

# IIT M QUIZ EXAM POD21TE3QZ1QPC

## Notations :

- 1.Options shown in green color and with ✓ icon are correct.
- 2.Options shown in red color and with ✗ icon are incorrect.

**Question Paper Name :**

IIT M QUIZ EXAM POD21TE3QZ1QPC 10 Oct  
2021

**Total Marks :**

250

## PDSA

**Number of Questions :**

14

**Section Marks :**

50

**Enable Mark as Answered Mark for Review and**

Yes

## Clear Response :

**Question Number : 1 Question Type : MCQ**

**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 :**

A. ✓ YES

B. ✗ NO

**Question Number : 2 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider a list `L` of points `[(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         mpos = i
7         for j in range(i + 1, n):
8             if L[j][2] < L[mpos][2]:
9                 mpos = j
10        (L[i], L[mpos]) = (L[mpos], L[i])
11    return(L)
```

Which of the following list is returned by the function `sort(L)` ?

**Options :**

A. ✗ `[(9, 9, 0), (7, 8, 1), (7, 6, 1), (6, 9, 5), (3, 7, 5), (7, 9, 5)]`

B. ✓ [(9, 9, 0), (7, 6, 1), (7, 8, 1), (6, 9, 5), (3, 7, 5), (7, 9, 5)]

C. ✗ [(9, 9, 0), (7, 6, 1), (7, 8, 1), (3, 7, 5), (6, 9, 5), (7, 9, 5)]

D. ✗ [(9, 9, 0), (7, 8, 1), (7, 6, 1), (3, 7, 5), (7, 9, 5), (6, 9, 5)]

**Question Number : 3 Question Type : MCQ**

**Correct Marks : 2**

**Question Label : Multiple Choice Question**

Which of the following functions can be used to detect a loop in a linked list, where each node of linked list is an object of class Node? In the below options, `head` is the first node in the linked list. Assume that the `flag` for every node in the linked list is set to `False` before calling `detect_loop(head)`.

```
1 class Node:
2     def __init__(self, value):
3         self.value = value
4         self.next = None
5         self.flag = False
```

**Options :**

```
1 def detect_loop(h):
2     while (h == None):
3         if (h.flag == True):
4             return True
5         h.flag = True
6         h = h.next
7     return False
```

A. ✗

```
1 def detect_loop(h):
2     while (h != None):
3         if (h.flag == True):
4             return False
5         h.flag = True
6         h = h.next
7     return True
```

B. ✗

C. ✓

```
1 def detect_loop(h):
2     while (h != None):
3         if (h.flag == True):
4             return True
5         h.flag = True
6         h = h.next
7     return False
```

D. ✗

