**Exercise 4: Employee Management System**

**1. Understand Array Representation:**

* **Memory Representation of Arrays:**
  + Arrays are stored in contiguous memory locations.
  + Each element is placed at a fixed distance (based on data type size) from the previous one.
  + The index is used to directly access elements using base address + index \* element size.
* **Advantages of Arrays:**
  + Fast access to elements using index (O(1) time).
  + Easy to implement and manage for fixed-size collections.
  + Suitable for scenarios where the size of data is known beforehand.

**4. Analysis:**

* **Time Complexity of Operations:**
  + **Add (at end):** O(1) if space is available; O(n) if resizing is needed.
  + **Search:** O(n) for linear search; O(log n) for binary search (only if sorted).
  + **Traverse:** O(n), since each element is accessed one by one.
  + **Delete:** O(n), because elements after the deleted one need to be shifted.
* **Limitations of Arrays:**
  + Fixed size once declared (in static arrays).
  + Insertion and deletion are costly due to shifting elements.
  + Not suitable for frequent dynamic modifications.
  + Better alternatives like ArrayList or LinkedList are preferred for dynamic data handling.
* **When to Use Arrays:**
  + When the number of elements is fixed or known in advance.
  + When fast, direct access to elements is needed.
  + In performance-critical applications with limited dynamic operations.