**ASSIGNMENT-16**

**1.** **Compare the Quicksort algorithm with other sorting Merge Sort.**

**Quicksort vs Merge Sort:** Quicksort outperforms Merge Sort in terms of space complexity due to its in-place nature. However, Merge Sort is a stable sort and guarantees consistent O(n log n) time complexity, making it more predictable in certain scenarios.

**2. Discuss the advantage and disadvantages of Quicksort.**

**Advantages:**

* + Fast average-case performance (O(n log n)).
  + In-place sorting, reducing the need for additional memory.
  + Efficient for large datasets.

**Disadvantages:**

* + Worst-case time complexity can degrade to O(n^2) (e.g., already sorted data).
  + Unstable sort, which may impact applications requiring stable sorting.
  + Requires careful implementation to avoid performance pitfalls (e.g., pivot selection).

**3. Write a conclusion that summarizes the strengths and weaknesses of Quicksort and its performance compared to other sorting algorithms.**

**Strengths of Quicksort:**

**Efficiency:** Quicksort demonstrates fast average-case performance, making it suitable for large datasets.

**In-Place Sorting:** Quicksort is an in-place sorting algorithm, consuming less memory compared to algorithms like Merge Sort.

**Adaptability:** Well-suited for scenarios where average-case performance is crucial.

**Weaknesses of Quicksort:**

**Worst-Case Complexity:** The worst-case time complexity of O(n^2) can be a drawback, especially with already sorted or nearly sorted data.

**Unstable Sort:** Quicksort is an unstable sort, which may not be suitable for applications requiring stable sorting.

#### ****Conclusion:****

Quicksort is a powerful sorting algorithm known for its efficiency, particularly in average-case scenarios. Its in-place nature and adaptability make it suitable for various applications. However, its worst-case time complexity and instability can be limiting factors. In comparison with Merge Sort, Quicksort excels in space efficiency but may fall short in terms of worst-case performance guarantees and stability. The choice between Quicksort and Merge Sort should consider the specific requirements of the application, dataset characteristics, and trade-offs between time and space complexity.