**COGNIZANT DIGITAL NURTURE – 3.0**

**JAVA FSE**

**WEEK – 1 EXERCISES**

**DATA STRUCTURES AND ALGORITHMS**

**Exercise 6: Library Management System**

**Step 1: Understand Search Algorithms:**

**I.**  **Explain linear search and binary search algorithms.**

**Linear Search**

* **Algorithm**: Linear search involves traversing the list from the beginning to the end, comparing each element with the target value.
* **Time Complexity**: O(n), where n is the number of elements in the list.
* **Use Case**: Suitable for small or unsorted lists.

**Binary Search**

* **Algorithm**: Binary search works on sorted lists. It divides the list into halves, repeatedly comparing the middle element with the target value, and discards the half where the target cannot lie.
* **Time Complexity**: O(log n), where n is the number of elements in the list.
* **Use Case**: Suitable for large, sorted lists.

**Step 2: Setup**

***Refer Program Files***

**Step 3: Implementation**

***Refer Program Files***

**Step 4: Analysis:**

**I. Compare the time complexity of linear and binary search.**

**Time Complexity**

* **Linear Search**: O (n) – Each element is checked one by one until the target is found.
* **Binary Search**: O (log n) – The list is repeatedly divided into halves until the target is found.

**II. Discuss when to use each algorithm based on the data set size and order.**

**Linear Search**:

* Use for small or unsorted lists.
* Simple to implement and doesn't require the list to be sorted.

**Binary Search**:

* Use for large, sorted lists.
* More efficient than linear search for large datasets due to its logarithmic time complexity.