Cs301,Spring 2020

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Problem-1

a) By "comparison-based", we mean a sorting algorithm which accesses input array elements only via comparisons as is the case for general-purpose sorting algorithms such as merge sort,heapsort.They have O(nlogn) in worst case.Firstly we will sort the array in O(nlogn) time and we will create a loop for taking k smallest elements that have O(k-1) time because we have kth element and we need smaller than k which k-1 elements.In end of the calculation O(nlogn)+O(k)=O(nlogn+k) in worst case.

b) Selection algorithm for the kth element in ordered array is O(n) time with quickselect.When we calculate the kth element in array left of the kth smallest elements smaller than k we will use comparision based algorithm to sort them it will be O((k-1)log(k-1)) time in the worst case.Because I will sort only k-1 elements smaller than the kth element.In the end of the calculation it will be O(klogk+n) in the worst case.

Which method would you use?

When I compare the both of the overall algorithm I would use Order statics such as Randomized divide and conquer because O(klogk+n) smaller than the O(nlogn+k) because n>=k always.

Problem-2

a) Radix sort ideology is sort on least significant digit first with auxiliary stable sort.Normally,we find the length of the max number and put other numbers 0 in their front for reaching the max length.Such as when we compare 12 and 134,012 and 134 will be sorted.In sorting the strings we will put the "!" symbols to strings their last of the digits to reach max length of the string.This symbol represents the least important symbol.We will start from end of the string and sort them as their alphabetic order.As a alpahbetically least index in alphabet means least significant.

b) Max length of the arrays string 6.So that strings will be that "VEYSEL","ALI ! ! !","SELIN!","YASIN!","ZEYNEP".As I mention above sort them for their alphabetic order.It will be the 6 step:

1-)Last Items orderly the list of strings : L, ! , ! , ! ,P   order will be [ALİ,SELİN,YASİN,VEYSEL,ZEYNEP]

2-) Last Items orderly the list of strings : ! ,N,N,E,E

[ALİ,VEYSEL,ZEYNEP,SELİN,YASİN]

3-) Last Items orderly the list of strings : !,S,N,İ,İ
[ALİ,SELİN,YASİN,ZEYNEP,VEYSEL]

4-) Last Items orderly the list of strings : İ,L,S,Y,Y
[ALİ,SELİN,YASİN,ZEYNEP,VEYSEL]

5-) Last Items orderly the list of strings :L,E,A,E,E
[YASİN,SELİN,ZEYNEP,VEYSEL,ALİ]

6-)Last items orderly the list of strings:Y,S,Z,V,A

 [ALİ,SELİN,VEYSEL,YASİN,ZEYNEP]

c) In radix sort,average time is $O(d(n+b))$ d is number of step for sorting.Max length is 6 so that 6 step emerged in our sorting.b is the base number for digits in radix sort with decimal numbers now our base is length of alphabet so it is 26.Calculation of the length of the max length is 6 and its average time is $O(n)$ so total time $O(n) +O(d(n+b)) = O(d(n+b))$ and d is 6 and b is 26.