Kunal Jha
Course: GATE
Computer Science Engineering(CS)

TOPICWISE : ALGORITHMS -1 (GATE - 2020) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(17) | CORRECT(10) | INCORRECT(5) | SKIPPED(2)

Q. 1 Solution Video | Have any Doubt ?

What is the time complexity of following recurrence relation?

$$T(n) = 2T\left(\frac{n}{2}\right) + n \log n,\ n \geq 2$$

$$T(1) = 0$$

A $O(n(\log n)^2)$ — Your answer is **Correct**

Solution :
(a)

$$T(n) = 2T\left(\frac{n}{2}\right) + n \log n$$

Using Master algorithm

$$a = 2, b = 2$$

$$T(n) = O(n(\log n)^2)$$

B $O(n)$

C $O(n \log n)$

D $O(n^2)$

QUESTION ANALYTICS +

Q. 2 Solution Video | Have any Doubt ?

Which of the following has best lower bound time complexity?

A Merge sort — Your answer is **Wrong**

B Quick sort

C Selection sort

D Insertion sort — Correct Option

Solution :
(d)
In best case merge sort time complexity = $O(n \log n)$
For quick sort in best case = $O(n \log n)$
For selection sort = $O(n^2)$
For insertion sort = $O(n)$

QUESTION ANALYTICS +

Q. 3 Solution Video | Have any Doubt ?

Consider the following C function:

```
void dosomething (int n)
{
        int m, j, k;
    for (j = 0; j < 200; j++)
    {
        for (k = 0; k < n; k++)
            {
                for (m = 0; m < j, m++)
                    printf("%d", i + m);
            }
    }
}
```

What is the time complexity of the above function?

A $O(n^2)$

B $O(n \log n)$

C $O(n)$ — Your answer is **Correct**

Solution :
(c)

$$\text{dosomething}(n) = \sum_{j=0}^{199}\sum_{k=0}^{n-1}\sum_{m=0}^{i-1} j$$
$$= \sum_{j=0}^{199}\sum_{k=0}^{n-1} j = \sum_{j=0}^{199} j(n-1)$$
$$= n \cdot \frac{199(199+1)}{2} = O(n)$$

D $O(n^2 \log n)$

QUESTION ANALYTICS +

Q. 4 Solution Video | Have any Doubt ?

Which of the following algorithm has minimum number of swap in worst case?

A Quick sort

B Selection sort — Your answer is **Correct**

Solution :
(b)
Selection sort has minimum number of swap $O(n)$ in worst case.

C Merge sort

D Bubble sort

QUESTION ANALYTICS +

Q. 5 Solution Video | Have any Doubt ?

Consider the following cases for quick sort to sort an array of n element $a[0 \ldots n-1]$
(i) Choosing the pivot element randomly from the given array.
(ii) Choosing median element as pivot.
(iii) Choosing middle element as pivot.
For which of the above cases quick sort always gives $O(n \log n)$ time complexity?

A (i) and (iii)

B (ii) and (iii)

C (i) and (ii) — Your answer is **Wrong**

D None of these — Correct Option

Solution :
(d)
(ii) choosing median element as pivot divide the array into two equal half and time complexity $O(n \log n)$.
For (i) and (iii) choosing pivot randomly or middle element does not guaranty $O(n \log n)$ time complexity.

QUESTION ANALYTICS +

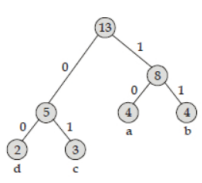
Q. 6 Solution Video | Have any Doubt ?

Consider the following message given below:
abbaabccdabcd
The number of bits required for Huffman encoding of the above message _____.

26 — Your answer is **Correct**26

Solution :
26

Number of 'a' = 4
Number of 'b' = 4
Number of 'c' = 3
Number of 'd' = 2
Bits for 'a' = 2
Bits for 'b' = 2
Bits for 'c' = 2
Bits for 'd' = 2
Number of bits = $4 \times 2 + 4 \times 2 + 3 \times 2 + 2 \times 2$
$= 8 + 8 + 6 + 4$
$= 26$



QUESTION ANALYTICS +

Q. 7 Solution Video | Have any Doubt ?

Consider the following table for job sequencing with deadline:

	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Start	1	2	1	3	4	7	6
Finish	4	4	5	7	6	8	7

Maximum number of task that can be completed on a single machine _____.

4 — Your answer is Correct4

Solution :
4
First sort the intervals by their finish time

T_1 T_2 T_3 T_5 T_4 T_7 T_6
(1,4) (2,4) (1,5) (4,6) (3,7) (6,7) (7,8)

First any of (1, 4), (2, 4) start, at T = 4 T_5 start then T_7 after that T_6 will be completed.
Total 4 task completed

QUESTION ANALYTICS +

Q. 8 Solution Video | Have any Doubt ?

What will be the maximum difference when quick sort is uses instead of heap sort for sorting the edge in the graph in Kruskal's algorithm for MST if number of edge is 128 _____.

15488 — Correct Option

Solution :
15488
Time complexity of heap sort

$= n\log n = E \log E$
$= 128 \log 128$
$= 128 \times 7 = 896$

Time complexity of quick sort in worst case because we have to find maximum difference.

$T(n) = n^2 = E^2$
$= (128)^2 = 16384$
Difference = 15488

Your Answer is 0

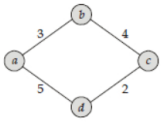
QUESTION ANALYTICS +

Q. 9 Solution Video | Have any Doubt ?

Consider the following statement:
S_1 : A graph where all edge weights are distinct can have more than one shortest paths between two vertices.
S_2 : Adding a number on every edge of a graph may change the shortest path between two vertices.
The number of correct statements is/are _____.

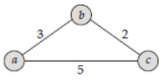
2 — Your answer is Correct2

Solution :
2
S_1 : A graph with distinct edge weights can have more than one shortest path.

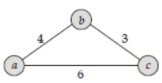


Two path $(a - d - c)$ $(a - b - c)$

S_2 : Consider the graph as shown below:



There are two shortest paths between a and c i.e. $(a - b - c)$ and $(a - c)$.
Add 1 to every edge.



Now only $(a - c)$ is the shortest path thus changed.
Hence, both S_1 and S_2 are true.

QUESTION ANALYTICS +

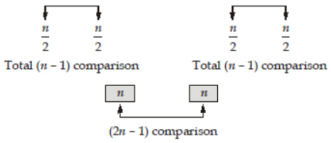
Q. 10

Solution Video | Have any Doubt ?

Suppose there are 4 sorted list each of $\frac{n}{2}$ elements each, if we merge these lists into a single sorted list of $2n$ elements, how many key comparisons in the worst case using efficient algorithm?

