**Exercise 4: Employee Management System**

**Scenario:**

You are developing an employee management system for a company. Efficiently managing employee records is crucial.

**Steps:**

**1. Understand Array Representation:**

**(i) Explain how arrays are represented in memory and their advantages.**

**Answer:**

Arrays are stored in memory as a single block of contiguous locations. Each element in the array has a specific address, which is calculated by adding an offset to the starting address of the array. This allows for fast access to individual elements using their index.

**4. Analysis:**

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

**Answer:**

* **addEmployee()**: O(1) because we are simply adding an employee to the end of the array.
* **searchEmployee()**: O(n) because we are traversing the array to find the employee.
* **traverseEmployees()**: O(n) because we are traversing the array to print all employees.
* **deleteEmployee()**: O(n) because we are traversing the array to find the employee and then shifting the remaining employees to fill the gap.

**(ii) Discuss the limitations of arrays and when to use them.**

**Answer:**

* Arrays have a fixed size, which can lead to memory waste if not fully utilized.
* Arrays do not support dynamic resizing, which can lead to performance issues if the array needs to be resized frequently.
* Arrays do not support efficient insertion or deletion of elements at arbitrary positions, which can lead to performance issues if these operations are frequent.