# Exercise 4: Employee Management System

# 1.UNDERSTAND THE PROBLEM:

**o Explain how arrays are represented in memory and their advantages.**

**Array Representation in Memory:**

* **Structure:** Arrays are stored in contiguous memory locations, which allows for efficient access and manipulation.
* **Advantages:**
  + **Direct Access:** Constant-time access to any element using its index (O(1) time complexity).
  + **Simplicity:** Easy to implement and use.
  + **Cache Efficiency:** Due to contiguous memory allocation, arrays have good cache locality.

**Limitations:**

* **Fixed Size:** Arrays have a fixed size, which can lead to wasted memory if the array is larger than necessary or require resizing if it is too small.
* **Insertion/Deletion:** Adding or removing elements involves shifting elements, which can be inefficient (O(n) time complexity for insertion/deletion).

# 2. ANALYSIS:

**o Analyze the time complexity of each operation (add, search, traverse, delete).**

**Time Complexity:**

* **Add:** O(1) – if there is space available in the array.
* **Search:** O(n) – linear search through the array.
* **Traverse:** O(n) – visiting each element once.
* **Delete:** O(n) – shifting elements to fill the gap left by the removed employee.

**o Discuss the limitations of arrays and when to use them.**

**Limitations of Arrays:**

* **Fixed Size:** Once the array is full, it cannot be resized without creating a new array and copying elements.
* **Insertion/Deletion Efficiency:** Operations that require shifting elements can be costly in terms of time complexity.

**When to Use Arrays:**

* Arrays are suitable for scenarios where the number of elements is known in advance or changes infrequently. They are ideal for situations where fast access to elements is needed and where resizing is not a major concern.