A $4n - 3$ — Your answer is **Correct**

Solution :
(a)



$$\begin{aligned}\text{Total comparison} &= (n-1) + (n-1) + (2n-1)\\ &= 2n - 2 + 2n - 1\\ &= 4n - 3\end{aligned}$$

B $3n - 1$

C $4n - 1$

D $2n - 3$

QUESTION ANALYTICS +

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Q. 11

Solution Video | Have any Doubt ?

Consider the following recursive function:

```
int F (int array [ ], int n)
{
    int S = 0;
    if (n = = 0)
        return 0;
    S = F (array, n – 1)
    if (array [n – 1] < 0)
        S = S + 100;
    return S;
}
```

What is the worst case time complexity of the above function?

A $O(n)$ — Your answer is **Correct**

Solution :
(a)
Recurrence relation of function F

$F(n) = 0$ if $n = 0$

$F(n) = F(n-1) + 1, n > 0$

Time complexity $= O(n)$

B $O(n \log n)$

C $O(n^2)$

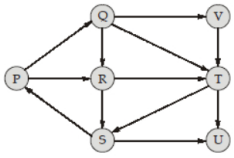
D $O(\log n)$

QUESTION ANALYTICS +

Q. 12

Solution Video | Have any Doubt ?

Which of the following is the correct decomposition of the directed graph given below into its strongly connected components?



A {P, Q, R, S} {T} {U} {V}

B {P, Q, R, S, T, V} {U} — Correct Option

Solution :
(b)
If $\forall i \forall j$ $(P(i \to j) \wedge P(j \to i))$ then i and j belongs to same strongly connected components where i and j are vertices and $P(i \to j)$ means there is a path from i to j.
Solving by elimination
Option (d): $P(U \to T)$ does not exists thus false.
Option (c): From R we can reach P Q V S T and from P Q V S T we can reach R thus R should not be separated thus false.

C {P, Q, S, T, V} {R} {U}

D {P, Q, R, S, T, U, V}

QUESTION ANALYTICS +

Q. 13

Solution Video | Have any Doubt ?

Let $g(n) = \Omega(n)$, $f(n) = O(n)$ and $h(n) = \theta(n)$ then what is the time complexity of $[g(n)\ f(n) + h(n)]$

A $O(n)$

B $\theta(n)$

C $\Omega(n)$ Your answer is **Correct**

Solution :
(c)

$$\begin{aligned} g(n) &= \Omega(n) \quad & g(n) \geq C_1 \cdot n \\ f(n) &= O(n) \quad & f(n) \leq C_2 n \\ h(n) &= \theta(n) \quad & C_3 \cdot n \leq h(n) < C_4 \cdot n \\ g(n) \cdot f(n) + h(n) & & \\ \geq C \cdot n \quad & \theta(n) & \\ = \Omega(n) & & \end{aligned}$$

D $\theta(n^2)$

QUESTION ANALYTICS +

Q. 14 Solution Video | Have any Doubt ? | Bookmark

Consider the following recurrence relation:

$$T(n) = \begin{cases} 1 \text{ if } n = 2 \\ \sqrt{n}\, T(\sqrt{n}) + n \text{ if } n > 2 \end{cases}$$

What is the time complexity of above recurrence relation?

A $\theta(n \log\log n)$ Correct Option

Solution :
(a)

$$\begin{aligned} T(n) &= \sqrt{n}\, T(\sqrt{n}) + c \cdot n \qquad c \text{ is some constant} \\ &= \sqrt{n}\left[n^{1/4} T(n^{1/4}) + c\sqrt{n}\right] + cn \\ &= n^{3/4}\, T(n^{1/4}) + c \cdot n + c\, n \qquad k \text{ times} \\ &= n^{1-1/2k}\, T(n^{1/2k}) + k\, c\, n \\ n^{1/2k} &= 2 \\ 2^{2k} &= n \\ 2^k &= \log n,\ k = \log\log n \\ T(n) &= \theta(n \log\log n) \end{aligned}$$

B $\theta(n \log n)$

C $O(n)$

D $\theta(n^2 \log n)$

QUESTION ANALYTICS +

Q. 15 Solution Video | Have any Doubt ? | Bookmark

Consider the following array with 45 on the first element all other element can be in any order:
{45, 58, 10, 38, 52, 88, 18}
Quick sort partition algorithm is used by choosing the first element as pivot then total number of arrangements of integer is possible to preserving the effect of the first pass of partition algorithm _____.

36 Correct Option

Solution :
36
First element is chosen as pivot and 45 is first element, after first pass pivot is goes to correct place.
So all element less than 45 go to left of it and greater than go to right to pivot.

10 18 38 [45] 58 52 88
3! 3!

$= 6 \times 6 = 36$

Your Answer is 12

QUESTION ANALYTICS +

Q. 16 Solution Video | Have any Doubt ? | Bookmark

Consider the following table with weight of the items and their corresponding profit, Knapsack has capacity 50, the maximum profit that can be achieved through fractional Knapsack is using greedy algorithm _____.

Item	I_1	I_2	I_3	I_4	I_5
Weight	20	40	5	10	15
Profit	180	160	30	20	70

320 Your answer is Correct320

Solution :
320

Item	I_1	I_2	I_3	I_4	I_5
Weight	9	4	6	2	4.66
Profit					

Items is descending profit/weight are I_1, I_3, I_5, I_2, I_4
First I_1, I_3, I_5 is chosen.

$$\text{Profit} = 180 + 30 + 70$$
$$\text{Weight} = 20 + 5 + 15 = 40$$
$$\text{Remaining weight } 50 - 40 = 10$$

Some fraction of I_2 is inserted in Knapsack

$$\text{Profit} = \frac{10 \times 160}{40} = 40$$
$$\text{Total profit} = 180 + 30 + 70 + 40 = 320$$

QUESTION ANALYTICS +

Q. 17 Solution Video Have any Doubt ?

consider an array A of length *n*, array contain number between (1 – 10), in any arbitrary order, best sorting algorithm takes 650 ns if *n* = 50, the time required by the algorithm if *n* = 300.

3900 Correct Option

Solution :
3900
We know the range of the element present in the array A, so can use counting sort also, takes O(n) time.

$$C \cdot n = 650$$
$$C \cdot 50 = 650$$
$$C = 13$$

For $n = 300$

$$300 \times 13 = 3900$$

Your Answer is 5730.5

QUESTION ANALYTICS +

Kunal Jha
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Computer Science Engineering(CS)

TOPICWISE : ALGORITHMS-2 (GATE - 2020) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(17) | CORRECT(5) | INCORRECT(5) | SKIPPED(7)

Q. 1 Solution Video | Have any Doubt ?

Consider a graph G(V, E) such that every vertex of G is connected to every other vertex through direct link. What is the time complexity to compute the shortest path using Bellman Ford algorithm?

A $O(V^2 \log V)$

B $O(V^3)$ — Your answer is **Correct**

Solution :
(b)
Time complexity of Bellman Ford algorithm is O(V E)
Graph G is complete graph so E = (V^2)
Time complexity = $O(V \times V^2) = O(V^3)$

C $O(V^2)$

D $O(V + E \log V)$

QUESTION ANALYTICS +

Q. 2 Solution Video | Have any Doubt ?

Which of the following algorithm is different from other given algorithm?

