Correct Marks : 2

Question Label : Short Answer Question

The following numbers are inserted into an empty binary search tree in the given order: 27, 43, 33, 49, 81, 92, 73, 10, 78. What is the height of the resulting binary search tree?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

5

Sub-Section Number :	8
Sub-Section Id :	640653134023
Question Shuffling Allowed :	Yes

Question Number : 227 Question Id : 640653903794 Question Type : SA Calculator : None

Correct Marks : 3

Question Label : Short Answer Question

Consider a **Block nested loop join** for the two relations, **instructor** and **department**.
Assuming the worst-case memory availability and **instructor** as the outer relation, the provided details are as follows:

• Total number of block transfers: 30500
• Total number of seeks required: 2000
• Number of block in the outer relation: 500

What is the number of blocks in the inner relations?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

30

PDSA

Section Id :	64065364121
Section Number :	8
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	25

Number of Questions to be attempted :	25
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653134024
Question Shuffling Allowed :	No

Question Number : 228 Question Id : 640653903795 Question Type : MCQ Calculator : Yes
Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406533043412. ✔ YES

6406533043413. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	640653134025
Question Shuffling Allowed :	Yes

Question Number : 229 Question Id : 640653903796 Question Type : MCQ Calculator : Yes
Correct Marks : 4

Question Label : Multiple Choice Question

Consider the following functions:

$h1(n) = 10n^2 \, log \, n + n^2$

$h2(n) = \log (\log n)$

$h3(n) = 100n$

$h4(n) = 2^n + n \, log \, n$

$h5(n) = n^2 + 1000$

Arrange the above functions in increasing order of asymptotic complexity.

Options :

6406533043414. ✖ $h2(n), h3(n), h1(n), h4(n), h5(n)$

6406533043415. ✔ $h2(n), h3(n), h5(n), h1(n), h4(n)$

6406533043416. ✖ $h2(n), h4(n), h5(n), h3(n), h1(n)$

6406533043417. ✖ $h2(n), h3(n), h1(n), h5(n), h4(n)$

Question Number : 230 Question Id : 640653903797 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

A list with 2^k elements needs to be processed using either of two given algorithms. Algorithm **A** takes $5n \log_2 n$ time and algorithm **B** takes $0.02n^2$ time to process a list of n elements. What is the smallest value of k for which algorithm **A** would be preferred?

Options :

6406533043418. ✖ 10

6406533043419. ✖ 11

6406533043420. ✔ 12

6406533043421. ✖ 13

Question Number : 231 Question Id : 640653903798 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

The list of tuples `L = [('a',2),('b',2),('c',4),('d',3),('e',2),('f',4),('g',1),('h',1)]` need to be sorted. The following `Insertionsort` function is executed on the list `L` which sorts the list based on the 2nd element of tuples.

```
1  def InsertionSort(L):
2      n = len(L)
3      if n < 1:
4          return(L)
5      for i in range(n):
6          j = i
7          while(j > 0 and L[j][1] < L[j-1][1]):
8              (L[j],L[j-1]) = (L[j-1],L[j])
9              j = j-1
10     return(L)
```

Which of the following list is returned by the function?

Options :

6406533043422. ✖ `[('g', 1), ('h', 1), ('e', 2), ('a', 2), ('b', 2), ('d', 3), ('f', 4), ('c', 4)]`

6406533043423. ✔ `[('g', 1), ('h', 1), ('a', 2), ('b', 2), ('e', 2), ('d', 3), ('c', 4), ('f', 4)]`

6406533043424. ✖ `[('g', 1), ('h', 1), ('e', 2), ('b', 2), ('a', 2), ('d', 3), ('c', 4), ('f', 4)]`

6406533043425. ✖ `[('h', 1), ('g', 1), ('e', 2), ('b', 2), ('a', 2), ('d', 3), ('f', 4), ('c', 4)]`

Question Number : 232 Question Id : 640653903799 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

What is recurrence and time complexity for the **worst case** of **Quick Sort** ? Consider that algorithm select last element as pivot element.

