DAA - PROJECT 1

Team Members :

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Sites Referred:

- **https://www.programiz.com/dsa/merge-sort**
- **https://www.geeksforgeeks.org/quick-sort/**
- **https://www.programiz.com/python-programming/file-operation**
- **https://www.w3resource.com/python-exercises/data-structures-and-algorithms/python-search-and-sorting-exercise-6.php**
- **Lecture Slides**

Time Complexity of each Algorithm:

Algorithm	Best	Average	Worst
Insertion Sort	Ω(n)	θ(n^2)	O(n^2)
Merge Sort	Ω(n log(n))	θ(n log(n))	O(n^2)
Quick Sort	Ω(n log(n))	θ(n log(n))	O(n log(n))

Experimental Results :

Array Length	Insertion Sort	Merge Sort	Quick Sort
Array of 20	0 secs	0.0 secs	0.0 secs
Array of 100	0 secs	0.0 secs	0.0 secs
Array of 1000	0.06475639343261719 secs	0.004514932632446289 secs	0.00463557243347168 secs
Array of 4000	1.0202813148498535 secs	0.016643285751342773 secs	0.015944719314575195 secs

Explain any differences between the experimental and theoretical results:

- As per average case for Mergesort and Quicksort, the time complexity should be similar, however we can see the minute difference from our experiments with random input sets of 4000.
- Insertion Sort and Merge sort should follow the same trend as per theory yet there is major difference in the runtime.

Compare and contrast the results between the three sorting algorithms and time taken to sort the 4 arrays. Explain anomalies if any.

- As per the results, with the increasing number of elements the quick sort becomes much more efficient compared to other sorting algorithms.
- For a lesser number of inputs, insertion sort can perform well but with increase in number of input, there is major change in running time.

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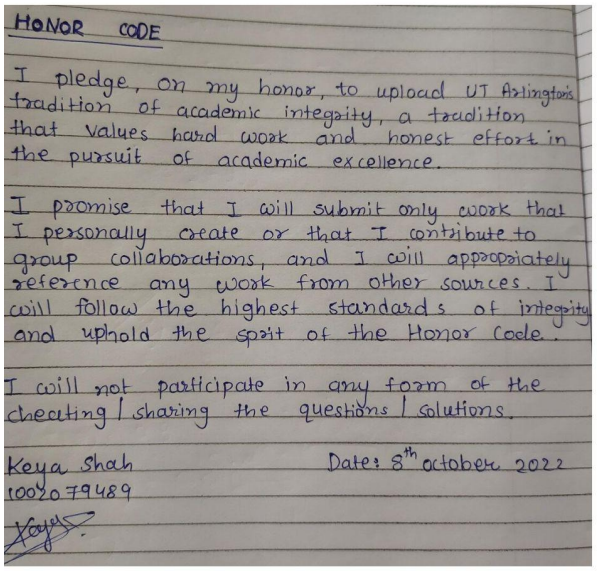

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I promise that I will submit only work that I personally create or that I contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

I will not participate in any form of the cheating / sharing the questions / solutions.

Keya Shah
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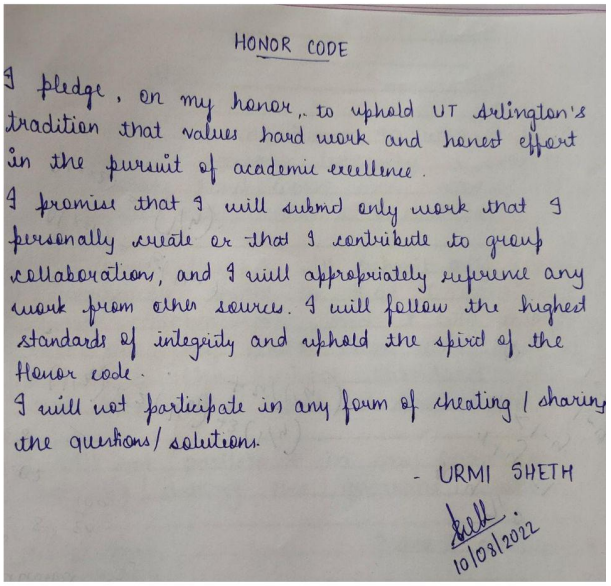
Date: 8th october 2022



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- URMI SHETH

10/08/2022