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National University of Computer & Emerging Sciences
FAST-Karachi Campus
CS201- Data Structures (Fall 2018)
Quiz#2

Dated: October 16, 2018 Marks: 20
Time: 20 min. Std-ID: _____Sol_________

Question No. 1

Consider the content of an integer array as below:

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
26	24	3	17	25	24	13	60	47	1

Tell which sorting algorithm produced the given content after four iterations of the out loop? Justify your answer with a one liner text.

a.

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
1	3	13	17	26	24	24	25	47	60

Bubble sort as the highest elements from list are now moved to the last.

b.

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
1	3	13	17	25	24	24	60	47	26

Selection Sort – the smallest element is replaced with the first place and only four such elements are changed.

c.

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
3	17	24	26	25	24	13	60	47	1

Insertion Sort – only four values are changed as per it inner loop working.

Question No. 2

Answer the following questions.

a. In what case(s) if any, is the bubble sort (may be modified one) O(n)?

   In almost sorted cases, Bubble sort with a Boolean in the inner loop to check whether any pair of elements still in inversion bubble sort is linear for the size of array that is to say O(n).

b. In what case(s) if any, someone preferred Selection sort over Bubble sort?

   In case, when the dataset for sorting has large record size and the key on which sorting to be performed is small to medium in size. Than selection sort will be a good choice as it will exchange lowest number of records to achieve sorting results.

c. What is the main difference in the working of the inner loop of Selection sort and Insertion sort?

   The inner loop of selection sort places the element at the final position in the sorting list, while the inner loop of insertion sort only places the element at the partial sorting list so far arrange for the outer loop.

d. Is selection sort a stable sorting algorithm?

   No selection sort is not stable.

e. How a comb sort is similar to bubble sort?

   The comb sort is an improvement over bubble sort, the main problem in bubble sort is turtles, or small values near the end of the list, since in a bubble sort these slow the sorting down tremendously. Comb sort compares these turtles with high gap values (bubble sort uses gap=1) to move them quickly to the place where they belong to.

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Question No. 1

Consider the content of an integer array as below:

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
7	13	24	2	37	87	64	21	53	19

Tell which sorting algorithm produced the given content after four iterations of the out loop? Justify your answer with a one liner text.

a

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	7	13	19	37	87	64	21	53	24

Selection sort as the smallest are moved to the right hand side for exact number of outer loop value.

b

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	7	13	24	37	87	64	21	53	19

Insertion sort is used; one can clearly see the first portion of four elements are sorted.

c

[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	7	13	21	24	19	37	53	64	87

Bubble sort (original version is used) – heavy weight elements are placed at the final positions.

Question No. 2

Answer the following questions.

a. In what case(s) if any, selection sort is O(n)?

   Selection sort is O(n) for a dataset that is almost sorted (or best cases). The algorithm can be modified to do no exchange for an element to be at its proper place.

b. In what case(s) if any, someone preferred Insertion sort over selection sort?

   Insertion sort is simple, easy to implement and for best cases for n records it is O(n). Insertion is a method of choice if data-set is small, with small to medium comparison keys and almost sorted arrangement, over selection sort. it is a stable sorting method while selection sort is not.

c. How shell sort gain efficiency over insertion sort?

   The shell sort starts by sorting pairs of elements far apart from each other, then progressively reducing the gap between elements to be compared. Starting with far apart elements, it can move some out-of-place elements into position faster than a simple nearest neighbor exchange. Insertion sort move element one at a time by comparing adjacent element only.

d. Is insertion sort a stable sorting algorithm?

   Yes, Insertion sort is stable.

e. How the Bubble sort with two tight nested loops, guarantee a sorted order of the array? Explain what is the idea behind it correctness.

   The Bubble sorts compares adjacent pair of elements and exchange if they are out place in sorted arrangement. In every iteration of out loop it place an element at the highest value place (pushing heavy weight elements to left). For the n-1 iteration of outer loop every element is compared with every other element and hence it guarantees that the sorted order of all elements are achieved.

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Question No. 1

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7	13	24	2	37	87	64	21	53	19

How the content of the array will look like after the fifth iteration of the outer loop in the following cases:

a

Selection Sort									
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	7	13	19	21	82	64	37	53	24

b

Bubble Sort - original									
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	7	13	21	19	24	37	54	64	87

c

Insertion Sort									
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	7	13	24	37	87	64	21	53	19

Question No. 2

Answer the following questions.

a. How Comb sorting algorithm gain its advantage over bubble sort?

The basic idea is to eliminate turtles, or small values near the end of the list, since in a bubble sort these slow the sorting down tremendously. Comb sort compares these turtles with high gap values (bubble sort uses gap=1) to move them quickly to the place where they belong to.

b. In what case(s) if any, someone preferred Insertion sort over selection sort?

Insertion sort is simple, easy to implement and for best cases for n records it is O(n). Insertion is a method of choice if data-set is small, with small to medium comparison keys and almost sorted arrangement, over selection sort. it is a stable sorting method while selection sort is not.

c. What are the advantages of Shell sort?

Shell sort is a generalization of insertion sort that allows the exchange of items that are far apart. The idea is to arrange the list of elements so that, starting anywhere, considering every hth element gives a sorted list. Such a list is said to be h-sorted. Beginning with large values of h, this rearrangement allows elements to move long distances in the original list, reducing large amounts of disorder quickly, and leaving less work for smaller h-sort steps to do the job.

d. Is bubble sort a stable sorting algorithm?

Yes, Bubble sort is stable.

e. What is comparison based sorting? Is it really necessary to do comparison for sorting?

The comparison based sorting algorithm uses comparison between a pair of values to determine their order in the final sorted arrangement. Sorting can be done without doing comparison.