A Dijkstra's algorithm

B Breadth first search

C Depth first search — Correct Option

Solution :
(c)
Dijkstra's, Prim's algorithm uses the similar idea which is used in the Breadth First Search, only DFS is different from other given algorithm.

D Prim's algorithm

QUESTION ANALYTICS +

Q. 3 FAQ | Solution Video | Have any Doubt ?

Consider an array of n element with sorted order, if any element i appear more than half the number of element, what is the time complexity to count the number of occurrences of i?

A $O(\log n)$ — Your answer is **Correct**

Solution :
(a)
Time complexity is $O(\log n)$ to count number of occurrences of i.

B O(1)

C $O(n)$

D $O(\log\log n)$

QUESTION ANALYTICS +

Q. 4 Solution Video | Have any Doubt ?

Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	List-II
A. Quick sort	1. Greedy algorithm
B. Longest common subsequence	2. Divide and conquer
C. Kruskal's algorithm	3. Dynamic programming
D. Shortest distance from a given node to every node	

D. Shortest distance from a given node to every node

Codes:

	A	B	C	D
(a)	2	3	1	3
(b)	2	1	3	2
(c)	2	3	1	1
(d)	2	1	2	1

A a

B b

C c — Your answer is **Correct**

Solution :
(c)
A : Quick sort uses divide and conquer.
B : Longest common subsequence uses dynamic programming.
C : Kruskal's algorithm is greedy algorithm.
D : Shortest distance from a given node to every node is greedy algorithm.

D d

QUESTION ANALYTICS +

Q. 5 Solution Video | Have any Doubt ? | Bookmark

What is the time complexity of job sequencing with deadline algorithm if we use greedy method?

A $O(n \log n)$ — Your answer is **Wrong**

B $O(n^2)$ — Correct Option

Solution :
(b).
Job sequencing algorithm:
Time required to sort in order to profit = $O(n \log n)$
Find the max deadline = $O(n)$
For each slot i apply linear search to find a job containing deadline $\geq i$
$= O(n^2)$

$$T(n) = O(n \log n) + O(n) + O(n^2)$$
$$= O(n^2)$$

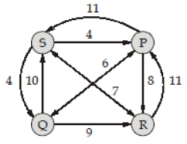
C $O(n)$

D $O(n^2 \log n)$

QUESTION ANALYTICS +

Q. 6 Solution Video | Have any Doubt ? | Bookmark

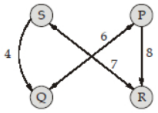
Consider the following graph:



The optimal cost of tour by travelling salesman using dynamic algorithm, if S is the starting vertex _____.

25 — Correct Option

Solution :
25



Optimal cost = 4 + 6 + 7 + 8 = 25

Your Answer is 22

QUESTION ANALYTICS +

Q. 7 Solution Video | Have any Doubt ? | Bookmark

Consider the following statements:

S_1 : A key has to be inserted in a hash table of size n with having already m item by using hash function, the probability of hitting a free space is $\left(1-\frac{m}{n}\right)$ (collision is resolved using linear probing).
S_2 : Prim's algorithm always makes a tree in any step for finding MST.
The number of the correct statements is/are _____.

2 — Correct Option

Solution :
2
Hash table size = n
m element is already in hash table.

So probability of hitting a free space is $\left(1-\frac{m}{n}\right)$.

S_1 is correct.
S_2 : Prim's algorithm produces a tree at any step.
S_2 is correct.

QUESTION ANALYTICS +

Q. 8 Solution Video | Have any Doubt ?

Consider two string p = "abcbdab" and q = "bdcabc" then the number of longest common subsequence of p and q is _____.

2 — Correct Option

Solution :
2

p = "abcbdab"
q = "bdcabc"
LCS (p, q) = abcbdab, bdcabc
First LCS = "bcab"
Second LCS = "bdab"
Then total 2 LCS.

Your Answer is 4

QUESTION ANALYTICS +

Q. 9 Solution Video | Have any Doubt ?

Consider the following elements, the maximum sum of contiguous subsequence of the given element list S using dynamic algorithm S = (2, 8, −16, 10, −8, 30, 10)

42 — Correct Option

Solution :
42
The maximum sum of the contiguous subsequence will be obtained by using (10, −8, 30, 10) as a subsequence.
Maximum sum (10, −8, 30, 10) = 42

Your Answer is 52

QUESTION ANALYTICS +

Q. 10 Solution Video | Have any Doubt ?

Consider the following matrices with given dimension:
A_0 (4 × 6), A_1 (6 × 8), A_2 (8 × 4), A_3 (4 × 5)
Which of the following multiplication order gives optimal solution of the above matrices.

A $((A_0\,(A_1\,A_2))\,A_3)$ — Correct Option

Solution :
(a)
(a) Number of multiplication in

$((A_0\,(A_1\,A_2))\,A_3) = 6\times8\times4 + 4\times6\times4 + 4\times4\times5$
$= 192 + 96 + 80 = 368$

(b) $((A_0\,A_1)\,A_2)\,A_3 = 4\times6\times8 + 4\times8\times4 + 4\times4\times5$
$= 192 + 128 + 80 = 400$

(c) $((A_0\,A_1)(A_2\,A_3)) = 4\times6\times8 + 8\times4\times5 + 4\times8\times5$
$= 192 + 160 + 160 = 512$

(d) $(A_0\,((A_1\,A_2)\,A_3)) = 6\times8\times4 + 6\times4\times5 + 4\times6\times5$
$= 192 + 120 + 120 = 432$

Optimal for (a).

B $((A_0\,A_1)\,A_2)\,A_3$

C $((A_0\,A_1)(A_2\,A_3))$

D $(A_0\ ((A_1\ A_2)\ A_3))$

QUESTION ANALYTICS +

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Q. 11 Solution Video | Have any Doubt ?

Consider the following max-heap which is stored in the array.
55, 48, 51, 25, 18, 35, 24, 8, 19
Which of the following represent the max heap after one deletion?

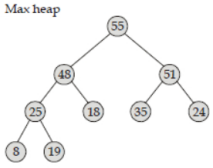
A 55, 48, 35, 25, 18, 24, 19, 8

B 51, 48, 35, 25, 24, 18, 19, 8

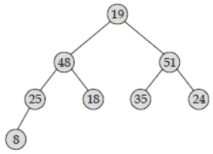
C 51, 48, 35, 25, 18, 19, 24, 8 — Your answer is **Correct**

Solution :
(c)

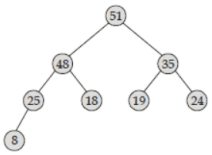
Max heap



On deletion perform the heapify operation and root will be deleted.



After performing heapify.



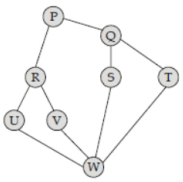
Max heap (51, 48, 35, 25, 18, 19, 24, 8).