Options :

6406533043426. ✖ Recurrence is $T(n) = T(n/2) + O(n)$ and time complexity is $O(n^2)$

6406533043427. ✔ Recurrence is $T(n) = T(n-1) + O(n)$ and time complexity is $O(n^2)$

6406533043428. ✖ Recurrence is $T(n) = 2T(n/2) + O(n)$ and time complexity is $O(n\ log\ n)$

6406533043429. ✖ Recurrence is $T(n) = 2T(n/2) + O(1)$ and time complexity is $O(n\ log\ n)$

Question Number : 233 Question Id : 640653903801 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

There is a stack `S` and a queue `Q`. Suppose the elements A, B, C, D, E, F, G, H and I are enqueued into `Q` in the reverse order i.e., starting from I. The following operations are performed on the stack and the queue.

```
1 S.push(Q.dequeue())
2 S.push(Q.dequeue())
3 Q.enqueue(S.pop())
4 Q.enqueue(S.pop())
5 S.push(Q.dequeue())
6 S.push(Q.dequeue())
7 S.push(Q.dequeue())
8 Q.enqueue(S.pop())
9 S.push(Q.dequeue())
```

Which of the following element is the rear of queue after execution of the above operations?

Options :

6406533043431. ✖ I

6406533043432. ✖ F

6406533043433. ✔ E

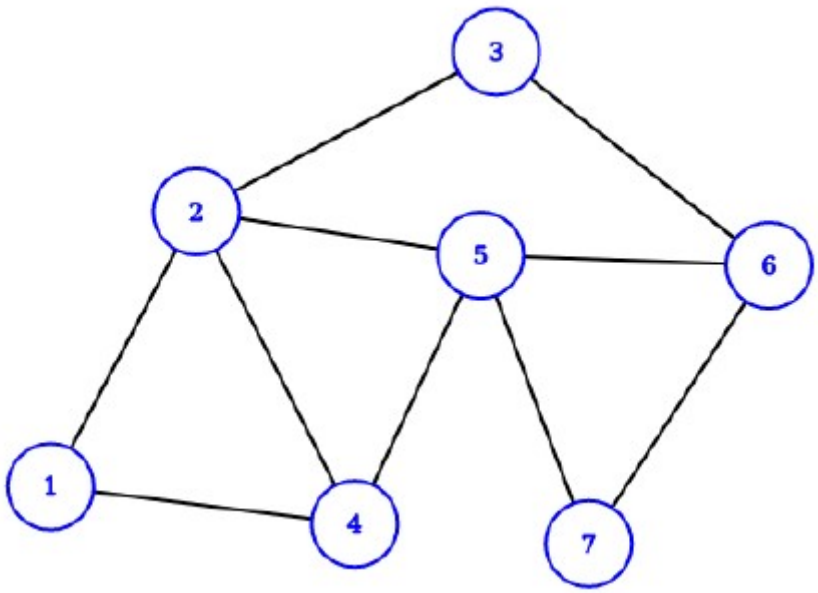
6406533043434. ✖ H

6406533043435. ✖ G

Question Number : 234 Question Id : 640653903802 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

Consider the following graph



Which of the following vertex sequence is the correct **BFS traversal** on the graph started from node **7**? Assume that when a node has multiple neighbours, BFS would visit the numerically smaller valued node first.

Options :

6406533043436. ✖ $7, 5, 6, 2, 3, 4, 1$

6406533043437. ✖ $7, 5, 6, 2, 4, 1, 3$

6406533043438. ✖ $7, 5, 6, 3, 4, 2, 1$

6406533043439. ✔ $7, 5, 6, 2, 4, 3, 1$

Question Number : 235 Question Id : 640653903805 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

Which of the following statements is **true** about Dijkstra's algorithm to find the shortest path?

I. The shortest path returned by Dijkstra's algorithm always passes through the least number of vertices.

II. To decide which node to visit next, Dijkstra's algorithm selects the node with maximum known distance.

Options :

6406533043449. ✖ Only I is correct

6406533043450. ✖ Only II is Correct

6406533043451. ✖ Both I and II are correct

6406533043452. ✔ Both I and II are incorrect

Question Number : 236 Question Id : 640653903806 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

Which of the following is/are always **true** about the **Bellman-Ford** algorithm?

I. It can not detect negative weight cycles in graph.

II. It works correctly if the graph has negative edge weights but does not have negative weight cycles.

III. It finds the shortest paths from a single source vertex to all other vertices in the graph.

Options :

6406533043453. ✖ Only statement I and II are correct

6406533043454. ✖ Only statement I and III are correct

6406533043455. ✔ Only statement II and III are correct

6406533043456. ✖ All statements are correct

6406533043457. ✖ All statements are incorrect

Question Number : 237 Question Id : 640653903809 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

Post-order traversal of a given binary search tree T produces the following sequence of keys:

`2, 6, 11, 8, 5, 14, 12, 20, 30, 25, 15`

Left child of element `14` is__.

