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DAA – Quick Sort Using 3 Conditions

I) First Element as Pivot

Working :

Use Quick Sort and sort this array by using

i) First Element as a Pivot
ii) Last Element as a Pivot.

Pivot
↓

i) 157 110 147 122 111 149 151 141 123 112 117 133

SWAP

STEP-1:

Pivot
↓

STEP-1 133 110 147 122 111 149 151 141 123 112 117 157

Pivot
↓

STEP-2 133 110 117 122 111 149 151 141 123 112 147 157

Pivot
↓

STEP-3 133 110 117 122 111 112 151 141 123 149 147 157

Pivot
↓

STEP-4 133 110 117 122 111 112 123 141 151 149 147 157

SWAP

STEP-5:

Pivot
↓

STEP-5 123 110 117 122 111 112 133 141 123 151 149 147 157

SWAP

Pivot
↓

STEP-6 112 110 117 122 111 123 133 141 151 149 147 157

Pivot
↓

STEP-7 112 110 111 122 117 123 133 141 147 149 151 157

SWAP

STEP-8:

Pivot
↓

STEP-8 111 110 112 122 117 123 133 141 147 149 151 157

SWAP

STEP-9 110 111 112 117 122 123 133 141 147 149 151 157

It takes 9 steps to completely sort the unsorted array using first element as pivot element.

Program :

```
1  #include <stdio.h>
2  int partitionFirst(int a[], int low, int high) {
3      int pivot = a[low];
4      int i = low + 1, j = high, temp;
5      while (i <= j) {
6          while (i <= high && a[i] <= pivot)
7              i++;
8          while (a[j] > pivot)
9              j--;
10         if (i < j) {
11             temp = a[i];
12             a[i] = a[j];
13             a[j] = temp;
14         }
15     }
16     temp = a[low];
17     a[low] = a[j];
18     a[j] = temp;
19
20     return j;
21 }
22 void quickSortFirst(int a[], int low, int high) {
23     if (low < high) {
24         int p = partitionFirst(a, low, high);
25         quickSortFirst(a, low, p - 1);
26         quickSortFirst(a, p + 1, high);
27     }
28 }
29 int main() {
30     int a[] = {10, 7, 8, 9, 1, 5};
31     int n = 6, i;
32
33     quickSortFirst(a, 0, n - 1);
34
35     printf("Sorted array:\n");
36     for (i = 0; i < n; i++)
37         printf("%d ", a[i]);
38
39     printf("\nCH.SC.U4CSE24108\n");
40     return 0;
41 }
```

Output :

Output

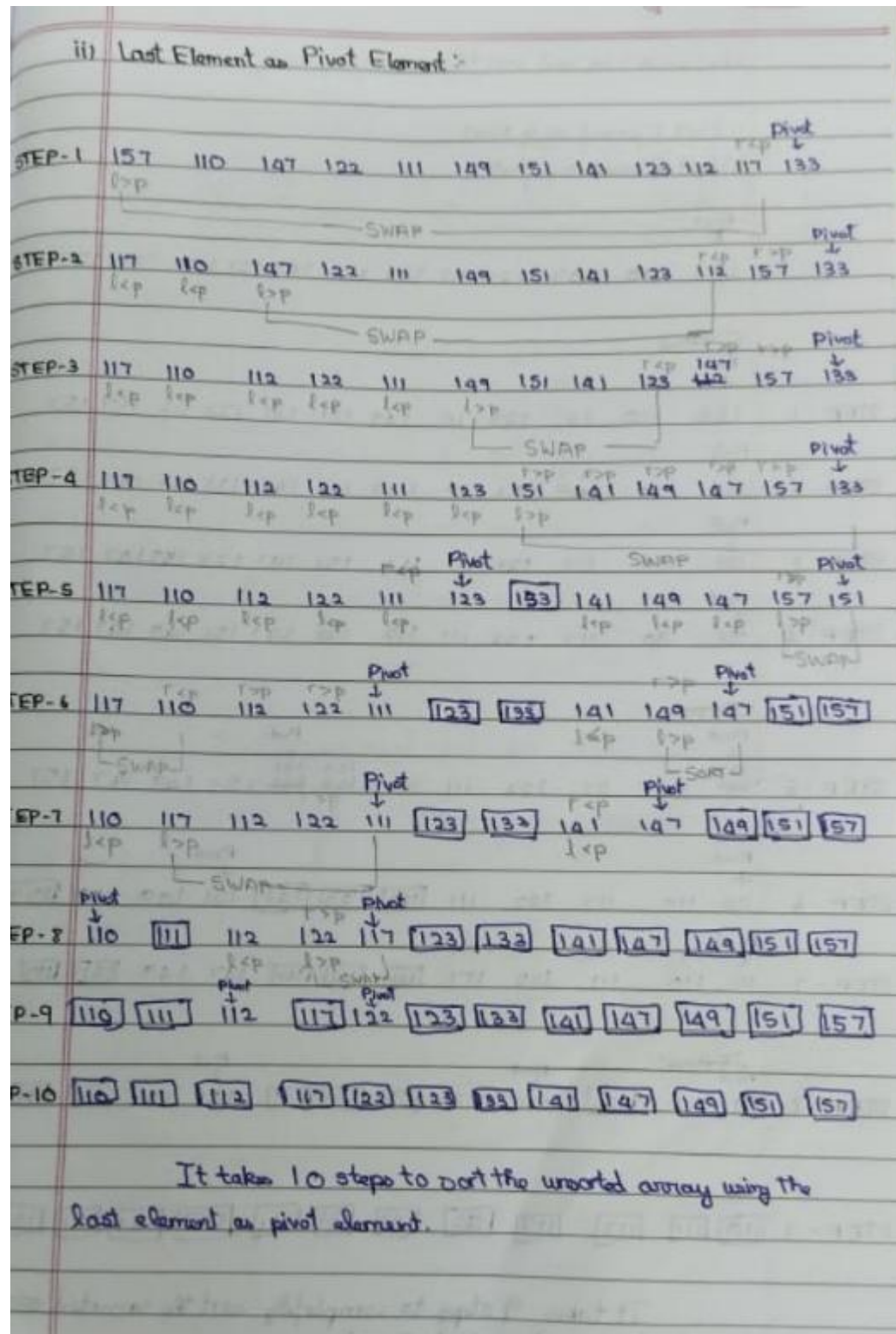
Sorted array:

1 5 7 8 9 10

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II) Last Element as Pivot

Working :



Program :

```
1  #include <stdio.h>
2  int partitionLast(int a[], int low, int high) {
3      int pivot = a[high];
4      int i = low - 1, j, temp;
5      for (j = low; j < high; j++) {
6          if (a[j] <= pivot) {
7              i++;
8              temp = a[i];
9              a[i] = a[j];
10             a[j] = temp;
11         }
12     }
13     temp = a[i + 1];
14     a[i + 1] = a[high];
15     a[high] = temp;
16
17     return i + 1;
18 }
19 void quickSortLast(int a[], int low, int high) {
20     if (low < high) {
21         int p = partitionLast(a, low, high);
22         quickSortLast(a, low, p - 1);
23         quickSortLast(a, p + 1, high);
24     }
25 }
26 int main() {
27     int a[] = {10, 7, 8, 9, 1, 5};
28     int n = 6, i;
29     quickSortLast(a, 0, n - 1);
30     printf("Sorted array:\n");
31     for (i = 0; i < n; i++)
32         printf("%d ", a[i]);
33     printf("\nCH.SC.U4CSE24108\n");
34     return 0;
35 }
```

Output :

Output

Sorted array:

1 5 7 8 9 10

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III) Middle Element as Pivot

Program :

```
1  #include <stdio.h>
2  #include <stdlib.h>
3  int partitionRandom(int a[], int low, int high) {
4      int random = low + rand() % (high - low + 1);
5      int temp = a[random];
6      a[random] = a[high];
7      a[high] = temp;
8      int pivot = a[high];
9      int i = low - 1, j;
10     for (j = low; j < high; j++) {
11         if (a[j] <= pivot) {
12             i++;
13             temp = a[i];
14             a[i] = a[j];
15             a[j] = temp;
16         }
17     }
18     temp = a[i + 1];
19     a[i + 1] = a[high];
20     a[high] = temp;
21     return i + 1;
22 }
23 void quickSortRandom(int a[], int low, int high) {
24     if (low < high) {
25         int p = partitionRandom(a, low, high);
26         quickSortRandom(a, low, p - 1);
27         quickSortRandom(a, p + 1, high);
28     }
29 }
30 int main() {
31     int a[] = {10, 7, 8, 9, 1, 5};
32     int n = 6, i;
33     quickSortRandom(a, 0, n - 1);
34     printf("Sorted array:\n");
35     for (i = 0; i < n; i++)
36         printf("%d ", a[i]);
37     printf("\nCH.SC.U4CSE24108\n");
38     return 0;
39 }
```

Output :

Output

Sorted array:

1 5 7 8 9 10

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