DPP 01

CS & IT

Algorithm

Sorting Algorithms

Q1 What is the recurrence relation of insertion sort when the array is almost sorted with P element?

(A) $T(P) = T(P/2) + O(1)$

(B) $T(P) = T(P/2) + p^2$

(C) $T(P) = 2T(P/2) + P$

(D) T(P) = $2T\left(\frac{P}{2}\right) + O(1)$

Q2 Bubble sort is

(A) In place sorting technique

(B) Outplace sorting technique

(C) Unstable sorting technique

(D) Stable sorting technique

Q3 What is the time complxity of selection sort in best case, average case and worst case respectively is:

(A) $O(n), O(nlogn), O(n^2)$

(B) $O(n), O(n^2), O(n^2)$

(C) $O(n^2), O(n^2), O(n^2)$

(D) O(n), O(nlogn), O(nlogn)

Q4 How many swaps are needed in selection sort to sort n element in worst case?

(A) n –1

(B) $\frac{n(n-1)}{2}$

(C) n

(D) n2

Q5 Consider the following array A with 8 elements:

A

70	60	20	50	40	5	19	21
0	1	2	3	4	5	6	7

What is the index value of elements 60 after 3rd pass of selection sort?

Q6 Consider the following array with 8 elements:

50	60	90	65	55	45	85	12

What is result after 3rd pass of bubble sort?

(A) 50, 60, 55, 45, 12, 65, 85, 90

(B) 12, 45, 50, 60, 90, 65, 55, 85

(C) 90, 85, 65, 50, 60, 55, 45, 12

(D) 50, 55, 45, 60, 12, 65, 85, 90

Q7

A

10	20	50	60	70	65	55	25	15

How many swaps are needed to sort the array by using insertion sort _____?

Q8 Consider the following elements:

101	56	934	555	8	12	785	23	5	999

What is the results after 3rd pass of Radix sort?

(A) 56, 23, 12, 8, 5, 101, 55, 785, 934

(B) 56, 23, 12, 8, 5, 101, 555, 785, 999, 934

(C) 5, 8, 12, 23, 56 101, 785, 555, 934, 999

(D) 5, 8, 12, 23, 56, 101, 555, 785, 999, 934

Answer Key

Q1	D
Q2	A, D
Q3	C
Q4	A
Q5	6
Q6	D
Q7	16
Q8	D

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Insertion sort time complexity when array is almost sorted TC=O(P)

$$T(P) = 2T(P/2) + O(1)$$

$$\text{According to master theorem } a = 2, b = 2, f(p) = 1$$

$$= p^{\log_2 2}$$

$$= p$$

Master's theroem

T(P) = O(P)

Q2 Text Solution:

Bubble sort is inplace & stable sorting algorithms.

Q3 Text Solution:

Time complixity of selection sort is $O(n^2)$ in every case.

Q4 Text Solution:

Number of swaps in selection sort in every case is (n-1). Selection sort is best for swaps.

Q5 Text Solution:

i/P = 70, 60, 20, 50, 40, 5, 19, 21

Take first min & swap it to first place

Pass-1: 5, 60, 20, 50,40, 70, 19, 21

Pass-2: 5, 19, 20, 50, 40, 70, 60, 21

Pass-3: 5, 19, 20, 50,40, 70, 60, 21

Index value of element 60 is 6.

Q6 Text Solution:

55, 45, 85, 12

65, ~~90~~, ~~90~~, ~~90~~, ~~90~~, 90

I/P: 50, 60, 90, 65, 55, 45, 85, 12

45

55, ~~65~~, 65, 12, 85

Pass:-1 50, 60, ~~65~~, ~~55~~, ~~45~~, ~~85~~, ~~12~~, (90)

45

55, ~~60~~, 60, 12, 65

Pass:-2 50, ~~60~~, ~~55~~, ~~45~~, ~~65~~, ~~12~~, (85, 90)

Pass:-3 50, 55, 45, 60, 12, (65, 85, 90)

Q7 Text Solution:

There is total 16 swaps required to sort all the 9 elements using insertion sort.

Q8 Text Solution:

Maximum element is 999, and number of Digits in this element is 3.

So there is 3 passes required to sort all the elements

after pass 3 all elements are in sorted order.

Pass-1: 101, 12, 23, 934, 555, 785, 5, 56, 8,999

Pass-2: 101, 5, 8, 12, 23, 934, 555, 56, 785, 999

Pass-3: 5, 8,12, 23, 56, 101, 555, 785, 939, 999