D 51, 48, 35, 25, 19, 18, 24, 8

QUESTION ANALYTICS +

Q. 12 Solution Video | Have any Doubt ?

Consider the following graph:



Which of the following is not a depth first search traversal of the given graph?

A P Q S W V R U T

B P Q S W T V R U

C P R U V W S Q T — Correct Option

Solution :
(c)
In P R U V W S Q T is not DFS traversal because after U, V can not come.

D P R V W S Q T U

QUESTION ANALYTICS +

Q. 13 Solution Video | Have any Doubt ?

Consider the following statements:
S_1 : For every weighted graph with starting vertex at S, Bellman Ford algorithm always gives shortest path to any given vertex V.
S_2 : If a graph contain a negative weight cycle then Dijkstra's algorithm may not terminate.
Which of the above is incorrect?

A Both S_1 and S_2 — Your answer is **Correct**

Solution :
(a)
S_1 : Bellman Ford algorithm may not give shortest path if it contain a negative weight cycle. So S_1 is incorrect
S_2 : Dijkstra's algorithm may give incorrect result if it contain negative weight cycle but it always terminates so S_1 is incorrect.

B Only S_1

C Only S_2

D None of these

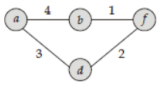
QUESTION ANALYTICS +

Q. 14 Solution Video | Have any Doubt ?

Which of the following statements is true?

A For a directed graph the absence of back edges in a DFS tree means the graph has no cycle. — Correct Option

Solution :
(a)
(a) For a directed graph if DFS tree does not have back edges then there is no cycle.
(b) Shortest path between two vertices may not be unique.



Shortest path between $a - f$ is not unique.
(c) A complete graph can have maximum $n^{n-2} = 4^{4-2} = 16$ MST.
So only option (a) is true.

B If all the edges in a graph have distinct weight then the shortest path between two vertices is unique.

C A complete graph with 4 vertices can have maximum 20 minimum cost spanning tree.

D Both (a) and (b)

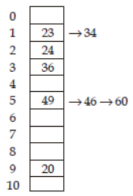
QUESTION ANALYTICS +

Q. 15 Solution Video | Have any Doubt ?

Consider a hash table with hash function $H(i) = i \mod 11$ and following keys are hashed into the 24, 49, 20, 16, 23, 36, 34, 60 hash table, to handle the collision chaining is used, after inserting all the keys if new key is inserted then what is the probability that it hashed into empty slot _____.
(Upto 2 decimal places)

0.54 [0.54 - 0.55] — Correct Option

Solution :
0.54 [0.54 - 0.55]



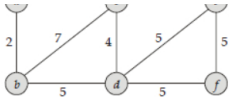
If the new key is inserted in empty slot 6, total 11 slot.

$$\text{Probability} = \frac{6}{11} = 0.54$$

QUESTION ANALYTICS +

Q. 16 Solution Video | Have any Doubt ?

Consider the following graph:

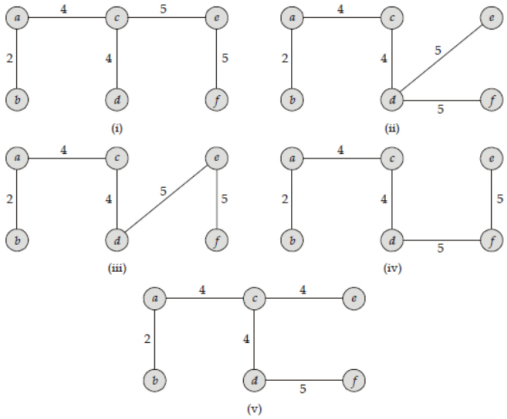


Number of minimum spanning tree using Prim's or Kruskal's algorithm _____.

5 Correct Option

Solution :
5

We get same number of spanning tree using Prim's or Kruskal's algorithm.



Total 5 minimum spanning tree exists.

QUESTION ANALYTICS +

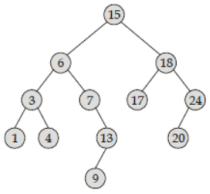
Q. 17 Solution Video Have any Doubt ?

Consider the postorder traversal of a binary search tree 1, 4, 3, 9, 13, 7, 6, 17, 20, 24, 18, 15. The expected number of comparison when a randomly record is requested _____. (Upto 2

3.16 [3.14 - 3.19] Correct Option

Solution :
3.16 [3.14 - 3.19]

Binary search tree of the given postorder traversal.



Let x be the number of comparison $P(x)$ is the probability of elements having x comparison

x	1	2	3	4	5
$P(x)$	$\frac{1}{12}$	$\frac{2}{12}$	$\frac{4}{12}$	$\frac{4}{12}$	$\frac{1}{12}$

$$E(x) = 1\times\frac{1}{12}+2\times\frac{2}{12}+3\times\frac{4}{12}+4\times\frac{4}{12}+5\times\frac{1}{12}$$

$$= \frac{1+4+12+16+5}{12} = 3.166$$

Your Answer is 1.07

QUESTION ANALYTICS +

Kunal Jha
Course: GATE
Computer Science Engineering(CS)

SINGLE SUBJECT : ALGORITHMS (GATE - 2020) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) | CORRECT(14) | INCORRECT(8) | SKIPPED(11)

Q. 1 Solution Video | Have any Doubt ?

Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	List-II
A. Single source shortest path	1. Divide and conquer
B. Optimal binary search trees	2. Greedy approach
C. The 8 queen problem	3. Backtracking
D. Strassen's matrix multiplication	4. Dynamic programming

Codes:

	A	B	C	D
(a)	2	1	3	4
(b)	4	2	3	1
(c)	2	4	3	1
(d)	4	1	2	3

A a

B b

C c — Your answer is **Correct**

Solution :
(c)
Single source shortest path is a greedy approach.
Optimal binary search trees uses dynamic programming.
The 8 queen problem uses backtracking.
Strassen's matrix multiplication uses divide and conquer.

D d

QUESTION ANALYTICS +

Q. 2 Solution Video | Have any Doubt ?

Which of the following hash function is of the form used in double hashing where k is key and m is number of slot in hash table?

A $h(k, i) = (h_1(k) - i\, h_2(k)) \bmod m$

B $h(k, i) = (h_1(k) + h_2(k) + i) \bmod m$

C $h(k, i) = (h_1(k) + h_2(k) - i) \bmod m$

D $h(k, i) = (h_1(k) + i\, h_2(k)) \bmod m$ — Your answer is **Correct**

Solution :
(d)
Given two randomly, uniformly selected hash function h_1 and h_2.
The i^{th} location in the bucket sequence for value k in a hash table is

$$h(k, i) = (h_1(k) + i\, h_2(k)) \bmod m$$

QUESTION ANALYTICS +

Q. 3 Solution Video | Have any Doubt ?

A n-ary tree has m leaf nodes. What is the total number of nodes in n-ary tree?

