

Q1. Assume that you have given input array of integers

$$A = (2,5,3,0,2,3,0,3),$$

write an algorithm to sort the array in  $\theta(n)$  times, without comparison. Also show the time complexity of the algorithm.

ANS:

## Counting Sort

COUNTING-SORT

( array A, array B,int k)

```
1  for i ← 1 to k
2  do C[i] ← 0    k times
3  for j ← 1 to length[A]
4  do C[A[j]] ← C[A[j]] + 1    n times
5  // C[i] now contains the number
   of elements = i
6  for i ← 2 to k
7  do C[i] ← C[i] + C[i - 1]    k times
8  // C[i] now contains the number
   of elements ≤ i
9  for j ← length[A] downto 1
10 do B[C[A[j]]] A[j]
11 C[A[j]] C[A[j]] - 1    n times
```

Time Complexity of Courting Sort:

$$k + n + k + n$$

Where the  $k$  and  $n$  is the maximum length of the loop; we can say its  $\theta(n)$

Q2.

- a. Using *Edit Distance*; model the transformation of string ALGORITHM to ALTRUISTIC. The above model should reflect the *Edit transcript*.

Ans:

M	M	D	S	M	I	M	I	M	S	S
A	L	G	O	R	_	I	_	T	H	M
A	L	_	T	R	U	I	S	T	I	C

- b. Show matrix model which reflects the possibilities of Edit Transcript which helps in the transformation of MATHS into ARTS.

Ans:

		A	R	T	S
	0	→ 1	→ 2	→ 3	→ 4
M	↓ 1	↘ 1	↘ 2	↘ 3	↘ 4
A	↓ 2	↘ 1	↘ 2	↘ 3	↘ 4
T	↓ 3	↓ 2	↘ 2	↘ 2	→ 3
H	↓ 4	↓ 3	↘ 3	↘ 3	↘ 3
S	↓ 5	↓ 4	↘ 4	↘ 4	↘ 3

Possible paths are three (3)

1.  $S S M D M$
2.  $D M I M D M$
3.  $S D I M D M$