```
1 def detect_loop(h):
2     while (h != None):
3         if (h.flag == True):
4             return True
5         h.flag = True
6     return False
```

**Question Number : 4 Question Type : MSQ**

**Correct Marks : 2**

Question Label : Multiple Select Question

Select the correct statement(s).

**Options :**

- A. ✓ The complexity of Selection sort remains the same irrespective of the sequence of elements.
- B. ✗ The complexity of Insertion sort remains the same irrespective of the sequence of elements.
- C. ✓ The complexity of Merge sort remains the same irrespective of the sequence of elements.
- D. ✗ The complexity of Quicksort remains the same irrespective of the choice of pivot.

**Question Number : 5 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Let  $g(n) = 6n^4 + 20n^3$  and  $f(n) = 5762n^3 \log n + 436n^2$ . Which of the following is true?

**Options :**

- A. ✗  $f(n)$  is  $O(g(n))$  and  $g(n)$  is  $O(f(n))$

B. ✓  $f(n)$  is  $O(g(n))$ , but  $g(n)$  is not  $O(f(n))$

C. ✗  $f(n)$  is not  $O(g(n))$  and  $g(n)$  is not  $O(f(n))$

D. ✗  $g(n)$  is  $O(f(n))$ , but  $f(n)$  is not  $O(g(n))$

**Question Number : 6 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

A doctor sees patients in his consulting room every evening. A certain number of appointments are given for each evening. Patients can also take a chance and come without an appointment. Appointments are not for a fixed time. The receptionist allows patients in to see the doctor in the order in which they arrive, with the provision that any patient with an appointment goes in before any patient without an appointment. What would be a good data structure for the receptionist to keep track of the waiting patients?

**Options :**

A. ✗ Single stack

B. ✗ Two stacks

C. ✗ Single array

D. ✗ Single queue

E. ✓ Two queues

**Question Number : 7 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider a set of CPUs that runs jobs, and a stream of incoming jobs that are received one after another. Every CPU has a unique CPU ID. We want to select one CPU among the idle CPUs to run the incoming job based on one of the two scheduling strategies listed below.

I. Next job should be given to a CPU that has been idle for the longest duration.

II. Next job should be given to a CPU that has spent the least time being idle.

Assume that you have a sufficient number of CPUs, so that no job has to wait to be executed after it arrives. Select the appropriate data structure to store the IDs of CPUs that are currently ideal and available, so that the operations below can be computed in time  $O(1)$  for the scheduling strategies I & II described above.

- Get an idle CPU Id to run the next incoming job .
- Add the CPU Id to the data structure when it becomes idle.

**Options :**

- A. ✓ I. Queue, II. Stack
- B. ✗ I. Stack, II. Queue
- C. ✗ I. Queue, II. Queue
- D. ✗ I. Stack, II. Stack

**Question Number : 8 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Select the most appropriate data structure for the following applications.

Application	Data Structure
1. A sequence of food orders in a restaurant	a. Array
2. Matrix operations	b. Graph
3. Math expression evaluation with parentheses	c. Stack
4. Social media network	d. Queue

**Options :**

- A. ✓ 1-d, 2-a, 3-c, 4-b
- B. ✗ 1-d, 2-b, 3-c, 4-a



C. ✖ 1-d, 2-a, 3-b, 4-c

D. ✖ 1-a, 2-d, 3-c, 4-b

**Question Type : COMPREHENSION**

**Question Numbers : (9 to 10)**

Question Label : Comprehension

A company makes an automobile engine assembly, the production of which involves multiple processes, named from A to I. A new operations head appointed by the company got the following instructions:

- A should be completed before B
- B, E, C should be completed before D
- C should be completed before E
- E should be completed before F
- F should be completed before H
- D and F should be completed before G
- G and H should be completed before I

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 9 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

Every operation takes one day. How many days are required to complete the engine assembly?

**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 :**

**Question Number : 10 Question Type : MCQ****Correct Marks : 3**

Question Label : Multiple Choice Question

One employee computed a sequence based on topological sort. Considering the fact that there are many solutions, he followed the lexicographic (dictionary) ordering to get the unique sequence. Select the unique sequence that he computed.

**Options :**

A. ✖ A, B, C, D, E, F, G, H, I

B. ✔ A, B, C, E, D, F, G, H, I

C. ✖ A, B, C, E, F, D, G, H, I

D. ✖ E, A, B, C, D, F, G, H, I

**Question Number : 11 Question Type : MSQ****Correct Marks : 4**

Question Label : Multiple Select Question

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

**Options :**

A. ✔ BFS systematically computes reachability in graphs.

B. ✔ Complexity of BFS is  $O(n^2)$  using adjacency matrix and  $O(m + n)$  using adjacency list.

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



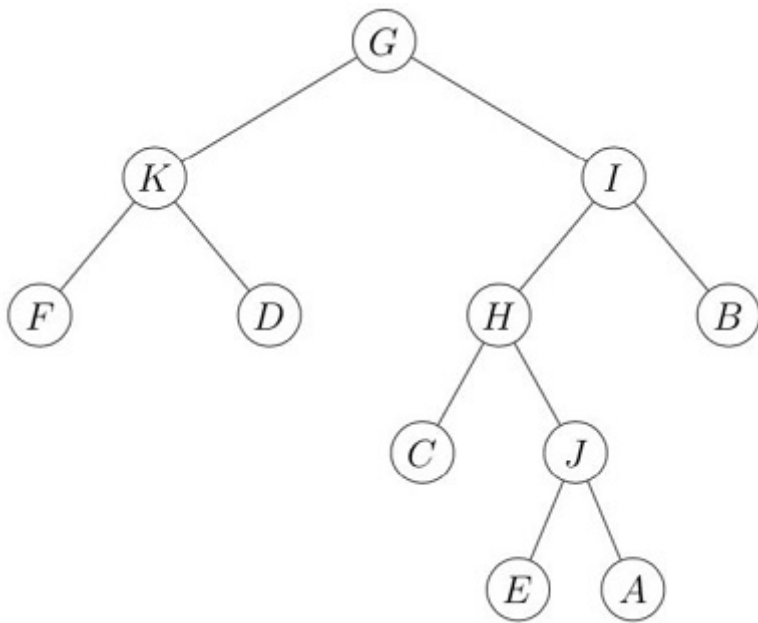
D. ✓ BFS is a systematic strategy to traverse a graph, level by level.

**Question Number : 12 Question Type : MSQ**

**Correct Marks : 4**

Question Label : Multiple Select Question

Suppose we obtain the following DFS tree rooted at node G for an undirected graph with vertices {A, B, C, D, E, F, G, H, I, J, K}



Which of the following cannot be an edge/edges in the original graph?

**Options :**

A. ✗ (D, G)

B. ✓ (F, D)

C. ✗ (A, I)

D. ✓ (C, B)

E. ✗ (E, H)

## Question Type : COMPREHENSION

### Question Numbers : (13 to 14)

Question Label : Comprehension

Consider the following function that takes a list `L` of integers as input and returns a list. In the code given below `rev(L, i, j)` takes a list `L`, indices `i` and `j` and reverses the segment `L[i], L[i+1], . . . , L[j]`. For instance if `L = [0, 1, 2, 3, 4, 5, 6, 7]` then, after we apply `rev(L, 3, 6)`, the contents of the list will be `L = [0, 1, 2, 6, 5, 4, 3, 7]`.

