

QUESTION 1: Write a program to sort an array of elements in ascending order using merge-sort. calculate the CPU time.

```
#include <stdio.h>

#include <time.h>

void merge(int arr[], int p, int q, int r) {
    int n1 = q - p + 1;
    int n2 = r - q;
    int L[n1], M[n2];
    int i,j;
    for (i = 0; i < n1; i++){
        L[i] = arr[p + i];
    }
    for ( j = 0; j < n2; j++){
        M[j] = arr[q + 1 + j];
    }
    int k;
    i = 0;
    j = 0;
    k = p;

    while (i < n1 && j < n2) {
        if (L[i] <= M[j]) {
            arr[k] = L[i];
            i++;
        } else {
            arr[k] = M[j];
            j++;
        }
    }
}
```

```
    }  
    k++;  
}
```

```
while (i < n1) {  
    arr[k] = L[i];  
    i++;  
    k++;  
}  
while (j < n2) {  
    arr[k] = M[j];  
    j++;  
    k++;  
}  
}  
void mergeSort(int arr[], int l, int r) {  
    if (l < r) {  
        int m = l + (r - l) / 2;  
        mergeSort(arr, l, m);  
        mergeSort(arr, m + 1, r);  
        merge(arr, l, m, r);  
    }  
}
```

```
void printArray(int arr[], int size) {  
    int i;  
    for (i = 0; i < size; i++)
```

```

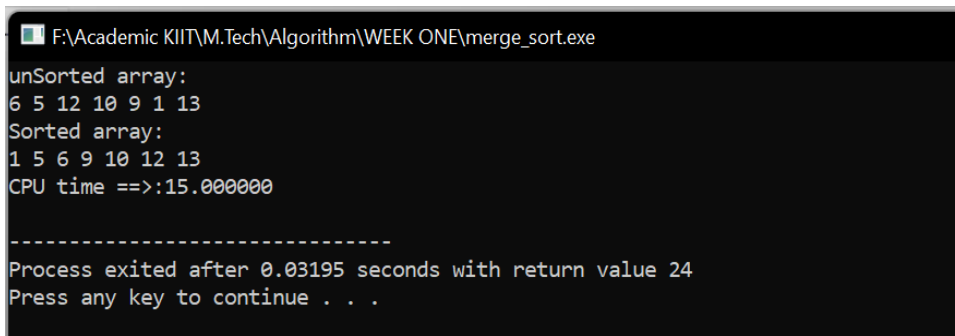
        printf("%d ", arr[i]);
    printf("\n");
}
int main() {
    clock_t start, end;
    double cpu_time_used;

    start = clock();
    int arr[] = {6, 5, 12, 10, 9, 1,13};
    int size = sizeof(arr) / sizeof(arr[0]);
    printf("unSorted array: \n");
    printArray(arr, size);
    mergeSort(arr, 0, size - 1);
    printf("Sorted array: \n");
    printArray(arr, size);
    end = clock();
    cpu_time_used = ((double) (end - start));

    printf("CPU time ==>:%f \n", cpu_time_used);
}

```

OUTPUT:



```

F:\Academic KIIT\M.Tech\Algorithm\WEEK ONE\merge_sort.exe
unSorted array:
6 5 12 10 9 1 13
Sorted array:
1 5 6 9 10 12 13
CPU time ==>:15.000000

-----
Process exited after 0.03195 seconds with return value 24
Press any key to continue . . .

```