**Exercise 4: Employee Management System Theory**

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

**Ans->** Memory Representation: Arrays are a collection of elements stored in contiguous memory locations. The address of the first element is the base address, and each subsequent element can be accessed by adding the size of the element type to the base address.

Advantages:

* Array allows direct access to elements using the index, making retrieval operations very fast (O(1)).
* Contiguous memory allocation improves cache performance in arrays.
* Arrays are simple to declare, initialize, and use in various programming languages.

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

**Ans-> Time Complexity**

* **Add**: O(1) - Adding an employee to the array is a constant time operation as long as there is space in the array.
* **Search**: O(n) - In the worst case, to search through all employees.
* **Traverse**: O(n) - To visit each element in the array.
* **Delete**: O(n) - In the worst case, to shift all elements after the deleted employee.

**Limitations of Arrays**

* The size of the array is fixed at creation time, making it difficult to handle a dynamic number of employees.
* Deleting an element requires shifting subsequent elements, which is time-consuming for large arrays.
* Inserting an element at a specific position requires shifting subsequent elements.

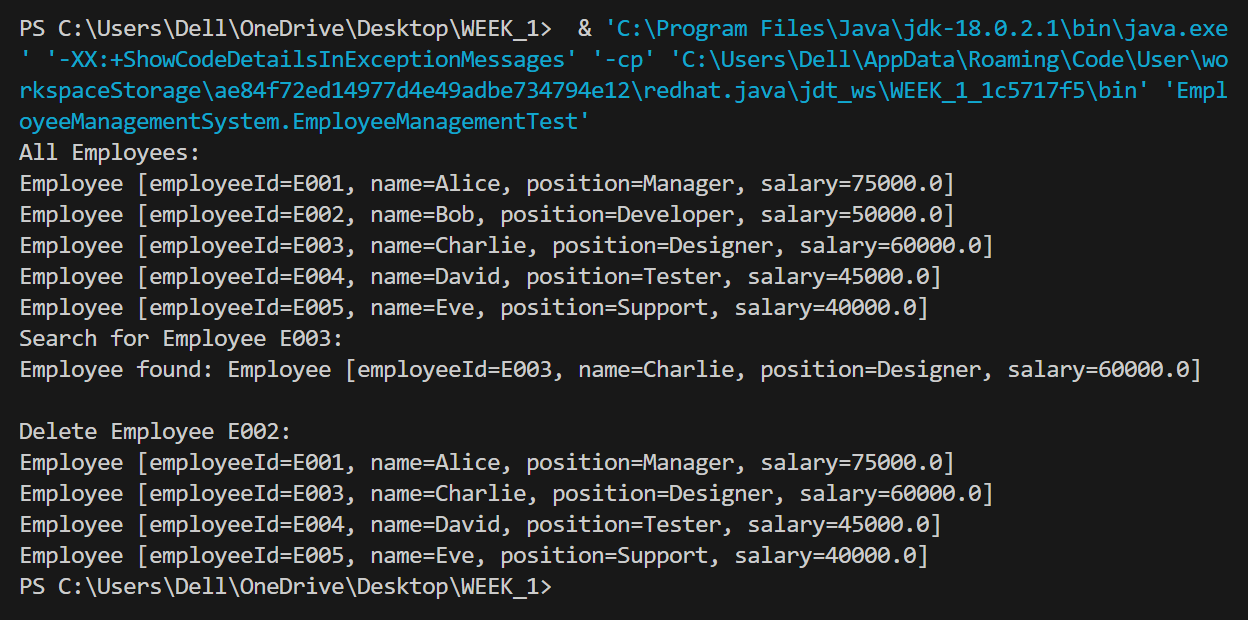
1. **Discuss the limitations of arrays and when to use them.**

**Ans-> Static Data**: When the number of elements is known in advance and doesn’t change frequently.

**Frequent Access**: When direct access to elements is required frequently.

**Memory Efficiency**: When memory overhead needs to be minimized compared to dynamic data structures like linked lists.

**OUTPUT FOR ADD, SEARCH, DELETE AND TRAVERSE ELEMENTS FOR EMPLOYEE DATA –**

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