Options :

6406533043460. ✖ 12

6406533043461. ✖ 11

6406533043462. ✖ 8

6406533043463. ✔ 14 is a leaf node.

Question Number : 238 Question Id : 640653903814 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

Consider the following recursive function to find the minimum element in list `L` of size `n` where `lower` and `upper` represents the first index and last index of list `L` respectively.

```
1  def find_min(L, lower, upper):
2      if upper-lower == 0:
3          return L[lower]
4      return min(L[lower],find_min(L,lower+1,upper))
```

What is the Recurrence relation of the given function?

Options :

6406533043474. ✖ $T(n) = T(n/2) + 1\ ,\ T(1) = 1$

6406533043475. ✔ $T(n) = T(n-1) + 1\ ,\ T(1) = 1$

6406533043476. ✖ $T(n) = T(n-1) + n\ ,\ T(1) = 1$

6406533043477. ✖ $T(n) = T(n/2) + n\ ,\ T(1) = 1$

Question Number : 239 Question Id : 640653903815 Question Type : MCQ Calculator : Yes

Correct Marks : 4

Question Label : Multiple Choice Question

Consider n matrices $M_0, M_1, \ldots M_{n-1}$ that needs to be multiplied. Let $C[i, j]$ is the cost required to multiply matrices $M_i, M_{i+1}, \ldots, M_{j-1}, M_j$.

Let $f(x)$ is the time to multiply matrices M_x and M_{x+1}.

The optimal substructure of the problem is given as:

$$C[i,j] = \begin{cases} 0, & if\ i == j \\ \_\_\_\_, & if\ i < j \end{cases}$$

Which among the following is the correct statement to fill the blank.

Options :

6406533043478. ✖ $\min_{i \le k < j} \{C[i, i+k] + C[i+k+1, j] + f(i+k)\}$

6406533043479. ✔ $\min_{i \le k < j} \{C[i, k] + C[k+1, j] + f(k)\}$

6406533043480. ✖ $\min_{i \le k < j} \{C[i, j] + C[k+1, j] + f(j)\}$

6406533043481. ✖ None of these

Question Number : 240 Question Id : 640653903821 Question Type : MCQ Calculator : Yes

Correct Marks : 4

Question Label : Multiple Choice Question

Let Z be an NP-complete problem and X and Y be two other problems not known to be in NP. X is polynomial time reducible to Z and Z is polynomial-time reducible to Y. Which one of the following statements is true?

Options :

6406533043501. ✖ Y is NP-complete

6406533043502. ✔ Y is NP-hard

6406533043503. ✖ X is NP-complete

6406533043504. ✖ X is NP-hard

Sub-Section Number :	3
Sub-Section Id :	640653134026
Question Shuffling Allowed :	Yes

Question Number : 241 Question Id : 640653903800 Question Type : SA Calculator : None

Correct Marks : 4

Question Label : Short Answer Question

Given the following sorted list :

`[16, 53, 59, 81, 94, 99, 121, 150, 162, 170, 187]`

If we use binary search algorithm to search for element 53 in the given list, then the number of list elements for comparison to 53 (including comparison with 53 in list) in this process is__.

Note: Assume here that binary search will compute the midpoint by using $(First\ index + Last\ index)//2$

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
4

Question Number : 242 Question Id : 640653903807 Question Type : SA Calculator : None Correct Marks : 4

Question Label : Short Answer Question

Consider a complete undirected graph with vertex set {0, 1, 2, 3, 4}. Every entry `w[i][j]` where `i` $\neq$ `j` in the matrix `w` below is the weight of the edge from vertex `i` to vertex `j`.

$$W = \begin{bmatrix} 0 & 3 & 12 & 5 & 7 \\ 3 & 0 & 9 & 6 & 8 \\ 12 & 9 & 0 & 11 & 10 \\ 5 & 6 & 11 & 0 & 2 \\ 7 & 8 & 10 & 2 & 0 \end{bmatrix}$$

What is the weight of the minimum spanning tree for the given graph?

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
19

Question Number : 243 Question Id : 640653903808 Question Type : SA Calculator : None Correct Marks : 4

Question Label : Short Answer Question

The number of leaf nodes in a rooted tree of `11` nodes, with each node having 0 or 2 children is__.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
6

Question Number : 244 Question Id : 640653903811 Question Type : SA Calculator : None Correct Marks : 4
Question Label : Short Answer Question
Consider the following tasks $T1, \ldots, T9$.