A $\frac{nm+1}{n-1}$

B $\frac{nm-1}{n-1}$ — Your answer is **Correct**

Solution :
(b)
Let number of internal node is k

$$\text{Total node} = k + m$$

For n-ary tree number of leaf nodes with k internal nodes $= (n-1)k + 1$

$$m = (n-1)k + 1$$

$$k = \frac{m-1}{n-1}$$

$$\text{Total nodes} = \frac{m-1}{n-1} + m = \frac{mn-1}{n-1}$$

$n-1$ $n-1$

C $\frac{nm+2m-1}{n-1}$

D $\frac{nm-1}{n+1}$

QUESTION ANALYTICS +

Q. 4 Solution Video Have any Doubt ?

In a AVL tree of height h minimum number of node is A and maximum number of node is B what is the value of A + B when height of AVL tree is 4? (Root at height 0)

A 43 Correct Option

Solution :
(a)
Number of maximum node at height $4 = 2^{h+1} - 1$

$S(h) = S(h-1) + S(h-2) + 1$
$S(4) = S(3) + S(2) + 1$
$S(3) = S(2) + S(1) + 1$
$S(2) = S(1) + S(0) + 1$
$= 2 + 1 + 1$
$S(2) = 4 \Rightarrow$ B value
is $S(4) = 12 =$ B
$S(1) = 2$
$A + B = 31 + 12 = 43$
So option (a) is correct.

B 45

C 48

D 52

QUESTION ANALYTICS +

Q. 5 Solution Video Have any Doubt ?

Consider the following functions:

$f_1 = n^4$, $f_2 = 4^n$, $f_3 = n^{110/37}$, $f_4 = \left(\frac{119}{37}\right)^n$

Which of the following is correct order of increasing growth rate?

A f_1, f_3, f_2, f_4

B f_3, f_1, f_4, f_2 Your answer is Correct

Solution :
(b)

$f_1 = n^4$ (polynomial time)
$f_2 = 4^n$ (ex-polynomial time)
$f_3 = n^{110/37} = n^{3.79}$ (polynomial)
$f_4 = (3.25)^n$ (exponential)

$f_3 < f_1 < f_4 < f_2$

C f_3, f_1, f_2, f_4

D f_1, f_3, f_4, f_2

QUESTION ANALYTICS +

Q. 6 Solution Video Have any Doubt ?

Which of the following is true?

A Complete graph with 4 vertices, each edges having same weight can have maximum 28 minimum cost spanning tree.

B Adding a constant to every edge weight in a directed graph can change the set of edges that belongs to minimum cost spanning tree, all weight are distinct. Correct Option

Solution :
(b)
If all weight are unique than adding a constant to every edge weight in a directed graph can change the set of edges that belongs to minimum cost spanning tree.

C Both (a) and (b)

D None of these — Your answer is **Wrong**

QUESTION ANALYTICS +

Q. 7 — Solution Video | Have any Doubt ?

Consider the following program segments:

```
main ( )
{
      int i = 0, m = 0;
for (i = 1; i < n; i++) {
          for (j = 1; j < i * i; j++) {
              if ((j % i) = = 0)
          for (k = 1; k < j; k++) {
              m = m + 1; }
          }
      }
}
```

What is the time complexity of above program?

A $O(n^2 \log n)$

B $O(n^3)$

C $O(n^4)$ — Correct Option

Solution :
(c)

```
for (i = 1, i < n, i++) – n time
{
for (j = 1; j < i * i, j++)
```

$$1^2 + 2^2 + 2^3 \ldots\ldots n^2 = \frac{n(n+1)(2n+1)}{6} = O(n^3)$$

```
for  (k = 1; k < j; k++)
     { m = m + 1;          } O(n)
     }
```

$$\text{Total} = O(n) \times O(n^3) = O(n^4)$$

D $O(n \log n)$

QUESTION ANALYTICS +

Q. 8 — Solution Video | Have any Doubt ?

Consider the following recursive function find:

```
int find (int A[ ], int n)
{
    int sum = 0;
    if (n = = 0) return 0;
    sum = find (A, n – 1)
    if (A [n – 1] < 0) sum = sum + 1;
    return sum;
}
```

What is the worst case running time of above function find (A [ ], n) when array A has 0 to n – 1 elements?

A O(1)

B O(log n)

C O(n) — Your answer is **Correct**

Solution :
(c)
Recurrence relation for the function find:

$$F(n) = 0; \text{ if } n = 0$$
$$= F(n-1) + 1; \text{ if } n > 0$$

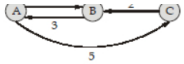
Time complexity of $F(n) = O(n)$

D $O(n^2)$

QUESTION ANALYTICS +

Q. 9 — Solution Video | Have any Doubt ?

Consider the following direct graph:



What is the adjacently matrix after Floyd's algorithm applied on the above graph to find all pairs shortest paths?

A

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 2 & 7 & 5 \\ 3 & 0 & 8 \\ 5 & 2 & 0 \end{bmatrix} \end{array}$$

Your answer is **Wrong**

B

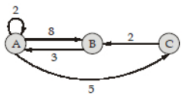
$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 2 & 7 & 5 \\ 3 & 11 & 8 \\ 5 & 2 & 0 \end{bmatrix} \end{array}$$

C

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 7 & 5 \\ 3 & 0 & 8 \\ 5 & 2 & 0 \end{bmatrix} \end{array}$$

Correct Option

Solution :
(c)



$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 8 & 5 \\ 3 & 0 & \infty \\ \infty & 2 & 0 \end{bmatrix} \end{array}$$ is adjacency matrix for above graph.

$$A_0 = \begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 8 & 5 \\ 3 & 0 & \infty \\ \infty & 2 & 0 \end{bmatrix} \end{array} \Rightarrow A_1 = \begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 8 & 5 \\ 3 & 0 & 8 \\ \infty & 2 & 0 \end{bmatrix} \end{array}$$

$$A_2 = \begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 8 & 5 \\ 3 & 0 & 8 \\ 5 & 2 & 0 \end{bmatrix} \end{array} \Rightarrow A_3 = \begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 7 & 5 \\ 3 & 0 & 8 \\ 5 & 2 & 0 \end{bmatrix} \end{array}$$

D

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0 & 7 & 5 \\ 3 & 11 & 8 \\ 5 & 2 & 0 \end{bmatrix} \end{array}$$

QUESTION ANALYTICS +

Q. 10

Solution Video | Have any Doubt ?

Match the following recurrence relations with their time complexities.