```
1 def mystery(L):
2     m = 0
3     n = len(L)
4     for i in range(0, n):
5         m = i
6         for j in range(i, n):
7             if (L[j] > L[m]):
8                 m = j
9         L = rev(L, i, m)
10    return L
```

Based on the above data, answer the given subquestions.

### Sub questions

#### Question Number : 13 Question Type : MCQ

Correct Marks : 4

Question Label : Multiple Choice Question

What will `mystery(L)` return?

Options :

A. ✖ Reversed list `L`

B. ✖ List `L`

C. ✓ List  $L$  sorted in descending order

D. ✗ List  $L$  sorted in ascending order

**Question Number : 14 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

If we generalize this to inputs of size  $n$ ,  
then the best upper bound for the running  
time of the procedure is:

**Options :**

A. ✗  $O(n)$

B. ✗  $O(n \log n)$

C. ✓  $O(n^2)$

D. ✗  $O(n^3)$

**Question Number : 15 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

We have an undirected graph  $G$  with 7 vertices. We write down the degrees of all vertices in  $G$  in  
descending order. Which of the following is a possible listing of the degrees?

**Options :**

A. ✗ 7, 6, 6, 5, 4, 1, 1

B. ✗ 6, 6, 6, 3, 2, 2, 1

C. ✗ 5, 3, 3, 2, 2, 1, 1

D. ✓ 5, 3, 3, 3, 3, 2, 1

**Question Number : 16 Question Type : MCQ**

**Correct Marks : 4**

**Question Label : Multiple Choice Question**

Consider a list  $L$  of  $n$  sorted numbers that are circularly shifted  $s$  positions to the right. For example,  $[46, 54, 82, 7, 13, 15, 27]$  is a sorted list that has been circularly shifted  $s = 3$  positions, while  $[27, 46, 54, 82, 7, 13, 15]$  has been shifted  $s = 4$  positions. 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  $s$  is known.

II. Value of  $s$  is not known.

**Options :**

A. ✖ I.  $O(1)$ , II.  $O(1)$

B. ✔ I.  $O(1)$ , II.  $O(\log n)$

C. ✖ I.  $O(\log n)$ , II.  $O(n)$

D. ✖ I.  $O(\log n)$ , II.  $O(n^2)$

## MLF

**Number of Questions :** 16

**Section Marks :** 50

**Enable Mark as Answered Mark for Review and Clear Response :** Yes

**Question Number : 17 Question Type : MCQ**

**Correct Marks : 0**


Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: MACHINE LEARNING FOUNDATIONS"

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 :
- A.  YES
- B.  NO

Question Number : 18 Question Type : SA

Correct Marks : 5

Question Label : Short Answer Question

A sugar patient records his daily Blood Glucose levels in the morning before taking a breakfast. He continues to do this for an year. The table below shows a few samples of the data set with food items that he had on the previous nights. Being a data scientist, he developed and trained a simple linear model. Eventually, he settled with the following model  $f(x) = 5.8x_1 + 3.4x_2 + 20.9x_3 + 1.2x_4 + 79.8$  to predict the glucose level.

Idli ( $x_1$ )	Dosa ( $x_2$ )	Ice Cream ( $x_3$ )	Slept by 11 p.m ( $x_4$ )	Level (mg/dL)
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
1	1	1	1 (Yes)	113.4
0	4	0.5	1 (Yes)	106.1
1	2	0	-1 (No)	92.2
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$

One fine day, he had three idli, two dosa, one ice cream and continued working beyond 11 p.m. to submit the MLF assignment. On the next day, he found the actual glucose level was at 118.2 mg/dL. Then he used the trained model to predict the glucose level. How much would be the squared error between the model's prediction and the actual glucose level?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

**Possible Answers :**

30 to 31

**Question Number : 19 Question Type : SA**

**Correct Marks : 5**

**Question Label : Short Answer Question**

The ML team in a movie production company wanted to predict whether a movie will be successful or not by using some classification models. Therefore, the team collected presence/absence of various factors  $\mathbf{x} = [x_1, x_2, x_3]$  from both successful and unsuccessful movies in the past. The data and the corresponding labels are shown in the Table below.

$\mathbf{x}$	$y$
$[0,1,1]$	0
$[1,0,1]$	1
$[1,0,0]$	1
$[1,1,1]$	1
$[1,1,0]$	1

Compute the loss of the model if they use

$$u(z) = \begin{cases} 1, & \text{if } z \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

and  $z = 0.5x_1 - 0.8x_2 + 0.4x_3$

