

Library Management System

Understand Search Algorithms:

Explain linear search and binary search algorithms.

Ans:

Linear Search: Checks each element sequentially until the target is found or the end is reached. Simple but $O(n)$ time complexity.

Binary Search: Divides the search interval in half repeatedly on a sorted list. Efficient with $O(\log n)$ time complexity, but requires the list to be sorted.

Analysis:

Q1: Compare the time complexity of linear and binary search.

Ans:

Linear Search: $O(n)$ time complexity—scans each element sequentially, making it slower for large datasets.

Binary Search: $O(\log n)$ time complexity—halves the search space each iteration, making it much faster for sorted datasets.

Q2: Discuss when to use each algorithm based on the data set size and order.

Ans:

Linear Search: Use for small or unsorted datasets where simplicity is preferred. It works on any list but is inefficient for large lists due to its $O(n)$ time complexity.

Binary Search: Use for large, sorted datasets. It is efficient with $O(\log n)$ time complexity but requires the list to be sorted before searching.