List-I	List-II
A. $T(n) \geq 2T\left(\frac{n}{2}\right) + \theta(n)$	1. $\theta(n \log n)$
B. $T(n) \leq 2T\left(\frac{n}{2}\right) + \theta(n)$	2. $O(n \log n)$
C. $T(n) \leq T\left(\frac{n}{2}\right) + c$	3. $\theta(n)$
	4. $O(n)$
	5. $O(\log_2 n)$
	6. $O(\log_n 2)$
	7. $\Omega(n \log_2 n)$

Codes:

	A	B	C
(a)	2	3	6
(b)	1	3	5
(c)	7	2	5
(d)	2	3	5

A a

B b

C c

Your answer is **Correct**

Solution :
(c)

A. $T(n) \geq 2T\left(\frac{n}{2}\right) + \Theta(n)$

Apply masters theorem: $n^{\log_b a} = f(n)$. Both are equal therefore $\Omega(n \log n)$

B. **Apply masters theorem:** $n^{\log_b a} = f(n)$. Therefore $T(n) = O(n \log n)$

C. **Apply masters theorem:** $T(n) = O(\log n)$

D d

QUESTION ANALYTICS +

Item 1-10 of 33 « previous 1 2 3 4 next »

Kunal Jha
Course: GATE
Computer Science Engineering(CS)

SINGLE SUBJECT : ALGORITHMS (GATE - 2020) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) CORRECT(14) INCORRECT(8) SKIPPED(11)

Q. 11 Solution Video | Have any Doubt ?

Consider the following two string P and Q.
P = csemadeasy20
Q = gateexam20
The length of longest common subsequence are possible from P and Q is _____.

5 — Your answer is Correct5

Solution :
5

P = csemadeasy20
Q = gateexam20
LCS (P, Q) = aea20
Length of the longest common sequence is 5.

QUESTION ANALYTICS +

Q. 12 Solution Video | Have any Doubt ?

Consider the array after one pass of the quick sot algorithm.
9 7 17 21 18 24 29
The sum of all the possible values that could have been used as a pivot is _____.

70 — Correct Option

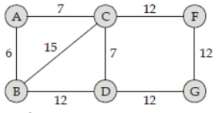
Solution :
70
(i) The pivot element on its correct position.
(ii) All element on left of it will be smaller and all element on right of it will be greater.
9, 7, 17, 21, 18, 24, 29
17, 24, 29 are in its correct position
Sum = 17 + 24 + 29 = 70

Your Answer is 89

QUESTION ANALYTICS +

Q. 13 Solution Video | Have any Doubt ?

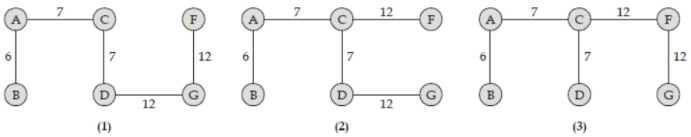
Consider the following graph G.



The total number of minimum spanning trees using Prim's or Kruskal's algorithm are _____.

3 — Your answer is Correct3

Solution :
3



QUESTION ANALYTICS +

Q. 14 Solution Video | Have any Doubt ?

An algorithm with time complexity O(log logn), A takes 100 seconds to execute the given data, B takes 75 sec for the same algorithm on same machine for data size of 256, data size of A is _____.

65536 — Your answer is Correct65536

Solution :
65536

Suppose data size of A is n

$$C \cdot \log \log n = 75$$
$$C \cdot \log \log 256 = 75$$
$$C = \frac{75}{3} = 25$$
$$25 \cdot \log \log n = 100$$
$$\log \log 65536 = 4$$
$$\log 16 = 4$$
$$n = 65536$$

QUESTION ANALYTICS +

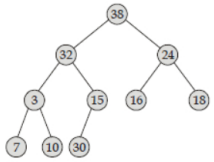
Q. 15 Solution Video | Have any Doubt ?

Consider the following array of elements (38, 32, 24, 10, 15, 16, 18, 7, 3, 30).
The minimum number of interchanges needed to convert it into a min heap are _____.

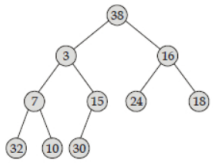
7 Your answer is **Correct**7

Solution :
7

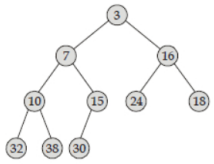
Step 1 interchange 10 and 3.



Step 2 interchange 16 and 24.
Step 3 interchange 3 and 32 and then 7 and 32.



Interchange 3 and 38, then 7 and 38 and last 10 and 38.



Min heap

Hence, total interchanges = 7.

QUESTION ANALYTICS +

Q. 16 Solution Video | Have any Doubt ?

Consider 5 items along with their respective weight and values

Items I	I_1	I_2	I_3	I_4	I_5
Weight W	20	40	5	10	30
Value V	100	160	30	20	90

The Knapsack has capacity, $w = 60$, the maximum profit that can be achieved using fractional knapsack is _____.

270 Your answer is **Correct**270

Solution :
270

Items	I_1	I_2	I_3	I_4	I_5
W_i	20	40	5	10	30
V_i	100	160	30	20	90
$P_i = V_i/W_i$	5.0	4.0	6.0	2.0	3.0

Arranging items with decreasing value of P_i.

Items	I_3	I_1	I_2	I_5	I_4
W_i	(5)	(20)	(40)	30	10
V_i	30	100	160	90	20
$P_i = V_i/W_i$	6.0	5.0	4.0	3.0	2.0

Items chosen : I_3, I_1, a fraction of I_2
Weight of I_2 to be added = 60 – 5 – 20 = 35
40 units of I_2 has 160 value

$$35 \text{ units of } I_2 = \frac{35 \times 160}{40} = 140 \text{ value}$$
$$\text{Total profit} = 30 + 100 + 140 = 270$$

QUESTION ANALYTICS +

QUESTION ANALYTICS

Q. 17 Solution Video | Have any Doubt ?

Consider an array 'A' of n distinct elements where value of elements lies from 1 to n. Array 'A' contains permutation of n elements. If we apply an operation $B[A[i]] = i$ for all i which of the following is correct? (Assume both array of same size)

A. Array B will be sorted array

B. A sorted permutation of array 'A' need not to give sorted array 'B'.

C. Array 'B' is a permutation of array 'A'. — Correct Option

Solution :
(c)

Index	1	2	3	4	5	6	7
A (input)	7	1	2	5	3	6	4
B (output)	2	3	5	7	4	6	1

- Since B is not a sorted array, but it is reverse index of all elements of array 'A'. i.e., array B is permutation of array A (1 permutation but of $n!$ permutation).
- A sorted permutation of A always give sorted array 'B'.

D. Doing the same permutation twice will not give the same array i.e., $C[B[A[i]]] = i$

QUESTION ANALYTICS

Q. 18 Solution Video | Have any Doubt ?

Consider a procedure find ( ) which take array of n integers as input and produce pair of elements of array whose difference is not greater than the difference of any other pair of element of that array. Which of the following represent worst case time complexity of find ( ) procedure?

