**Employee Management System**

1. **Explain how arrays are represented in memory and their advantage.**

Managing employee records efficiently is essential in any organization. In this system, we use an array to store employee objects, which provides fast and direct access using indices. Arrays are represented as contiguous memory locations, meaning all elements are stored one after the other in memory. This allows for quick access (O(1) time) to any element using its index, making arrays advantageous for fast traversal and retrieval operations.

Advantages of Arrays:

* Fast indexed access (O(1) for arr[i])
* Memory efficiency due to no overhead from pointers (unlike linked lists)
* Simple structure and easy to implement

1. **Analysis of Time complexity of each operation.**

Add:

* Time Complexity: O(1)
* Explanation: Insertion happens at the next available index without any shifting.

Search:

* Time Complexity: O(n)
* Explanation: Performs linear search through the array to find the matching employee ID.

Traverse:

* Time Complexity: O(n)
* Explanation: Visits each element in the array sequentially.

Delete (by ID):

* Time Complexity: O(n)
* Explanation: Searches for the element, then shifts the remaining elements left to fill the gap.

1. **Limitation of Arrays and when to use them.**

**Limitations:**

* Fixed size: Once created, the size of an array cannot be changed.
* Costly insert/delete: Inserting/deleting in the middle requires shifting elements.
* Inefficient search: Linear search is needed unless data is sorted.

**When to use Arrays:**

* When the number of records is known and fixed.
* When fast index-based access is needed.
* When memory overhead should be minimal.