**NOTE:** Enter your answer in two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.19 to 0.21

**Question Number : 20 Question Type : SA**

**Correct Marks : 5**

**Question Label : Short Answer Question**



The dimensionality of the data points shown in the below Table is to be reduced from  $\mathbb{R}^3$  to  $\mathbb{R}$ . To achieve it, the encoder function  $f(x_1, x_2, x_3) = \frac{2x_1 - x_2}{2}$  and the corresponding decoder function  $g(u) = [u, 2u, 3u]$  is proposed. Compute the loss (or reconstruction error) of the proposed model.

x
[1,2,3]
[2,3,4]
[-1,0,1]
[0,1,1]

**NOTE:** Enter your answer in two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

14.00 to 14.50

**Question Number :** 21 **Question Type :** SA

**Correct Marks :** 5

**Question Label :** Short Answer Question

Consider the following Table that shows the data points ( $x$ ) and two possible distributions ( $P_1(x), P_2(x)$ ) which might have generated those data points.

$x$	$P_1(x)$	$P_2(x)$
0.2	$\frac{1}{6}$	0.5
0.4	$\frac{1}{6}$	0.2
0	$\frac{1}{6}$	0.1
-0.2	$\frac{1}{6}$	0.1
-0.4	$\frac{1}{6}$	0.05
0.1	$\frac{1}{6}$	0.05

Rohan argues that the data points are most likely generated by  $P_1(x)$ . Let  $L_1$  be the loss for  $P_1(x)$  and  $L_2$  be the loss for  $P_2(x)$ . Verify his claim by computing the average loss for both distributions and enter the difference  $L_1 - L_2$ .

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

-0.4 to -0.3

**Question Number : 22 Question Type : SA**

**Correct Marks : 5**

**Question Label :** Short Answer Question

The two eigenvalues of the matrix  $\begin{bmatrix} 2 & 1 \\ 1 & p \end{bmatrix}$  have a ratio 3:1 for  $p = 2$ . What is another value of  $p$  for which eigenvalues have the same ratio 3:1?

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

4.5 to 4.8

**Question Number : 23 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

The first order derivative of  $f(x) = \frac{e^x}{\sqrt{2+x}}$  at  $x = 0$  is

**NOTE:** Enter your answer in two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.45 to 0.60

**Question Number : 24 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Let  $f(x, y, z) = -3x + 4ye^{6z}$ . Find the directional derivative of  $f$  at  $(1, -1, 0)$  in the direction of unit vector along  $[1, 0, -1]^T$ .

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

14.0 to 15.5

**Question Number :** 25 **Question Type :** SA

**Correct Marks :** 2

**Question Label :** Short Answer Question

Find the element  $P_{2,2}$  of the projection matrix  $P$  of vector  $v = \begin{bmatrix} -1 \\ 7 \\ 2 \end{bmatrix}$ . (Assume matrix index starts from 1).

**NOTE:** Enter your answer in two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.88 to 0.94

**Question Type :** COMPREHENSION

**Question Numbers :** (26 to 27)

**Question Label :** Comprehension

The linear approximation of  $f(x) = 5x^2 + 3x - 9$  around  $x = 0.1$  is

**NOTE :** If your answer is  $ax + b$  then enter your answer for a,b  
in the given subquestions.

### Sub questions

**Question Number : 26 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **a**: \_\_\_\_\_

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

3.5 to 4.5

**Question Number : 27 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **b**: \_\_\_\_\_

**NOTE:** Enter your answer in two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

-9.10 to -8.95

**Question Type : COMPREHENSION**

**Question Numbers : (28 to 30)**

Question Label : Comprehension

The linear approximation of  $f(x_1, x_2) = 2x_1^2 + 2x_2^2$  around  $(1, 1)$  is

**NOTE :** If your answer is  $ax_1 + bx_2 + c$  then enter your answer for a,b,c in the given subquestions.

**Sub questions**

**Question Number : 28 Question Type : SA**

**Correct Marks : 0.5**

Question Label : Short Answer Question

Enter the correct answer for **a**: \_\_\_\_\_

**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

**Question Number : 29 Question Type : SA**

**Correct Marks : 0.5**

Question Label : Short Answer Question

Enter the correct answer for **b**: \_\_\_\_\_



**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

**Question Number : 30 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **c:** \_\_\_\_\_

**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

**Question Type : COMPREHENSION**

**Question Numbers : (31 to 33)**

Question Label : Comprehension

The second degree polynomial that best-fits in the following data under the 'sum of squares' error is:

x	y
1	2
2	3
3	7

