ASSIGNMENT 4
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GROUP : CS4D
TOPIC : ANALYSIS OF ALGORITHM LAB
CODE : CS-14202

Q1

```c
// Analysis of QuickSort over 100K entries

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

clock_t begin;
clock_t end;

void swp(int *x, int *y) {
    int t = *x;
    *x = *y;
    *y = t;
}

int divArr(int arr[], int low, int high)
{
    int pivot = arr[high];
    int i = (low - 1), j;

    for (j = low; j <= high - 1; j++) {
        if (arr[j] < pivot) {
            i++;
            swp(&arr[i], &arr[j]);
        }
    }
    swp(&arr[i + 1], &arr[high]);
    return (i + 1);
}

void qSort(int arr[], int low, int high)
{
    if (low < high) {
        int pi = divArr(arr, low, high);
        qSort(arr, low, pi - 1);
        qSort(arr, pi + 1, high);
    }
}

void writeTable(int size, double time, char *filename)
{
    int i;
```

```
    FILE *fp = fopen(filename, "a+");

    if (fp == NULL) printf("FILE CANNOT BE OPENED\n");
    else {
        fprintf(fp, "%d %lf", size, time);
        fprintf(fp, "\n");
    }
    fclose(fp);
}

void readData(int arr[], char *filename) {
    FILE *fp = fopen(filename, "r+");
    char x[16];
    int i, k = 0;

    if (fp == NULL) printf("FILE CANNOT BE OPENED\n");
    else {
        while (fgets(x, 16, fp) != NULL) {
            int num = 0;
            fscanf(fp, "%d", &num);
            if (num == 0) break;
            arr[k++] = num;
        }
    }
    fclose(fp);
}

int main(int argc, char **argv) {
    int arr[100000];
    int size[] = {1000, 5000, 8000, 10000, 20000,
30000, 40000, 50000, 65000, 80000, 90000, 100000};
    int i = 0;
    for (i = 0; i <= 11; i++) {
        readData(arr, argv[1]);
        begin = clock();
        qSort(arr, 0, size[i]-1);
        end = clock();
        writeTable(size[i], (end - begin) / 2000.0,
argv[2]);
    }
    return 0;
}
```

```
set autoscale                          # scale axes automatically
unset log                              # remove any log-scaling
unset label                            # remove any previous labels
set xtic auto                          # set xtics automatically
set ytic auto                          # set ytics automatically    set tics
font "Helvetica,10"
set title "Quick Sort Best/Avg/Worst"
set xlabel "Number of Inputs (Array Size)"
set ylabel "Time Taken (ms)"

#set key 0.01,100
#set label "Yield Point" at 0.003,260
#set arrow from 0.0028,250 to 0.003,280

set xr [1000:125000]
set yr [0:7500]
plot    "qTableAVG.txt" using 1:2 title 'QuickSort AVG' with linespoints, \
        "qTableBST.txt" using 1:2 title 'QuickSort BEST' with linespoints, \
        "qTableWST.txt" using 1:2 title 'QuickSort WORST' with linespoints
```