PDSA

Section Id :	64065323902
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	17
Number of Questions to be attempted :	17
Section Marks :	50
Display Number Panel :	Yes
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065355348
Question Shuffling Allowed :	No

Question Number : 81 Question Id : 640653386735 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON"

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 :

6406531286129. ✔ YES

6406531286130. ✖ NO

Sub-Section Number :	2

Sub-Section Id : 64065355349

Question Shuffling Allowed : Yes

Question Number : 82 Question Id : 640653386736 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

```
def fun(m,n):
    if m == n:
        return n
    else:
        if m > n:
            return fun(m-n, n)
        else:
            return fun(m, n-m)
```

What does the function `fun` compute?

Options :

6406531286131. ✖ `m + n` using repeated subtraction

6406531286132. ✖ `m mod n` using repeated subtraction

6406531286133. ✔ The greatest common divisor of `m` and `n`

6406531286134. ✖ The least common multiple of `m` and `n`

Question Number : 83 Question Id : 640653386737 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

```python
def prime_bad(n):
  if n < 2:
    return False
  for i in range(2, int(n**0.5)):
    if n % i == 0:
      return False
  return True
```

Here is a function `prime_bad` that takes a positive integer `n` as input and returns `True` if the number is prime and `False` otherwise. There is an error in this function. For which of the following input values of `n` , does function `prime_bad` return an **incorrect** output?

Options :

6406531286135. ✖ 36

6406531286136. ✖ 29

6406531286137. ✔ 49

6406531286138. ✖ 37

Question Number : 84 Question Id : 640653386738 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

$$f1(n) = 30n^2 + 6n$$

$$f2(n) = 5n + (\log n)^2$$

$$f3(n) = 2\log(\log n)$$

$$f4(n) = 10\log n$$

$$f5(n) = 7n\log n + 20$$

Arrange the above functions in increasing order of asymptotic complexity.

Options :

6406531286139. ✖ $f3(n), f4(n), f2(n), f1(n), f5(n)$

6406531286140. ✖ $f3(n), f2(n), f1(n), f5(n), f4(n)$

6406531286141. ✔ $f3(n), f4(n), f2(n), f5(n), f1(n)$

6406531286142. ✖ $f4(n), f3(n), f2(n), f1(n), f5(n)$

Question Number : 85 Question Id : 640653386739 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider a list `L` of tuples `[(7, 8, 1), (3, 7, 5), (7, 9, 5), (6, 9, 5), (7, 6, 1), (9, 9, 0)]`. The following `sort` function is executed on the list `L`.

```
1  def sort(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][2] < L[j-1][2]):
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 `sort(L)`?

Options :

6406531286143. ✖ `[(9, 9, 0), (7, 8, 1), (7, 6, 1), (6, 9, 5), (3, 7, 5), (7, 9, 5)]`

6406531286144. ✖ `[(9, 9, 0), (7, 6, 1), (7, 8, 1), (6, 9, 5), (3, 7, 5), (7, 9, 5)]`

6406531286145. ✖ `[(9, 9, 0), (7, 6, 1), (7, 8, 1), (3, 7, 5), (6, 9, 5), (7, 9, 5)]`

6406531286146. ✔ `[(9, 9, 0), (7, 8, 1), (7, 6, 1), (3, 7, 5), (7, 9, 5), (6, 9, 5)]`

Question Number : 86 Question Id : 640653386740 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider an input list `L` of `n` distinct elements, and the aim is to sort it in increasing order. Which of the following statement(s) is/are **true**?

1. Input in increasing order is the worst case for Insertion sort, but not for Quick sort.
2. Input in increasing order is the worst case for Quick sort, but not for Insertion sort.
3. Input in decreasing order is the worst case for both Quick sort and Insertion sort.

Options :

6406531286147. ✖ 1 and 2

6406531286148. ✖ 1 and 3

6406531286149. ✔ 2 and 3

6406531286150. ✖ 1, 2 and 3

Question Number : 87 Question Id : 640653386741 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider a list `L` of `n` sorted numbers that are circularly shifted `k` positions to the right.

For example, `[-1,0,3,4,9,12]` is a sorted list.

`[9,12,-1,0,3,4]` : circularly shifted `2` positions to the right.

`[3,4,9,12,-1,0]` : circularly shifted `4` positions to the right.

What will be the complexity of the **most efficient algorithm** to search for the smallest element in `L` for the two cases listed below?

I. Value of `k` is not known.

II. Value of `k` is known.

Options :

6406531286151. ✖ I. $O(n)$, II. $O(1)$

6406531286152. ✖ I. $O(\log n)$, II. $O(\log n)$

6406531286153. ✖ I. $O(n)$, II. $O(\log n)$

6406531286154. ✔ I. $O(\log n)$, II. $O(1)$

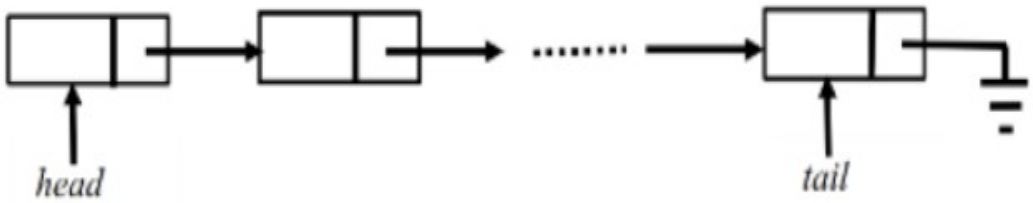
Question Number : 88 Question Id : 640653386742 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