**NOTE :** If your answer is  $y=ax^2+bx+c$  then enter your answer for a,b,c in the given subquestions.

### Sub questions

**Question Number : 31 Question Type : SA**

**Correct Marks : 0.5**

Question Label : Short Answer Question

Enter the correct answer for **a**: \_\_\_\_\_

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

1.4 to 1.6

**Question Number : 32 Question Type : SA**

**Correct Marks : 0.5**

Question Label : Short Answer Question

Enter the correct answer for **b**: \_\_\_\_\_

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

-3.6 to -3.4

**Question Number : 33 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **c:** \_\_\_\_\_

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

3.5 to 4.5

**Question Type : COMPREHENSION**

**Question Numbers : (34 to 37)**

Question Label : Comprehension

Find the projection of vector  $b = \begin{bmatrix} 2 \\ 3 \\ -1 \\ 2 \end{bmatrix}$  onto vector  $a = \begin{bmatrix} 1 \\ 2 \\ -1 \\ 3 \end{bmatrix}$

**NOTE :** If your answer is  $\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix}$  then enter your answer for a,b,c,d

in the given subquestions.

### Sub questions

**Question Number : 34 Question Type : SA**

**Correct Marks : 0.5**

Question Label : Short Answer Question

Enter the correct answer for **a**: \_\_\_\_\_

**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 :**

1

**Question Number : 35 Question Type : SA**

**Correct Marks : 0.5**

Question Label : Short Answer Question

Enter the correct answer for **b**: \_\_\_\_\_

**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 :**

2

**Question Number : 36 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **c**: \_\_\_\_\_

**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 :**

-1

**Question Number : 37 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **d**: \_\_\_\_\_

**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 :**

3

**Question Type :** COMPREHENSION

**Question Numbers :** (38 to 39)

Question Label : Comprehension

The best-fit line using least squares method for the data set given below is

x	y
1	2
2	3
3	7
4	10
5	13

**NOTE :** If your answer is  $y = mx + c$  then enter your answer for  $m, c$  in the given subquestions.

**Sub questions**

**Question Number :** 38 **Question Type :** SA

**Correct Marks :** 2

Question Label : Short Answer Question

Enter the correct answer for **m**: \_\_\_\_\_

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**



2.8 to 3.0

Question Number : 39 Question Type : SA

Correct Marks : 1

Question Label : Short Answer Question

Enter the correct answer for **c**: \_\_\_\_\_

**NOTE:** Enter your answer in one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

-1.8 to -1.6

Question Type : COMPREHENSION

Question Numbers : (40 to 43)

Question Label : Comprehension

The eigenvalues and the corresponding eigenvectors of a  $2 \times 2$  matrix  $A$  are given by

Eigenvalue	Eigenvector
8	$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$
4	$\begin{bmatrix} 1 \\ -1 \end{bmatrix}$

What will be the matrix  $A$ ?

**NOTE :** If your answer is  $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$  then enter your answer for a,b,c,d in the given subquestions.

Sub questions

**Question Number : 40 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **a**: \_\_\_\_\_

**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 :**

6

**Question Number : 41 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **b**: \_\_\_\_\_

**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 :**

2

**Question Number : 42 Question Type : SA**

**Correct Marks : 1**

Question Label : Short Answer Question

Enter the correct answer for **c**: \_\_\_\_\_

**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 :**

2

**Question Number : 43 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Enter the correct answer for **d**: \_\_\_\_\_

**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 :**

6

**Question Number : 44 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

The function  $f(x) = c \cos |x| + de^{|x|}$  is differentiable at  $x = 0$ . Which of the following options are correct?

**Options :**

A. ✖  $c - d = 0$

B. ✖  $c = 0$

C. ✖  $d = 0$

D. ✔ Any values of  $c$  and  $d$

## BDM

Number of Questions :	15
Section Marks :	50
Enable Mark as Answered Mark for Review and Clear Response :	Yes

**Question Number : 45 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: BUSINESS DATA MANAGEMENT"

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 :**

