**Exercise 4: Employee Management System**

1**.Understand Array Representation:**

Q) Explain how arrays are represented in memory and their advantages.

Ans) Arrays in Java are a collection of elements of the same data type, stored together in memory. Arrays are indexed data structures and the index starts from 0. All elements of the array are retrieved using their index.

**Advantages: -**

**Fast Access**: Accessing an element through an index is real quick, O(1) time complexity.

**Low Memory Overhead**: Arrays have a small amount of additional memory that is called overhead, since the data is stored in contiguous memory locations.

**Easy Traversal**: Iterating over an array is straightforward and efficient.

**4.Analysis:**

Q) Analyze the time complexity of each operation (add, search, traverse, delete)

Ans) Add: O(1) — Adding an employee to the array takes constant time as long as there is space in the array.

Search: O(n) — In the worst case we might have to search through the whole array.

Traverse: O(n) - Because we are traversing through all elements of a given array.

Delete: O(n) - In the worst-case scenario, we might have to iterate through the entire array to find an element to be deleted and then we need to shift rest of the elements.

Q) Discuss the limitations of arrays and when to use them.

Ans**) Fixed Size**: An array's size is fixed at the time of its declaration; therefore, it cannot be modified. It may lead to wastage of memory if an array is not fully occupied, and a new array is to be formed when it becomes full.

**Deleting and Inserting at inefficient**: The process of deletion and insertion of elements in an array is inefficient, particularly for middle elements as extra elements may need to be shifted.

**Better Alternatives**: In the case of dynamic data—when the count of elements may be changed—other data structures, like ArrayLists or LinkedLists, or other collections, may turn out to be more appropriate.