WEEK\_1\_ALGORITHMS\_DATA\_STRUCTURES

Exercise 4: **Employee Management System**

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

Arrays are stored in contiguous memory locations. Each element in an array is placed next to the previous one, thus they are placed one after another.

The advantages are:

* Fast Access: O(1) time complexity for accessing elements by index.
* Memory Efficiency: Arrays are memory efficient because they do not require additional storage for pointers or other structures.
* Cache Friendly: Contiguous memory allocation makes arrays more cache-friendly, leading to faster access times.

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

Add Employee: O(1) (direct addition at the end of the array).

Search Employee: O(n) (linear search through the array).

Traverse Employees: O(n) (iterating through the entire array).

Delete Employee: O(n) (linear search to find the employee, then shifting elements).

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

The limitations of arrays are:

* Fixed Size: Arrays have a fixed size, making it difficult to handle dynamic data sizes.
* Insertion and Deletion: Inserting or deleting elements (other than at the end) requires shifting elements, leading to O(n) time complexity.
* Wasted Space: If the array is not fully utilized, it leads to wasted memory space.