DPP - 01

CS & IT

Algorithms

Divide & Conquer

Q1 Consider an array containing the following elements in unsorted order (placed randomly) but 120 as first elements 120 160 30 190 14 24 70 180 110
Quick sort partitioning algorithm is applied by choosing first elements as pivot element. Then what is the total number of arrangements of array integers are possible preserving the effect of first pass of partitioning algorithm.

(A) 680 (B) 700
(C) 720 (D) 740

Q2 Let T(n) = [n(log(n^3) – logn) + logn]n + logn. complexity of T(n) is

(A) $O(n^2)$ (B) $O(n^3)$
(C) O(nlogn) (D) $O(n^2 \log n)$

Q3 Assume that there are 4 sorted lists of $\frac{n}{4}$ elements each, if these lists are merged into a single sorted list of 'n' elements then how many key comparisons are required in the worst case using an efficient algorithm?

(A) 2n – 3 (B) $\frac{7}{4}n-3$
(C) $\frac{9}{4}n-3$ (D) $\frac{6}{4}n-3$

Q4 Consider the number in the sequence
2 5 11 17 19 21 26 33 39 40 51 65 79 88 99
Using binary search, the number of comparisons required to search elements '2' is____

Q5 Merging 4 sorted files having 400, 100, 250, 50 records will take how many comparisons to be merged into a single sorted file, if 2 files are merged at a time?

(A) 800 (B) 799
(C) 1597 (D) 1347

Q6 Consider a machine which needs a minimum of 50 seconds to sort 500 names by quick sort, then what is the minimum time required to sort 50 names (approximately)is _____ (round off to 2 decimal & Consider log with base 2)

Q7 What is the total number of comparisons that will be required in worst case to merge the following sorted files into a single sorted file by merging together two files at a time____.

Files	F_1	F_2	F_3	F_4
Number of records	40	42	44	46

Answer Key

Q1	C
Q2	D
Q3	A
Q4	4
Q5	D
Q6	3.14
Q7	341

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

We have to choose the I[st] elements as pivot.

Here 120 is the I[st] element. After the I[st] pass I[st] elements goes to its exact location.

All the elements greater than 120 goes to right of 120 and lesser elements goes to left side of 120 after I[st] pass.

110 30 14 24 70 120 160 180 190

5! 3!

5! × 3!

720 possible arrangement

C is correct option.

Q2 Text Solution:

Given

T(n) = [n (log(n^3) – logn) + logn] n + logn

$= \left[n\left(\log \frac{n^3}{n}\right)+\log n\right] n+\log n$

$= \left[n \log n^2+\log n\right] n+\log n$

$= n^2 \cdot 2 \log n + n \log n + \log n$

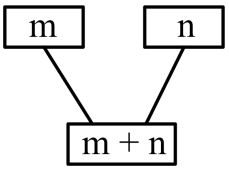
$= 2n^2 \log n + n \log n + \log n$, here

$n^2 \log n$ is dominating term

= O(n^2logn)

option (d) is correct.

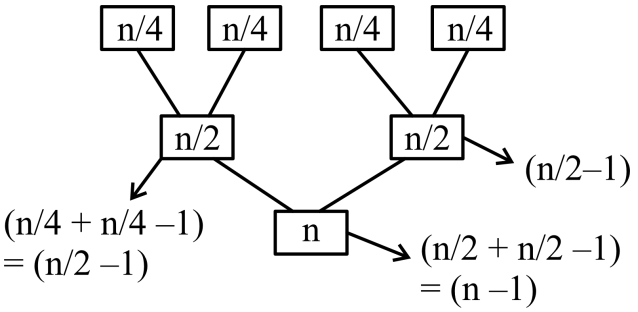
Q3 Text Solution:



Comparisions

WC m + n – 1

BC min (m, n)



total number of WC comparisions

= (n/2 –1) + (n/2 – 1) + (n –1)

= (n –2) + (n –1)

= (2n –3)

Q4 Text Solution:

Low = 0, high = 14

Mid = $\frac{0+14}{2} = 7$

A[7] = 33

33 > 2

Low =0, high = 6;

Mid = $\frac{0+6}{2} = 3$

A[3] = 17

17 > 2

Low = 0, high = 2, mid = $\frac{0+2}{2} = 1$

A[1] = 5

5 > 2

Low = 0, high = 0, mid = $\frac{0+0}{2} = 0$

A[0] = 2

2 = 2

Q5 Text Solution:

Two sorted file of size m and n takes O(m + n) time for merging, and m + n -1 comparisons

Apply optimal merge pattern of records or files.

number of comparisons if we use two way merge pattern = 1347

Q6 Text Solution:

In best case quick sort algorithm takes nlogn comparisons,

So, 500 × $\log_2$500 @ 4482.89

Which takes 50 seconds.

To sort 50 names a minimum of $50(\log_2 50)$ = 282.19 comparisons

282.19 comparisons are needed.

This takes = $50 \times \frac{282.19}{4482.89}$ = 3.14 second

Q7 Text Solution:

Given files

{(40, 42), 44, 46} 82 – 1 = 81 comparisons

{82, (44, 46)} 90 – 1 = 89 comparisons

{82, 90} 172 – 1 = 171 comparisons

So Total= 81 + 89 + 171 = 341 comparisons