Task	T1	T2	T3	T4	T5	T6	T7	T8	T9
Deadline	3	5	3	2	1	4	5	4	3

The execution of each task requires one unit of time. We can execute one task at a time. What is the maximum number of tasks that can be completed without lateness(before or by the deadline)? Consider the start time 0.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
5

Question Number : 245 Question Id : 640653903813 Question Type : SA Calculator : None Correct Marks : 4
Question Label : Short Answer Question

Consider the following code to find median.

```
def MoM(L):
    if len(L) <= 5:
        L.sort()
        return L[2]
    M = []
    for i in range(0,len(L),5):
        X = L[i:i+5]
        X.sort()
        M.append(X[2])
    return MoM(M)
```

What median value will be returned by the given `MoM` function for the following list?

`L = [17, 7, 76, 6, 60, 26, 12, 33, 5, 0, 49, 24, 55, 66, 75, 32, 93, 28, 43, 46, 15, 64, 50, 98, 29]`

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal
Text Areas : PlainText
Possible Answers :
43

Sub-Section Number :	4
Sub-Section Id :	640653134027
Question Shuffling Allowed :	Yes

Question Number : 246 Question Id : 640653903803 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0
Question Label : Multiple Select Question

Let T_B and T_D be the BFS tree and DFS tree respectively generated when BFS and DFS are applied on the node s in undirected and unweighted graph G. Let $d(x)$ be the shortest distance of node x from the node s in G. Which among the following statements is/are correct ?

Options :

6406533043440. ✖ For every neighbor v of s in graph G, the edge (s, v) must exist in T_D.

6406533043441. ✔ If (u, v) is an edge of G that is not in T_B then $|(d(u) - d(v)| \leq 1$.

6406533043442. ✔ If there is no path from s to u in T_D, then u is in a different component from s.

6406533043443. ✔ The number of vertices in T_B and T_D is equal.

Question Number : 247 Question Id : 640653903804 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

A baker is preparing an elaborate cake M. The recipe includes preparing several other components, each of which has its dependencies. The order in which these components must be prepared is given below:

1. Component X is used to make components P and Q.
2. Component Y is added to prepare components R and S.
3. Component T is prepared by mixing components Q and R.
4. Component Y is made by blending X.
5. Component U is made by mixing P and T.
6. Component V is made by adding sugar to component S.
7. The cake M is assembled by layering components U and V together.

The baker has enough assistants to prepare multiple components simultaneously, allowing the cake M to be completed in the minimum number of steps, considering all dependencies. Each step represents a time unit during which one or more components can be prepared in parallel. The component(s) prepared in the 3rd step is/are ___.

Options :

6406533043444. ✖ Q

6406533043445. ✖ T

6406533043446. ✔ R

6406533043447. ✖ U

6406533043448. ✔ S

Question Number : 248 Question Id : 640653903810 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider a binary **min-heap** implemented using list. Which of the following lists represents a binary min-heap?

Options :

6406533043464. ✔ [6, 8, 15, 20, 12, 17, 21]

6406533043465. ✖ [6, 8, 17, 20, 12, 15, 21]

6406533043466. ✖ [6, 8, 15, 20, 17, 12, 21]

6406533043467. ✔ [6, 8, 17, 12, 15, 20, 21]

Question Number : 249 Question Id : 640653903812 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following are possible **valid** codes for the character set S = {A, B, C, D, E, F}, generated using the Huffman algorithm?

Options :

6406533043469. ✗

Character	A	B	C	D	E	F
Huffman code	000000	1011	110	001	01	111

6406533043470. ✓

Character	A	B	C	D	E	F
Huffman code	000	001	01	100	101	11

6406533043471. ✗

Character	A	B	C	D	E	F
Huffman code	100	1011	1001	011	101	000

6406533043472. ✓

Character	A	B	C	D	E	F
Huffman code	0000	0001	001	01	10	11

Question Number : 250 Question Id : 640653903819 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

A manufacturing company produces two types of products: `A` and `B`. Market tests and available resources indicate that the combined production level should not exceed 1000 products per week and the demand for the product `B` is at most half of that for product `A`. Further, the production level of product `A` can exceed three times the production of product `B` by at most 500 units. The company makes profit of Rs 15 and Rs 20 per product respectively on products `A` and B`.

The above problem is to be formulated as a linear programming problem. Let x and y be the number of product `A` and product `B`, respectively. Objective function to maximize the number of products `z = 15x + 20y`.

