical data model = Trees

4. If you are using C language to implement the heterogeneous linked list, what pointer type will you use?

The heterogeneous linked list contains different data types in its nodes and we need a link, pointer to connect them. It is not possible to use ordinary pointers for this. So we go for void pointer. Void pointer is capable of storing pointer to any type as it is a generic pointer type.

5. Minimum number of queues needed to implement the priority queue?

Two. One queue is used for actual storing of data and another for storing priorities.

6. What is the data structures used to perform recursion?

Stack. Because of its LIFO (Last In First Out) property it remembers its 'caller' so knows whom to return when the function has to return. Recursion makes use of system stack for storing the return addresses of the function calls.

Every recursive function has its equivalent iterative (non-recursive) function. Even when such equivalent iterative procedures are written, explicit stack is to be used.

7. What are the notations used in Evaluation of Arithmetic Expressions using prefix and postfix forms?

Polish and Reverse Polish notations.

8. Convert the expression \(((A + B) \times C - (D - E) \wedge (F + G))\) to equivalent Prefix and Postfix notations.
1. **Prefix Notation:** - * +ABC ^ - DE + FG
2. **Postfix Notation:** AB + C * DE - FG + ^ -

9. Sorting is not possible by using which of the following methods? (Insertion, Selection, Exchange, Deletion)

**Sorting is not possible in Deletion.** Using insertion we can perform insertion sort, using selection we can perform selection sort, using exchange we can perform the bubble sort (and other similar sorting methods). But no sorting method can be done just using deletion.

10. What are the methods available in storing sequential files?

   1. Straight merging,
   2. Natural merging,
   3. Polyphase sort,
   4. Distribution of Initial runs.

11. List out few of the Application of tree data-structure?

   1. The manipulation of Arithmetic expression,
   2. Symbol Table construction,
   3. Syntax analysis.

12. List out few of the applications that make use of Multilinked Structures?

   1. Sparse matrix,
   2. Index generation.

13. In tree construction which is the suitable efficient data structure? (Array, Linked list, Stack, Queue)

Linked list is the suitable efficient data structure.

14. What is the type of the algorithm used in solving the 8 Queens problem?

Backtracking.

15. In an AVL tree, at what condition the balancing is to be done?

If the 'pivotal value' (or the 'Height factor') is greater than 1 or less than -1.

16. What is the bucket size, when the overlapping and collision occur at same time?

One. If there is only one entry possible in the bucket, when the collision occurs, there is no way to accommodate the colliding value. This results in the overlapping of values.

17. Classify the Hashing Functions based on the various methods by which the key value is found.

   1. Direct method,
   2. Subtraction method,
   3. Modulo-Division method,
   4. Digit-Extraction method,
   5. Mid-Square method,
   6. Folding method,
18. What are the types of Collision Resolution Techniques and the methods used in each of the type?

1. **Open addressing (closed hashing)**, The methods used include: Overflow block.
2. **Closed addressing (open hashing)**, The methods used include: Linked list, Binary tree.
3. 19. In RDBMS, what is the efficient data structure used in the internal storage representation?
4. **B+ tree.** Because in B+ tree, all the data is stored only in leaf nodes, that makes searching easier. This corresponds to the records that shall be stored in leaf nodes.
5. 20. What is a spanning Tree?
6. A spanning tree is a tree associated with a network. All the nodes of the graph appear on the tree once. A minimum spanning tree is a spanning tree organized so that the total edge weight between nodes is minimized.
7. 21. Does the minimum spanning tree of a graph give the shortest distance between any 2 specified nodes?
8. No. The Minimal spanning tree assures that the total weight of the tree is kept at its minimum. But it doesn't mean that the distance between any two nodes involved in the minimum-spanning tree is minimum.
9. 22. Which is the simplest file structure? (Sequential, Indexed, Random)
10. Sequential is the simplest file structure.
11. 23. Whether Linked List is linear or Non-linear data structure?
12. According to Access strategies Linked list is a linear one. According to Storage Linked List is a Non-linear one.