```
class Node:
    def __init__(self,data):
        self.data = data
        self.next = None
```

Consider an implementation of a singly linked list, where each node is created using the given class `Node`. Suppose it has a `head` variable that points to the first node of the linked list and a `tail` variable that points to the last element of the linked list.



Suppose we want to perform the following operations on the given linked list:-

1. Insertion of the new node at the first position of the linked list.
2. Insertion of the new node at the last position of the linked list.
3. Deletion of the first node of the linked list.
4. Deletion of the last node of the linked list.

Which of the above operation can be performed in **constant time** $O(1)$?

Options :

6406531286155. ✖ 1, 2 and 4

6406531286156. ✔ 1, 2 and 3

6406531286157. ✖ 2, 3 and 4

6406531286158. ✖ 1, 2, 3 and 4

Question Number : 89 Question Id : 640653386743 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

A hash table of size 10 uses open addressing with hash function `h(k) = k mod 10`, and linear probing. After inserting 6 keys into an empty hash table, the table is as shown below.

Index	Key(k)
0	
1	
2	72
3	23
4	12
5	54
6	36
7	83
8	
9	

Which of the following option **cannot** be a possible order in which the key could have been inserted in the hash table?

Options :

6406531286159. ✖ 23, 36, 72, 12, 54, 83

6406531286160. ✖ 36, 72, 23, 12, 54, 83

6406531286161. ✔ 36, 23, 72, 12, 83, 54

6406531286162. ✖ 36, 23, 72, 12, 54, 83

Question Number : 90 Question Id : 640653386744 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Select the most appropriate data structure for the following applications.

Application	Data Structure
1. To implement ticket reservation waiting list	a. Array
2. Matrix operations	b. Graph
3. Undo/Redo operation for editor	c. Stack
4. Friend suggestion algorithm for social networking site	d. Queue

Options :

6406531286163. ✔ 1-d, 2-a, 3-c, 4-b

6406531286164. ✖ 1-d, 2-b, 3-c, 4-a

6406531286165. ✖ 1-d, 2-a, 3-b, 4-c

6406531286166. ✖ 1-c, 2-a, 3-d, 4-b

Question Number : 91 Question Id : 640653386745 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the following implementation for queue.

```
class Queue:
    def __init__(self):
        self.L = []
    def enqueue(self,v):
        self.L.append(v)
    def isempty(self):
        return(self.L == [])
    def dequeue(self):
        v = None
        if not self.isempty():
            v = self.L.pop(0)
        return(v)
```