A. ✔ YES

B. ✖ NO

**Question Number : 46 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Kumbak is hungry and has decided to eat roti at his mess. His total joy after eating the first roti is 10 utils. He is still hungry and so he eats another roti, and the total utils increases to 20. Kumbak is still hungry and eats one more roti which takes his total utils to 27. Then, suddenly his friend Lakshman enters the mess and decides to join him. So Kumbak decides to eat three more roties making his total utils become 29, 28 and 23 respectively. Then what is the number of roties when Kumbak should have stopped eating?

**Options :**

A. ✖ 2

B. ✖ 3

C. ✔ 4

D. ✖ 5

**Question Number : 47 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

IITM-BDM's price elasticity for number of student registrations is expected to be constant at -0.9 for the next couple of years. Currently the course fee is Rs.10,000 and 1500 students have registered. If the course fee is increased to Rs. 12,000 (everything else remaining the same), how many students will register?

**Options :**

A. ✖ 270

B. ✖ 1770

C. ✔ 1230

D. ✖ Cannot say, insufficient data

**Question Number : 48 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Which of the following statement is true?

**Options :**

A. ✔ Cross Price Elasticity and Income Elasticity both measure shift in demand curve

- B. ✖ Cross Price Elasticity and Income Elasticity both measure movement along demand curve
- C. ✖ Cross Price Elasticity measures shift in demand curve and Income Elasticity measure movement along demand curve
- D. ✖ Cross Price Elasticity measure movement along demand curve and Income Elasticity measure shift in demand curve

**Question Number : 49 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Which of the following is not an objective of pricing strategies?

**Options :**

- A. ✖ To maximize profits for the next ten years
- B. ✖ To create an entry barrier to a competitor
- C. ✖ To drive out the competitors from the market
- D. ✖ To make a product affordable to a large mass of people
- E. ✔ None of these

**Question Number : 50 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Which of the following is not an example of price discrimination?

**Options :**

- A. ✔ An airline charging Rs 350 for an aisle seat but charging Rs. 700 for a seat with extra leg space.
- B. ✖ Swami could book an economy seat for Rs 7,000 while Mahesh had to pay Rs 9,000 for a similar seat on the same aircraft.
- C. ✖ Srivatsa went to a cinema. At the ticket booking he could see on the price list that there are discounts for children as well as senior citizens.
- D. ✖ All of these



**Question Number : 51 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Match the following

A. Product A was launched in the market at a very high price. However, it was gradually reduced in a year	i) Price discrimination
B. There are two painters A and B; B is famous among the people while A is a wannabe painter. Both the painters are of equivalent quality in their paintings and are of the same painting genre. However, A's works are priced at an average of 1 lakh rupees, while B's works go for about 10 lakh rupees	ii) Value pricing
C. Mike booked his flight ticket for Aug 2021 in May for Rs. 15,000. Lin got a seat on the same flight during July for Rs 20,000.	iii) Penetration Pricing
D. XYZ company has a good customer base for its Product A in market M1. Now, XYZ wants to launch A in market M2. They set A's price to be just Rs. 100, which is the lowest in M2.	iv) Market skimming

**Options :**

A. ✓ A-(iv), B-(ii), C-(i) and D-(iii)

B. ✗ A-(ii), B-(iii), C-(i) and D-(iv)

C. ✗ A-(iii), B-(ii), C-(iv) and D-(i)

D. ✗ A-(i), B-(iv), C-(iii) and D-(ii)

**Question Number : 52 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Which of the following is not a profitability ratio?

**Options :**

A. ✗ Gross profit margin

- B. ✖ Net profit margin
- C. ✖ Return on Capital Employed (ROCE)
- D. ✔ Asset turnover

**Question Number : 53 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Which of the following statements are correct (choose all that are applicable)

**Options :**

- A. ✖ In the long run, all costs are fixed
- B. ✔ In the long run, all costs are variable
- C. ✖ In the short run, all costs are fixed
- D. ✖ In the short run, all costs are variable
- E. ✖ None of these

**Question Number : 54 Question Type : MCQ**

**Correct Marks : 5**

Question Label : Multiple Choice Question