Which of the following are **valid** constraints for the given problem?

Options :

6406533043490. ✓ x + y <= 1000

6406533043491. ✓ x - 2y >= 0

6406533043492. ✗ 3x - y <= 500

6406533043493. ✗

$2x - y >= 0$

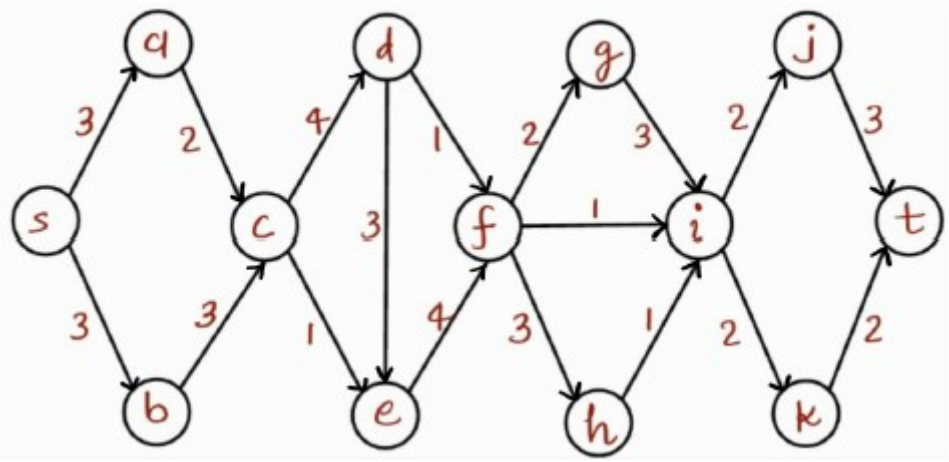
6406533043494. ✔ $x - 3y <= 500$

6406533043495. ✖ $x, y <= 0$

Question Number : 251 Question Id : 640653903820 Question Type : MSQ Calculator : Yes Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider the network given below with source *s* and sink *t*, with the numbers on the edges denoting maximum capacity across a particular edge.



Which of the following edges form a **valid min cut** in the given network?

Options :

6406533043496. ✖ Edges {ce, cd}

6406533043497. ✖ Edges {ac, ce, de}

6406533043498. ✔ Edges {fg, fi, hi}

6406533043499. ✖ Edges {fg, fh}

6406533043500. ✔ Edges {ij, ik}

Sub-Section Number : 5

Sub-Section Id : 640653134028

Question Shuffling Allowed : No

Question Id : 640653903816 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None

Question Numbers : (252 to 253)

Question Label : Comprehension

The **Longest Increasing Subsequence** problem is defined as below.

Given a list `L` of size `n` non-negative integers, determine the Longest Increasing Subsequence(LIS) i.e., the longest possible subsequence in which the elements of the subsequence are sorted in increasing order.

Consider the following function `LIS` which takes list `L` as input and returns the length of the Longest Increasing Subsequence.

```
1  def LIS(L):
2      n = len(L)
3
4      Lis = [1]*n  #initialize with all 1's
5
6      for i in range(1, n):
7          for j in range(0, i):
8              if L[i] > L[j]:
9                  Lis[i] = ____ # Check here
10
11     return max(Lis)
```

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 252 Question Id : 640653903817 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

In the given code, what expression should be placed at the place of `____` so that it return the correct output?

Options :

6406533043482. ✔ `max(Lis[i], Lis[j]+1)`

6406533043483. ✖ `max(Lis[i], Lis[j])`

6406533043484. ✖ `max(Lis[i], Lis[j+1]+1)`

6406533043485. ✖ `max(Lis[i], Lis[j-1]+1)`

Question Number : 253 Question Id : 640653903818 Question Type : MCQ Calculator : Yes Correct Marks : 4

Question Label : Multiple Choice Question

What is the time complexity of function `LIS()`?

Options :

6406533043486. ✖ $O(n)$

6406533043487. ✖ $O(n\ log\ n)$

6406533043488. ✖ $O(log\ n)$

6406533043489. ✔ $O(n^2)$

AppDev1

Section Id :	64065364122
Section Number :	9
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	32
Number of Questions to be attempted :	32
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653134029
Question Shuffling Allowed :	No

Question Number : 254 Question Id : 640653903822 Question Type : MCQ Calculator : Yes Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : MODERN APPLICATION DEVELOPMENT I (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?
CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.