P3

a)

A white paper with black text

Description automatically generated

b)

The algorithm was process from right to left, which means last occurrence of an element gets the highest available position. So, the array maintained their relative order. Also, the placement order is fixed based on the count array. Plus, counting sort doesn’t require comparison. So no swap is needed.

c)

No, quicksort and heapsort are not stable.

For quick sort,

The partition of quicksort would require swapping of elements. The order may gets changed when elements are on opposite sides of the pivot.

Ex.

5(red), 3, 5(blue), 2

After quick sort:

[2, 3, 5(blue), 5(red)]

For heapsort,

Heapsort builds a heap and then extract max or min. Heapify operations can move elements out of order.

Ex.

[4(red), 2, 4(blue), 3]

After heap sort:

[2, 3, 4(red), 4(blue)]