Given the supply and demand data, which of the following options correctly denotes equilibrium price, price that creates surplus and price that creates shortage

Price	Supply Quantity	Demand Quantity
10	100	600
20	200	500
30	300	400
40	400	300
50	500	200
60	600	100

**Options :**

- A. ✔ Rs. 35, Rs. 50 and Rs.20
- B. ✖ Rs. 35, Rs. 20 and Rs. 50
- C. ✖ Rs. 70, Rs. 35 and Rs. 20

D. ✖ Rs. 20, Rs. 50 and Rs. 35

### Question Type : COMPREHENSION

#### Question Numbers : (55 to 56)

Question Label : Comprehension

Table below provides the average household income and monthly expenditure for upper middle-class families living in two different Indian States. Answer the subquestions, given the scenario in which an average family working in Jharkhand moves to TN. (Answer the subquestions after rounding the final calculations to two decimal places)

States	TN	Jharkhand
Average Income (Rs./ Family)	46,692	20,646
Expenditures	Average Amount Spent for Different Items (Rs./ Family)	
1. Rice, Vegetables and Fruits	5603.04	1238.76
2. Meat & Spices	5102.5	6871.32
3. Milk	1300.24	4002.12
4. Education, Clothing & Footwear	567.44	206.46
5. House Rent & EB Bills	11706.62	2064.6
6. House EMI	0	0
7. Vehicle EMI & Fuel	3193.7328	1032.3
8. Transportation	0	419.89
9. Investments & Personal Care	6592.9104	3166.4
10. Entertainment	5536.12	644.15
11. Tobacco & Alcohol	7089.40	1000

#### Sub questions

Question Number : 55 Question Type : MCQ

Correct Marks : 2.5

Question Label : Multiple Choice Question

For which item, did the spending relative to the income **increase** the most?

Options :

A. ✖ Rice, Vegetables and Fruits

B. ✖ Meat & Spices

- C. ✖ Milk
- D. ✖ Education, Clothing & Footwear
- E. ✖ House rent & EB Bills
- F. ✖ Home EMI
- G. ✖ Vehicle EMI & fuel
- H. ✖ Transportation
- I. ✖ Investments & Personal Care
- J. ✔ Entertainment
- K. ✖ Tobacco & Alcohol
- L. ✖ None of these

**Question Number : 56 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

For which item, did the spending relative to the income **decrease** the most?

**Options :**

- A. ✖ Rice, Vegetables and Fruits
- B. ✖ Meat & Spices
- C. ✖ Milk
- D. ✖ Education, Clothing & Footwear
- E. ✖ House rent & EB Bills
- F. ✖ Home EMI
- G. ✖ Vehicle EMI & fuel
- H. ✔ Transportation
- I. ✖ Investments & Personal Care
- J. ✖ Entertainment
- K. ✖ Tobacco & Alcohol
- L. ✖ None of these

**Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group**

## Comprehension Questions : No

### Question Numbers : (57 to 58)

Question Label : Comprehension

The consumption basket of a person for Month-1 and Month-2 is provided in table below. Given this information, if the income for the person has changed from Rs. 10000 in Month-1 to Rs. 8000 in Month-2, then answer the given subquestions.

Item	% Of Income Spent for Item in Month-1	% Of Income Spent for Item in Month-2
A	12	10
B	8	20
C	10	8
D	32	23
E	5	2
F	13	10
G	9	13
H	11	14

### Sub questions

Question Number : 57 Question Type : MSQ

Correct Marks : 2.5

Question Label : Multiple Select Question

Which of the following items are **normal** items?

Options :

A. ✓ A

B. ✗ B

C. ✓ C

D. ✓ D

E. ✓ E

F. ✗ H

Question Number : 58 Question Type : MSQ

Correct Marks : 2.5

Question Label : Multiple Select Question

Which of the following items are **inferior** items?

**Options :**

A. ✓ B

B. ✗ C

C. ✗ D

D. ✗ F

E. ✓ G

F. ✓ H

**Question Type : COMPREHENSION**

**Question Numbers : (59 to 60)**

Question Label : Comprehension

Given the following income statement of XYZ company, answer the given subquestions.

Revenue	100
Cost of goods sold	25
Operating expenses	20
Interest expense	10
Tax expense	30

**Sub questions**

**Question Number : 59 Question Type : SA**

**Correct Marks : 2.5**

Question Label : Short Answer Question

The Gross Profit Margin for XYZ is \_\_\_\_\_ (in %)

**NOTE:** Enter your answer to the nearest integer.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

75

75%

**Question Number :** 60 **Question Type :** SA

**Correct Marks :** 2.5

Question Label : Short Answer Question

The Net Profit Margin for XYZ is \_\_\_\_\_ (in %)

**NOTE:** Enter your answer to the nearest integer.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

15

15%

**Question Type :** COMPREHENSION

**Question Numbers :** (61 to 62)

Question Label : Comprehension

