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Q) Sort a given set of N integer elements using Merge sort technique. and compute its time taken

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>

void mergesort (int a[], int i, int j);
void merge (int a[], int i1, int i2, int j2);
int main()
{
 int a[30], n, i; clock_t startTime, endTime;
 printf("Enter no of elements:");
 scanf("%d", &n);
 printf("Enter array elements:");
 for(i=0; i<n; i++)
 scanf("%d", &a[i]); startTime = clock();
 mergesort(a, 0, n-1); endTime = clock();
 printf("\n Storted array is:");
 for(i=0; i<n; i++)
 printf("%d", a[i]); printf("\n Time taken is %.10f
                          seconds\n", (double)
                          (endTime - startTime)/CLOCKS_PER
                          SEC);
 return 0;
}
void mergesort (int a[], int i, int j)
 {
  int mid;
  if (i<j)
  {
   mid = (i+j)/2;
```

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```
mergesort (a, i, mid); //left recursion
mergesort (a, mid+1, j); // right recursion
merge (a, i, mid, mid+1, j); //merging of two
sorted sub-arrays
}
}

void merge (int a[], int i1, int i2, int j1, int j2)
{
int temp [50]; //array used for merging
int i, j, k;
i = i1; //beginning of first list
j = i2; //beginning of second list
k = 0;
while (i<=j1 && j<=j2) //while elements in both the
{                       lists
if (a[i] <a[j])
temp [k++] = a[i++];
else
temp [k++] = a[j++];
}
while (i<=j1) //copy remaining elements of first list
temp [k++] = a[i++];
while (j<=j2) //copy remaining elements of
                second list
temp[k++] = a[j++];

//Transfer elements from temp [] back to a[]
for (i = i1; j = 0; i <= j2; i++; j++)
a[i] = temp [j];
}
```

Modified version :-

```
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
int merge_two_sorted_arrays (int arr1[],int arr2[],
 int arr3[], int m, int n)
 {
 int i,j,k;
 i=j=k=0;
 for (i=0; i<m && j<n;)
  {
  if (arr1[i] < arr2[j])
  {
   arr3[k] = arr1[i];
   k++;
  i++;
  }
  else
  {
  arr 3[k] = arr2[j];
  k++;
  j++;
  }
 }
 while (i<m)
  {
  arr 3[k]= arr1[i];
  k++;
 } i++;
 while (j<n)
  {
  arr 3[k] = arr 2[j];
 k++;
 j++;
```

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```
}
}
int main()
{
int n,m;
 clock_t startTime, endTime;
 Printf ("\nEnter the Size of Array 1:");
 scanf ("%d", &m);
 Printf ("\nEnter the Size of Array 2:");
 scanf ("%d", &n);
  int arr1[m], arr2[n];
  int arr3[m+n];
  int i,
  Print f ("\n Input the Array1 elements:");
   for (i=0; i<m; i++)
   {
   scanf ("%d", &arr1[i]);
   }
   print f ("\n Input the Array2 elements:");
   for (i=0; i<n; i++)
    {
    scanf ("%d", &arr2[i]);
    }
    Start Time = Clock ();
    merge_two_sorted_arrays (arr1, arr2, arr3, m, n);
    end Time = clock ();
    printf ("\n The Merge Sorted Array:");
     for (i=0; i<n+m; i++)
     {
     printf ("%d", arr3[i]);
     }
     printf ("\n");
     return 0;
     }
```