**Quick Sort**
**Code :**

```
#include<stdio.h>
#include<stdlib.h>
#include<sys/time.h>
#include<math.h>
void fnGenRandInput(int X[], int n)
{
        int i;
        srand(time(NULL));
        for(i=0;i<n;i++)
        X[i]=rand()%10000;
}
void swap(int *a, int *b) {
   int temp = *a;
   *a = *b;
   *b = temp;
}

int partition(int A[], int l, int r) {
   int P = A[r];
   int i = (l - 1);

   for (int j = l; j <= r - 1; j++) {
      if (A[j] <= P) {
         i++;
         swap(&A[i], &A[j]);
      }
   }
   swap(&A[i + 1], &A[r]);
   return (i + 1);
}

void quickSort(int A[], int l, int r) {
   if (l < r) {
      int S = partition(A, l, r);

      quickSort(A, l, S - 1);
      quickSort(A, S + 1, r);
   }
}

int main(int argc, char **argv)
{
        FILE *fp;
        struct timeval tv;
        double dStart, dEnd;
        int Arr[100000],i;
        fp=fopen("quicktimeC.txt","w");
        for(i=100;i<15000;i+=500)
        {
                fnGenRandInput(Arr,i);
```

```
                gettimeofday(&tv, NULL);
                dStart=tv.tv_sec+(tv.tv_usec/1000000.0);
                dEnd=tv.tv_sec+(tv.tv_usec/1000000.0);
                fprintf(fp,"%d\t%lf\t%d\n",i,dEnd-dStart,(i*log(i)) / 1000000.0);
        }
        fclose(fp);

        FILE *gnuplotPipe=popen("gnuplot -persistent","w");
        if(gnuplotPipe!=NULL)
        {
                fprintf(gnuplotPipe, "set xlabel 'Input Size'\n");
                fprintf(gnuplotPipe, "set ylabel 'Time Taken (seconds)'\n");
                fprintf(gnuplotPipe, "set title 'Time Efficiency of Quick Sort'\n");
                fprintf(gnuplotPipe, "set style line 1 lc rgb '#0060ad' lt 1 lw 2 pt 7 ps 0.5\n");
                fprintf(gnuplotPipe, "set style line 2 lc rgb '#006ae90' lt 2 lw 2 pt 8 ps 0.5\n");
                fprintf(gnuplotPipe, "plot 'quicktimeC.txt' using 1:2 with linespoints ls 1 title 'Actual
Time',%d*x**2 with lines ls 2 title 'Estimated Time'\n",(i*log(i)) / 1000000.0);
                fprintf(gnuplotPipe, "set term png\n");
                fprintf(gnuplotPipe, "set output 'quicksort_efficiencyC.png'\n");
                fprintf(gnuplotPipe, "replot\n");
                fflush(gnuplotPipe);
                fprintf(gnuplotPipe, "exit\n");
                pclose(gnuplotPipe);
        }
        return 0;
}
```

**Time Content:**

| | | |
|---|---|---|
| 100 | 0.000000 | 288530457 |
| 600 | 0.000000 | 288530457 |
| 1100 | 0.000000 | 288530457 |
| 1600 | 0.000000 | 288530457 |
| 2100 | 0.000000 | 288530457 |
| 2600 | 0.000000 | 288530457 |
| 3100 | 0.000000 | 288530457 |
| 3600 | 0.000000 | 288530457 |
| 4100 | 0.000000 | 288530457 |
| 4600 | 0.000000 | 288530457 |
| 5100 | 0.000000 | 288530457 |
| 5600 | 0.000000 | 288530457 |
| 6100 | 0.000000 | 288530457 |
| 6600 | 0.000000 | 288530457 |
| 7100 | 0.000000 | 288530457 |
| 7600 | 0.000000 | 288530457 |
| 8100 | 0.000000 | 288530457 |
| 8600 | 0.000000 | 288530457 |
| 9100 | 0.000000 | 288530457 |
| 9600 | 0.000000 | 288530457 |
| 10100 | 0.000000 | 288530457 |
| 10600 | 0.000000 | 288530457 |
| 11100 | 0.000000 | 288530457 |
| 11600 | 0.000000 | 288530457 |

| | | |
|---|---|---|
| 12100 | 0.000000 | 288530457 |
| 12600 | 0.000000 | 288530457 |
| 13100 | 0.000000 | 288530457 |
| 13600 | 0.000000 | 288530457 |
| 14100 | 0.000000 | 288530457 |
| 14600 | 0.000000 | 288530457 |

**Graph :**