**Exercise 4: Employee Management System**

1. **Understand Array Representation**:  
   In Java, arrays store multiple elements of the same data type. They are stored in contiguous memory locations, meaning each element is placed one after the other in memory.  
   The advantages of arrays are:
   1. Fast Access
   2. Memory efficient
   3. Cache friendly
   4. Simple to use
   5. Compile-time checking
2. 3. **Setup and Implementation**:  
   Shown in code.

4. **Analysis**:

- Analysing time complexity of each operation as follows:  
 1. Add Operation: O(1)- Constant time (as it just adds element to the end of the array if place is available)

2. Search Operation: O(N) – Linear time (as it may need to check every element, till the end)  
 3. Traverse Operation: O(N) – Linear time (it NEEDS to go through every element to print it)

4. Delete Operation: O(N) – Linear time (might need to go through every element to find the element to delete or will have to traverse the entire array to find the last element or in case of invalid element)

- Limitations of arrays:

* Fixed size: The defined size of array is fixed while declaration or initialisation. There is always chance of wasting memory or running out of space in array.
* Not good for insertion/ deletion: Not good for insertion or deletion of elements in middle of the array as it will require shifting the elements and take up O(n) time, which is bad for large arrays.
* Homogeneous data type: Can only store element of set type.
* When to use arrays:
  + When we need fast access through index.
  + When the structure is simple, in case of small programs.
  + When there is need for low memory overhead.
  + When we know exactly what is the required size.