**1.Understand Array Representation**

How Arrays Are Represented in Memory:

* Arrays are stored in contiguous memory blocks.
* Each element is accessed using an index: base\_address + index × element\_size.
* Arrays have fixed size defined at creation time.

Advantages of Arrays:

* Fast Access (O(1)): Direct access using index.
* Cache-friendly: Sequential memory improves cache performance.
* Simple to use: Easy syntax for storage and iteration.

**4.Analysis**

Time Complexity Analysis:

|  |  |  |
| --- | --- | --- |
| **Operation** | **Time Complexity** | **Explanation** |
| Add | O(1) | Add at end using size index. |
| Search | O(n) | Linear scan to find employee by ID. |
| Traverse | O(n) | One loop through the array. |
| Delete | O(n) | Find index and shift remaining elements. |

Limitations of Arrays:

1. Fixed Size: Cannot grow dynamically (unless replaced with a new array).
2. Costly Insertions/Deletions: Shifting elements is expensive.
3. Wasted Space: If unused capacity exists.
4. Better Alternatives: Use ArrayList or HashMap for dynamic and faster operations.

When to Use Arrays:

* When the number of records is known and fixed.
* When fast random access (by index) is needed.
* When memory usage must be minimal.