A. O(n)

B. O(n log n) — Correct Option

Solution :
(b)
Using divide and conquer approach, closest pair can be found in $O(n \log n)$ time.
Algorithm :
Step 1 : Divide the set into two equal sized parts by the line l and recursively compute the distance in each part. [d_1 = closest pair (left half); d_2 = closest pair (right half)] and returning the points in each set in order that is sorted by y-coordinate].
Step 2 : Let 'd' be the minimal of two minimal distances

$$d = \min(d_1, d_2) \quad ....O(1)$$

Step 3 : Eliminate points that lie farther than 'd' apart from l, ...$O(n)$.
Step 4 : Merge the two sorted lists into one sorted list ...$O(n)$.
Step 5 : Scan the remaining points in the y-order and compute the distances of each point to its 5 neighbour ...$O(n)$.
Step 6 : If any of these distances is less than 'd' the update 'd' ...$O(1)$.

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$

$$T(n) = O(n \log n)$$

C. $O(n^2)$

D. $O(n^2 \log n)$

QUESTION ANALYTICS

Q. 19 Solution Video | Have any Doubt ?

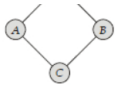
Consider two vertices 'a' and 'b' that are simultaneously on the FIFO queue at same point during the execution of breadth first search from 's' in an undirected graph. Consider the following statements:
S_1: The number of edges on the shortest path between 's' and 'a' is atmost one more than the number of edges on the shortest path between 's' and 'b'.
S_2: The number of edges on the shortest path between 's' and 'a' is atleast one less than the number of edges on the shortest path between 's' and 'b'.
S_3: There is a path between 'a' and 'b'.
Which of the following is true?

A. S_1 only

B. S_1 and S_2 only

C. S_1 and S_3 only — Correct Option

Solution :
(c)
Consider a graph



During the breadth first traversal of the graph. The status of the queue will be as follows :

S

A	B

$\therefore$ $S - A \rightarrow 1$ edge
$S - B \rightarrow 1$ edge
Difference = 0

B	C

$\therefore$ $S - B \rightarrow 1$ edge
$S - C \rightarrow 2$ edge
Difference = 1

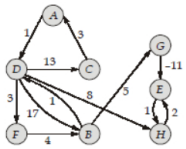
Hence, statements S_1 and S_3 are correct.

D S_1, S_2 and S_3

QUESTION ANALYTICS +

Q. 20 Solution Video | Have any Doubt ?

Consider the graph given below:



Suppose you are running Dijkstra's algorithm starting from source vertex 'D'. What will be the order of vertices which will be relaxed using Dijkstra's algorithm?

A DFBHEGCA — Your answer is **Correct**

Solution :
(a)
Starting vertex is D

	A	B	C	D	E	F	G	H
	∞	∞	∞	0 Nil	∞	∞	∞	∞
D	∞ Nil	17 D	13 D		∞ Nil	3 D	∞ Nil	8 D
F	∞ Nil	7 F	13 D		∞ Nil		∞ Nil	8 D
B	∞ Nil		13 D		∞ Nil		12 B	8 D
H	∞ Nil		13 D		10 H		12 B	
E	∞ Nil		13 D				12 B	
G	∞ Nil		13 D					
C	16 C		13 D					
A								

So the order of relaxed the vertices by using Dijkstra's algorithm is DFBHEGCA.

B DFBHGECA

C DFBHEGAC

D DFBEHGCA

QUESTION ANALYTICS +

Kunal Jha
Course: GATE
Computer Science Engineering(CS)

SINGLE SUBJECT : ALGORITHMS (GATE - 2020) - REPORTS

OVERALL ANALYSIS | COMPARISON REPORT | SOLUTION REPORT

ALL(33) | CORRECT(14) | INCORRECT(8) | SKIPPED(11)

Q. 21 Solution Video | Have any Doubt ?

Consider the following statement:
S_1 : Given a max heap of height (logn) it will take O(1) time to delete the root element of the max heap.
S_2: In quick sort at first iteration, no element changes its position iff given input is already sorted.
Which of the above statement is true?

A S_1 only

B S_2 only

C S_1 and S_2 — Your answer is **Wrong**

D Neither S_1 nor S_2 — Correct Option

Solution :
(d)
Given a max heap of height log$n$ to delete root it get O(1) time, heap property is not maintained, to maintain heap property O(log$n$) time required, total time O(log$n$).
S_2 is incorrect statement.

QUESTION ANALYTICS +

Q. 22 Solution Video | Have any Doubt ?

Which of the following is true?

I. $T(n) = 2T\left(\frac{n}{2}\right) + n \log n \quad n \geq 2$

$T(1) = 0$
$T(n) = O(n \log n)$

II. $T(n) = T(n-1) + \frac{1}{n}$

$T(n) = \theta(\log n)$

A I only

B II only — Correct Option

Solution :
(b)

I. $T(n) = 2T\left(\frac{n}{2}\right) + n \log n$

$T(2^K) = 2T(2^{K-1}) + K\,2^K$
$= 2[2T(2^{K-2}) + (K-1)\,2^{K-1}] + K \cdot 2^K$
$= 2^K\,T(2^{K-K}) + 2^K[1 + 2 + \ldots K]$

Putting, $K = \log n$
$= 2K \cdot 0 + 2^K \frac{K(K+1)}{2}$
$= O(n\,(\log n)^2)$

II. $T(n) = T(n-1) + \frac{1}{n}$
$= \theta(\log n)$

C Both I and II

D Neither I nor II

QUESTION ANALYTICS +

Q. 23 Solution Video | Have any Doubt ?

Consider the following statement:
S_1: There exists a stable implementation of merge sort.
S_2 : Radix sort works in a linear time only if the elements to sort are integers in the range {0, 1 ..... cn} for same c = O(1).
Which of the above statements is/are correct?

A S_1 only

B S_2 only

C Both S_1 and S_2 — Correct Option

Solution :
(c)
S_1: There exists a implementation in which we make merge sort stable.
S_2 : Radix sort also works in linear time if the elements to sort are integers in the range {0 ..... n^d} for any constant d given range (0 to cn) is subset of (0 to n^d).

D Neither S_1 nor S_2

QUESTION ANALYTICS +

Q. 24 — Solution Video | Have any Doubt ?

Consider the following statement:
S_1: If the load factor of a hash table is less than 1, then there is no collision.
S_2 : In a breadth first search of an undirected graph there exist no cross edges but there may be back edge.
Which of the above statements is/are correct?

A S_1 only

B S_2 only — Correct Option

Solution :
(b)
S_1: If the table contain fewer elements than slots, than load factor is less than 1, but it does not prevent elements from hashing to the same slot.
S_2: In a breadth first search of an undirected graph there is no cross edge but can be back edges.

C Both S_1 and S_2

D Neither S_1 nor S_2

QUESTION ANALYTICS +

Q. 25 — Solution Video | Have any Doubt ?

Consider a modified quick sort where we have an input sorted array A[1 .... n] all element of array are distinct and n ≥ 3, pivot is the median of set of 3 element (first, middle, last) what is the worst case time complexity of this modified quick sort?

