

**K. K. Wagh Institute of Engineering Education and Research, Nashik.**  
**Department of Computer Engineering**  
**Academic Year 2022-23**

**Course: Laboratory Practice III**

**Name:** Ahire kalpesh Bapurao

**Roll No. :** 12

**Course Code: 410246**

**Class: BE**

**Div: A**

\*\*\*\*\*

**Problem Statement:**

Write a program for analysis of quick sort by using deterministic and randomized variant.

**Program:**

**1. Deterministic Approach:**

```
def partition(array, low, high):
    pivot = array[high]
    i = low - 1
    for j in range(low, high):
        if array[j] <= pivot:
            i = i + 1
            (array[i], array[j]) = (array[j], array[i])
    (array[i + 1], array[high]) = (array[high], array[i + 1])
    return i + 1

def quickSort(array, low, high):
    if low < high:
        pi = partition(array, low, high)

        # Recursive call on the left of pivot
        quickSort(array, low, pi - 1)
        # Recursive call on the right of pivot
        quickSort(array, pi + 1, high)

data = []
print("Enter number of elements to sort")
size=int(input())
print("Enter input numbers:")
for i in range(size):
    s=int(input())
    data.append(s)
print("Unsorted Array")
print(data)

quickSort(data, 0, size - 1)

print('Sorted Array in Ascending Order:')
```

```
print(data)
```

\*\*\*\*\*OUTPUT\*\*\*\*\*

```
Enter number of elements to sort
```

```
8
```

```
Enter input numbers:
```

```
56
```

```
34
```

```
44
```

```
89
```

```
12
```

```
46
```

```
7
```

```
8
```

```
Unsorted Array
```

```
[56, 34, 44, 89, 12, 46, 7, 8]
```

```
Sorted Array in Ascending Order:
```

```
[7, 8, 12, 34, 44, 46, 56, 89]
```

\*\*\*\*\*

## 2. Randomized Approach

```
import random
```

```
def quicksort(arr, start , stop):
```

```
    if(start < stop):
```

```
        pivotindex = partitionrand(arr,start, stop)
```

```
        quicksort(arr , start , pivotindex-1)
```

```
        quicksort(arr, pivotindex + 1, stop)
```

```
def partitionrand(arr , start, stop):
```

```
    randpivot = random.randrange(start, stop)
```

```
    arr[start], arr[randpivot] = arr[randpivot], arr[start]
```

```
    return partition(arr, start, stop)
```

```
def partition(arr,start,stop):
```

```
    pivot = start
```

```
    i = start + 1
```

```
    for j in range(start + 1, stop + 1):
```

```
        if arr[j] <= arr[pivot]:
```

```
            arr[i] , arr[j] = arr[j] , arr[i]
```

```
            i = i + 1
```

```
    arr[pivot] , arr[i - 1] =arr[i - 1] , arr[pivot]
```

```
    pivot = i - 1
```

```
    return (pivot)
```

```
array = []
print("Enter number of elements to sort")
size=int(input())
print("Enter input numbers:")
for i in range(size):
    s=int(input())
    array.append(s)
print("Unsorted Array")
print(array)

quicksort(array, 0, size - 1)
print(array)
```

\*\*\*\*\*OUTPUT\*\*\*\*\*

```
Enter number of elements to sort
8
Enter input numbers:
45
78
12
56
89
23
64
21
Unsorted Array
[45, 78, 12, 56, 89, 23, 64, 21]
[12, 21, 23, 45, 56, 64, 78, 89]
```

\*\*\*\*\*