

Question 2:

a. Insertion Sort:

Best-case time complexity: $O(n)$

Average-case time complexity: $O(n^2)$

Worst-case time complexity: $O(n^2)$

b. Bubble Sort:

Best-case time complexity: $O(n)$

Average-case time complexity: $O(n^2)$

Worst-case time complexity: $O(n^2)$

Bubble Sort is generally considered worse than Insertion Sort due to the following reasons:

- 1) Comparisons: Bubble Sort makes more comparisons, leading to inefficient performance.
- 2) Early Termination: Bubble Sort does not terminate early when the array is sorted, leading to unnecessary work.

Question 3:

Time complexity:

Heap sort - $O(n \log n)$

Merge Sort - $O(n \log n)$ in the worst, average, and best cases.

Quick Sort - average-case time complexity of $O(n \log n)$, worst-case - $O(n^2)$