A O(n logn) — Your answer is **Correct**

Solution :
(a)
Since the given array is sorted, finding first, middle and last take O(1) time.

The selected pivot will divide the given array in two part of $\frac{n}{2}$ element.

$$T(n) = 2T\left(\frac{n}{2}\right) + O(n)$$
$$= O(n \log n)$$

B $O(n^2)$

C $O(n^2 \log n)$

D O(nloglogn)

QUESTION ANALYTICS +

Q. 26 — Solution Video | Have any Doubt ?

Consider the functions $\log n!$, $(\log n)!$, $(\log n)^{\log n}$, $\log(\log n)!$ and $(\log\log n)!$ not necessarily in the order. Which of the following options is correct in the increasing order of the mentioned functions?

A $\log(\log n)! < (\log\log n)! < \log n! < (\log n)^{\log n} < (\log n)!$

B $\log(\log n)! < (\log\log n)! < \log n! < (\log n)! < (\log n)^{\log n}$ — Correct Option

Solution :
(b)
$\log(\log n)! < (\log\log n)! < \log n! < (\log n)! < (\log n)^{\log n}$
Hence option (b) is the correct answer.

C $(\log\log n)! < \log(\log n)! < \log n! < (\log n)^{\log n} < (\log n)!$

D $\log(\log n)! < \log n! < (\log\log n)! < (\log n)! < (\log n)^{\log n}$ — Your answer is **Wrong**

QUESTION ANALYTICS +

Q. 27 Solution Video | Have any Doubt ?

Let X is a max heap with heap size of n, a function MH (X, i, key) which replace $A[i]$ with key value, if it is smaller than key, time taken by the function MH when $i = 1$?

A θ(log n) — Your answer is **Wrong**

B θ(n)

C θ(loglogn)

D θ(1) — Correct Option

Solution :
(d)
In max heap the root element is at $i = 1$ position and it is largest element in heap.
If key > $A[i]$, then $A[i]$ and key is replace and heap property is maintain.
So it take only O(1) time.

QUESTION ANALYTICS +

Q. 28 Solution Video | Have any Doubt ?

Consider a recursive merge sort implementation that calls insertion sort on sublists which are smaller than some threshold, if there are n function calls in merge sort, how many calls will there be in insertion sort?

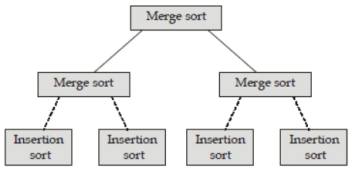
A (n + 1)

B log n — Your answer is **Wrong**

C log n + n

D $\left\lceil \frac{n}{2} \right\rceil$ — Correct Option

Solution :
(d)
Consider merge sort in terms of full binary tree, each call to merge sort either result in two new calls to merge sort or a single call to insertion sort, the calls to insertion sort are equivalent to the leaf nodes of a full binary tree.



Number of leaf nodes in a full binary tree of n nodes is $\left\lceil \frac{n}{2} \right\rceil$, so $\left\lceil \frac{n}{2} \right\rceil$ calls to insertion sort.

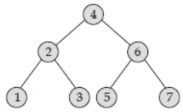
QUESTION ANALYTICS +

Q. 29 Solution Video | Have any Doubt ?

The maximum number of order in which element {1, 2, 3, 4, 5, 6, 7} where 4 is the root can be insert into an empty AVL binary search tree such no rotation need to perform are _____.

48 — Correct Option

Solution :
48
Given that 4 is the root of the tree and no rotation is performed.



There ordering of (2, 6) not matter total way = 2! = 2
(1, 3, 5, 7) can be come in any order 4! = 24.
Total maximum order possible = 24 × 2 = 48

QUESTION ANALYTICS +

Q. 30

Solution Video | Have any Doubt ?

Consider the following statement:
I. Traversing DFS algorithm on a directed graph G, if we removed all back edges from the graph G, then resulting graph is acyclic graph.
II. The running time of radix sort is effectively independent of input given.
III. Time complexity of fractional Knapsack using greedy algorithm is O($n$log$n$).
The number of correct statements is/are _____.

2 — Correct Option

Solution :
2

I. Traversing DFS algorithm on a directed graph G, if we removed all back edges from the graph G, then resulting graph is acyclic graph.
II. Radix sort is independent of given input.
III. Time complexity of fractional Knapsack is O($n$log$n$).

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Q. 31 Solution Video | Have any Doubt ?

Consider the four matrixes with their dimension $A_{5\times10}$, $B_{10\times3}$, $C_{3\times12}$, $D_{12\times5}$ minimum number of scalar multiplication required by matrix chain multiplication algorithm _____.

405 — Correct Option

Solution :
405

Minimum number of scalar multiplication obtained by optimal parenthesis of matrix chain multiplication algorithm.

Minimum number of multiplication = $(A_{5\times10}\ B_{10\times3}) \times (C_{3\times12}\ D_{12\times5})$

$$\begin{aligned}(A_{5\times10}\ B_{10\times3}) &= AB_{5\times3} + 5\times10\times3\\ (C_{3\times12}\ D_{12\times5}) &= CD_{3\times5} + 3\times12\times5\\ (AB_{5\times3})\ (CD)_{3\times5} &= (ABCD)_{5\times5} + 5\times3\times5\\ \text{Total multiplicaiton} &= 5\times10\times3 + 3\times12\times5 + 5\times3\times5\\ &= 150 + 180 + 75 = 405\end{aligned}$$

QUESTION ANALYTICS +

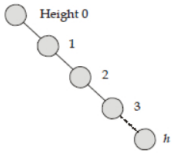
Q. 32 Solution Video | Have any Doubt ?

The maximum number of nodes in a Binary Search Tree which have same preorder and inorder is when height of the tree is 16 _____. (Assume root at height 0)

17 — Your answer is **Correct**17

Solution :
17

For the same inorder and preorder binary search tree will be right skew binary search tree.



Total number of nodes = 16 + 1 = 17

QUESTION ANALYTICS +

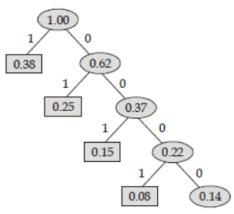
Q. 33 Solution Video | Have any Doubt ?

A text is made using A, B, C, D, E each occurring with the probability of 0.38, 0.25, 0.08, 0.15, 0.14 respectively, the optimal coding technique will have the average length of _____. (Upto 2 decimal places)

2.21 (2.20 - 2.25) — Correct Option

Solution :
2.21 (2.20 - 2.25)

Huffman coding is used to find the optimal average length.



$$\begin{aligned}\text{Average length} &= 0.38\times1 + 0.25\times2 + 0.15\times3 + 0.08\times4 + 0.14\times4\\ &= 0.38 + 0.5 + 0.45 + 0.32 + 0.56 = 2.21\end{aligned}$$

Your Answer is 2.28

QUESTION ANALYTICS +