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|  | **Manav Rachna University** |
| **Lab Assignment 3** |
| **Subject:** Analysis and Design of Algorithms **Subject Code**:  **Semester: VI** | |

**Learning Objective:** Students would be Able to implement sorting algorithms

**Learning Outcome:** To learn an assortment of sorting algorithms; and, from these, that different algorithms have properties making them appropriate for different applications

1. Write a Program to Sort a given set of elements using merge sort method and determine the time required to sort the elements.

Code:

import time

def merge\_sort(arr):

    if len(arr) > 1:

        mid = len(arr) // 2

        left\_half = arr[:mid]

        right\_half = arr[mid:]

        merge\_sort(left\_half)

        merge\_sort(right\_half)

        i = j = k = 0

        while i < len(left\_half) and j < len(right\_half):

            if left\_half[i] < right\_half[j]:

                arr[k] = left\_half[i]

                i += 1

            else:

                arr[k] = right\_half[j]

                j += 1

            k += 1

        while i < len(left\_half):

            arr[k] = left\_half[i]

            i += 1

            k += 1

        while j < len(right\_half):

            arr[k] = right\_half[j]

            j += 1

            k += 1

arr = [10, 7, 8, 9, 1, 5, 12, 3, 2, 6]

n = len(arr)

start\_time = time.time()

merge\_sort(arr)

end\_time = time.time()

time\_taken = (end\_time - start\_time) \* 1000000

print("Sorted array:", arr)

print(f"Time taken to sort the elements: {time\_taken:.10f} seconds")

Output:

