LAB#26

Example#1: Write a program to sort an unsorted array by using counting sort algorithm:

Solution:

```
def counting sort(initial arr):
         max val = max(initial_arr)
         count_arr = [0] * (max_val + 1)
         for num in initial_arr:
             count_arr[num] += 1
         for i in range(1, len(count_arr)):
             count_arr[i] += count_arr[i - 1]
11
         output_arr = [0] * len(initial_arr)
12
13
         for num in reversed(initial_arr):
             output arr[count_arr[num] - 1] = num
15
             count_arr[num] -= 1
17
18
         return output_arr
     initial_arr = [2,3,1,2,5,1,2,5,2,5]
     sorted_arr = counting_sort(initial_arr)
21
     print("Sorted array:", sorted_arr)
22
```

Result:

```
Sorted array: [1, 1, 2, 2, 2, 2, 3, 5, 5, 5]
```

Explanation:

Count arr→

0	1	2	3	4	5
0	0	0	0	0	0
	1	1	1		
	2	2			1
		3			2
0	2	4	1	0	3

for num in initial_arr:

Initial_arr=[2,3,1,2,5,1,2,5,2,5]

Count_arr[1]=Count_arr[1]+1=0+1=1

Count_arr[2]=Count_arr[2]+1=1+1=2

Count_arr[5]=Count_arr[5]+1=0+1=1

Count_arr[1]=Count_arr[1]+1=1+1=2

Count_arr[2]=Count_arr[2]+1=2+1=3

Count_arr[5]=Count_arr[5]+1=1+1=2

Count_arr[2]=Count_arr[2]+1=3+1=4

Count_arr[5]=Count_arr[5]+1=2+1=3

Count_arr→

0	1	2	3	4	5
0	2	4	1	0	3

Now, store the result of cumulative sum in the Count_arr:

Count_arr →

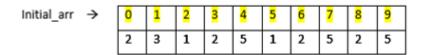
0	1	2	3	4	<mark>5</mark>
0	2	4	1	0	3
<mark>0</mark>	<mark>2</mark>	<mark>6</mark>	<mark>7</mark>	<mark>7</mark>	<mark>10</mark>

for i in range(1,len(Count_arr)):

Updated Count_arr:

0	1	2	3	4	5
0	2	6	7	7	10

Now, we have:



Count_arr→	0	1	2	3	4	5
	0	2	6	7	7	10

Output_arr→	0	1	2							
	0	0	0	0	0	0	0	0	0	0

for num in reversed(initial_arr):

#num=5

Output_arr[Count_arr[5]-1]=5

Output_arr[10-1]=5

Output_arr[9]=5

Count_arr[5]=Count_arr[5]-1

=10-1

Count_arr[5]=9

Output_arr[Count_arr[2]-1]=2

Output_arr[6-1]=2

Output_arr[5]=2

Count_arr[2]=Count_arr[2]-1

=6-1

Count_arr[2]=5

#num=5

Output_arr[Count_arr[5]-1]=5

Output arr[9-1]=5

Output_arr[8]=5

Count_arr[5]=Count_arr[5]-1

=9-1

Count_arr[5]=8

#num=2

Output_arr[Count_arr[2]-1]=2

Output_arr[5-1]=2

Output_arr[4]=2

Count_arr[2]=Count_arr[2]-1

=5-1

Output_arr[Count_arr[1]-1]=1

Output_arr[2-1]=1

Output_arr[1]=1

Count_arr[1]=Count_arr[1]-1

=2-1

Count_arr[1]=1

#num=5

Output_arr[Count_arr[5]-1]=5

Output_arr[8-1]=5

Output_arr[7]=5

Count_arr[5]=Count_arr[5]-1

=8-1

Count_arr[5]=7

```
#num=2
```

#num=3

Output_arr[Count_arr[2]-1]=2

Output_arr[3-1]=2

Output_arr[2]=2

Count_arr[2]=Count_arr[2]-1

=3-1

Count_arr[2]=2

Return Output_arr

[1,1,2,2,2,2,3,5,5,5]

Class Assignment

Q.1: Take an unsorted array, apply the counting sort algorithm to sort it, and then explain the code in detail, visualizing each step.