```
def fun(Q):
    if (not Q.isempty()):
        i = Q.dequeue()
        fun(Q)
        Q.enqueue(i)
```

Let Q be a queue `[5, 3, 7, 2, 8, 1, 4]` created using the given class `Queue`. What will be the state of the queue after the execution of `fun(Q)`?

Options :

6406531286167. ✖ `[5, 3, 7, 2, 8, 1, 4]`

6406531286168. ✖ `[4, 3, 7, 2, 8, 1, 5]`

6406531286169. ✔ `[4, 1, 8, 2, 7, 3, 5]`

6406531286170. ✖ `[3, 4, 2, 7, 1, 8, 5]`

Question Number : 92 Question Id : 640653386746 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider an undirected connected graph `G` with `7` vertices. Which of the following is a possible listing of the degrees of vertices in graph `G`?

Options :

6406531286171. ✖ 6, 6, 6, 6, 6, 6, 1

6406531286172. ✖ 4, 4, 4, 3, 3, 3, 2

6406531286173. ✔ 5, 4, 3, 3, 2, 2, 1

6406531286174. ✖ 7, 7, 6, 2, 1, 1, 2

Question Number : 93 Question Id : 640653386747 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Let *G* be an undirected connected graph and *T* be a breadth-first search tree for G, let *x* and *y* be nodes in *T* belonging to the levels *i* and *j* respectively, and let (*x*,*y*) be an edge of *G*. Then *i* and *j* differ by at most___.

Options :

6406531286175. ✖ 0

6406531286176. ✔ 1

6406531286177. ✖ 2

6406531286178. ✖ 3

Question Number : 94 Question Id : 640653386748 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Consider a connected, directed graph G on which **DFS** is executed. `pre` and `post` numbering is used in the DFS algorithm on the graph. In which of the following situations can we conclude that edge `(u,v)` is a **Back edge**?

Options :

6406531286179. ✔ `pre[u] = 3, post[u] = 6, pre[v] = 1, post[v] = 10`

6406531286180. ✖ `pre[u] = 7, post[u] = 8, pre[v] = 4, post[v] = 5`

6406531286181. ✖ `pre[u] = 2, post[u] = 9, pre[v] = 7, post[v] = 8`

6406531286182. ✖ `pre[u] = 2, post[u] = 9, pre[v] = 4, post[v] = 5`

Sub-Section Number : 3

Sub-Section Id : 64065355350

Question Shuffling Allowed : Yes

Question Number : 95 Question Id : 640653386751 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Select Question

Which of the following statement(s) is/are **true** about Breadth First Search (BFS) on an undirected graph?

Options :

6406531286185. ✔ BFS systematically computes reachability in graphs.

6406531286186. ✖ The Time complexity of BFS is $O(mn)$ when Adjacency List is used and $O(m^2)$ when Adjacency Matrix is used, where m represents the number of vertices and n represents the number of edges.

6406531286187. ✖ BFS cannot be used to check for cycles in the graph.

6406531286188. ✔ Paths discovered by BFS are the shortest paths in terms of the number of edges from source to destination.

Sub-Section Number : 4

Sub-Section Id : 64065355351

Question Shuffling Allowed : Yes

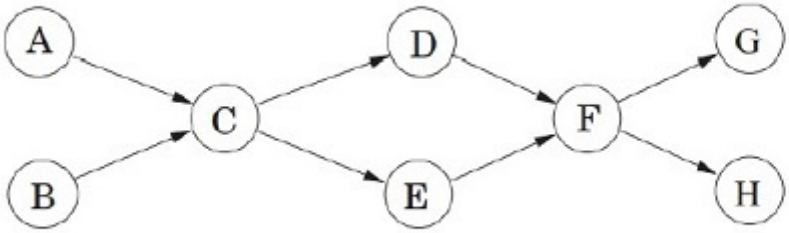
Question Number : 96 Question Id : 640653386749 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Consider the following DAG



The number of different topological orderings of the vertices of the graph is ___.

NOTE: Enter your answer to the nearest integer.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

8

Question Number : 97 Question Id : 640653386750 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

A university offers an online learning program in which there are 12 courses in total. The program is divided into **semesters** of 6 months. Students can take any number of courses in one semester, but they can take a course only if they have finished taking its prerequisites.

Course	Prerequisite
Course 1	None
Course 2	None
Course 3	Course 1
Course 4	Course 2
Course 5	None
Course 6	Course 1, Course 3
Course 7	Course 2, Course 4
Course 8	Course 3
Course 9	Course 5, Course 7
Course 10	Course 6, Course 8
Course 11	Course 7
Course 12	Course 4, Course 8

There is no constraint on how many courses a student can take in a semester. The minimum number of **semesters** required to complete all 12 courses is ___.

NOTE: Enter your answer to the nearest integer.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

4

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