An entrepreneur is planning to start his business of selling shoes online. The entrepreneur made an investment of Rs. 100 to buy a computer. Next, the entrepreneur needs to create the online platform using external programmers and also needs to invest in a logistics provider for shipping

the shoes. The online platform cost and logistics cost depends on the number of shoes sold online per hour, which is provided in the table below. Given this information, answer the subquestions.

Quantity of shoes to be sold (shoes/ hour)	Platform cost for that quantity (Rs.)	Logistics cost for that quantity (Rs.)
0	0	0
10	20	3
20	35	8
30	50	16
40	70	26
50	85	39
60	100	54
70	120	72
80	135	92
90	150	115
100	195	140

### Sub questions

**Question Number : 61 Question Type : MCQ**

**Correct Marks : 5**

Question Label : Multiple Choice Question

What should be the target sales quantity for the entrepreneur's online platform?

**Options :**

- A. ✓ 90 shoes/ hour
- B. ✗ 40 shoes/ hour
- C. ✗ 50 shoes/ hour
- D. ✗ 100 shoes/ hour
- E. ✗ Cannot say, insufficient information.

**Question Number : 62 Question Type : MCQ**

**Correct Marks : 2.5**

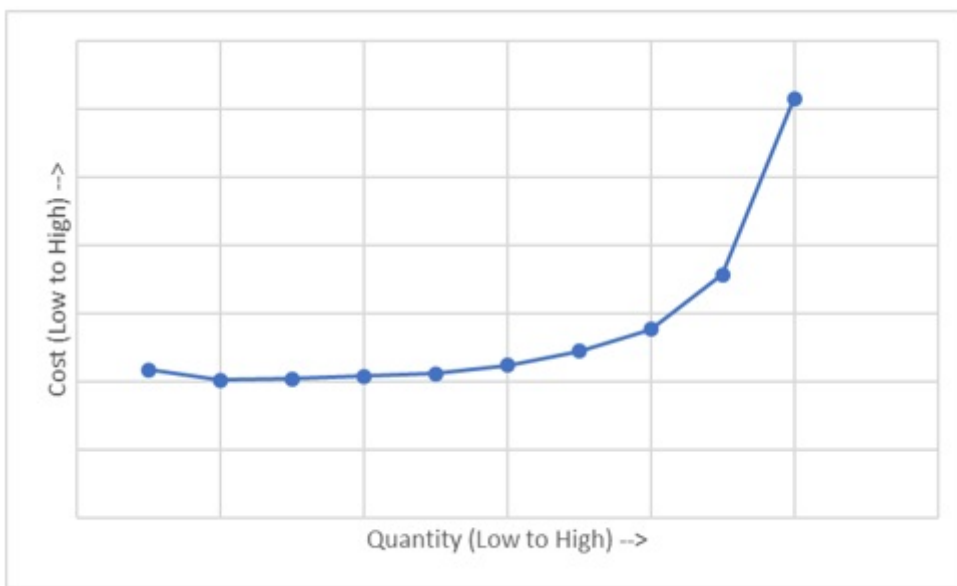
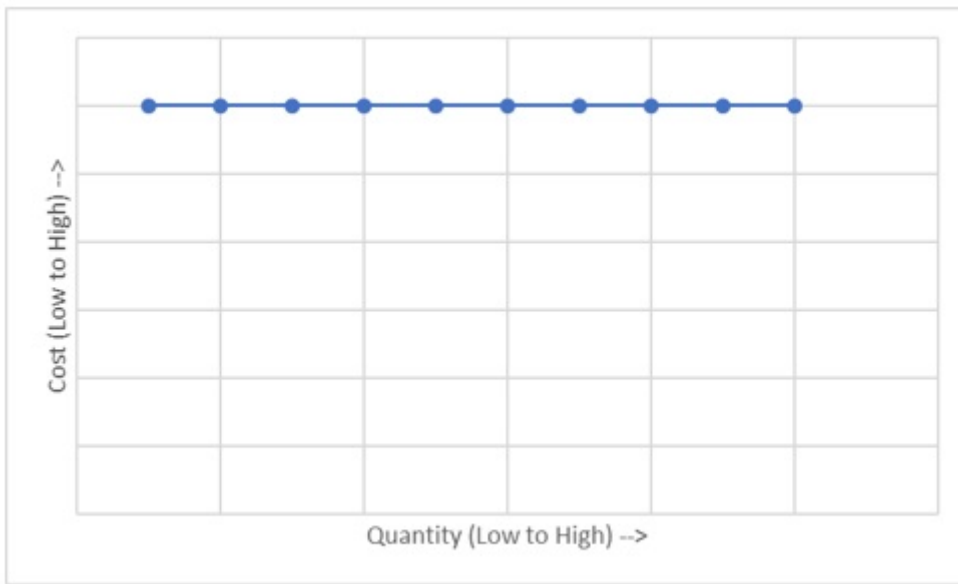
Question Label : Multiple Choice Question

Which of the following depicts the "Average Total Cost" curve most accurately?

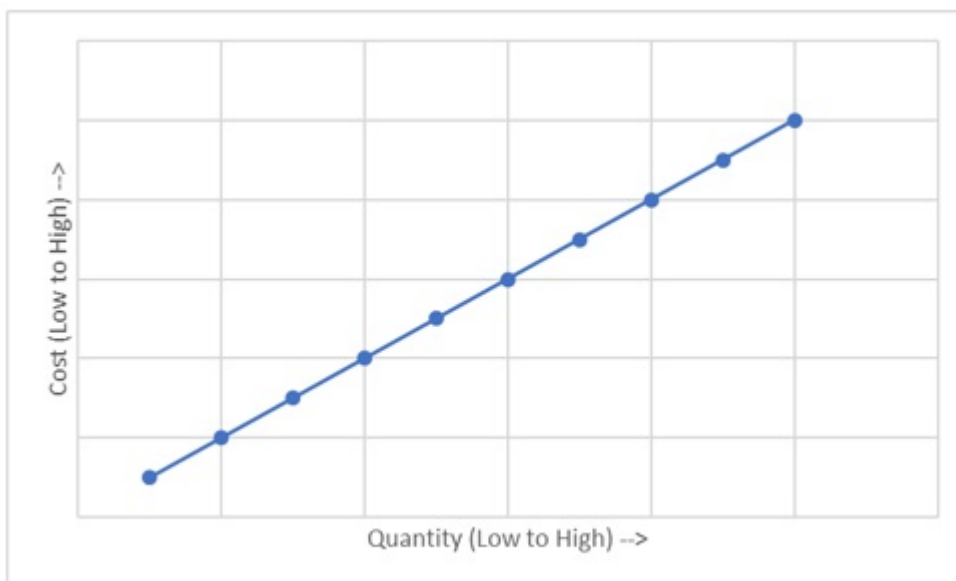
**Options :**

- A. ✗



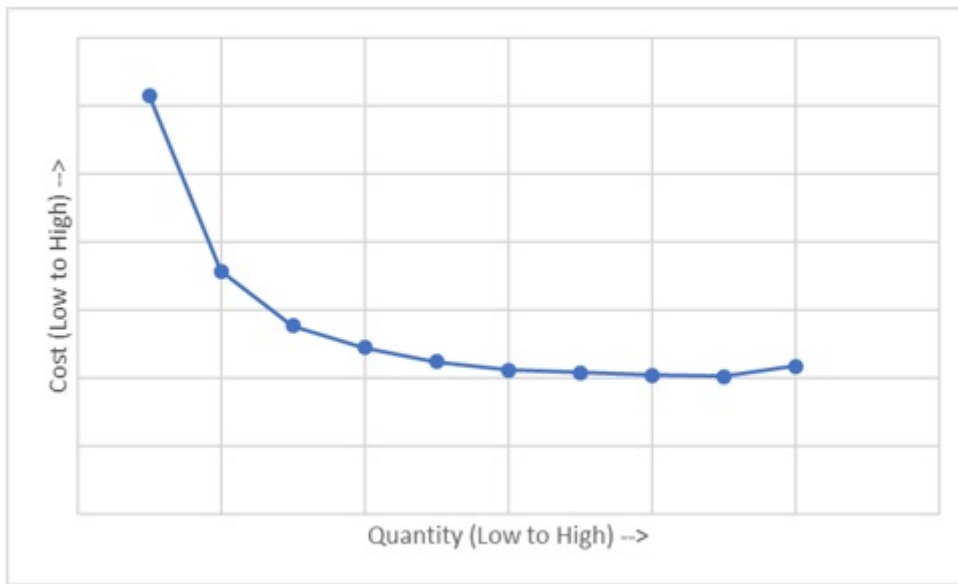


B. ✖



C. ✖

D. ✔



**Question Number : 63 Question Type : SA**

**Correct Marks : 2.5**

Question Label : Short Answer Question

A college wants to provide pens engraved with its logo to all students who are joining in the coming academic term. The college has two options

- (a) Buying pens at Rs.10/piece from a third party or
- (b) Establish a factory at Rs. 7000 to make pens at Rs. 3/piece.

What will be the maximum number of pens up to which the college would prefer to buy from the third party?

**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 :**

1000

## DBMS

Number of Questions :	15
Section Marks :	50
Enable Mark as Answered Mark for Review and Clear Response :	Yes

Question Number : 64 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "**DIPLOMA LEVEL: DATABASE MANAGEMENT SYSTEMS**"

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 :

A. ✓ YES

B. ✗ NO

Question Number : 65 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

What do we mean by an *instance of a database*?

Options :

A. ✓ The content/data of a database at a given moment of time

B. ✗ The attributes of the database tables

C. ✗ The access rights of users in a database

D. ✗ The range of values a single attribute in a table can have.

**Question Number : 66 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

A company *ImaginaryComp* decides to store the CoWIN reference ID of its employees along with the employee details. Consequently, a new field 'CoWINid' is added to Table Employee. Which among the following categories of SQL commands is used for this purpose?

**Options :**

A. ✓ DDL

B. ✗ DML

C. ✗ TCL

D. ✗ DCL

**Question Number : 67 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following stores information regarding how much space is currently used by a table in the database?

**Options :**

A. ✗ Concurrency Control Manager

B. ✗ Transaction Log

C. ✓ Data Dictionary

D. ✗ None of these

**Question Number : 68 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider two relational schemas as follows:

*employees* (*emp\_num*, *emp\_name*, *salary*, *dept\_num*)

*departments* (*dept\_num*, *dept\_name*)

Suppose the instances (tables) for **employees** and **departments** relations have 30 tuples and 50 tuples respectively. What will be the number of tuples and the number of attributes in the table resulting from executing the following SQL statement?

```
SELECT * FROM employees, departments
```

**Options :**

- A. ✗ number of tuples = 50, number of attributes = 4
- B. ✓ number of tuples = 1500, number of attributes = 6
- C. ✗ number of tuples = 1500, number of attributes = 5
- D. ✗ number of tuples = 50, number of attributes = 5

**Question Number : 69 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the relational schema given in Figure 6.

capital	country
countryID(varchar)	countryID(varchar)
capitalID(varchar)	continent(varchar)
capitalName(varchar)	countryName(varchar)

Figure 6: Country Capitals Relational Schema

What does the following query return?

```
SELECT capitalName FROM capital
WHERE countryID NOT IN (SELECT countryID FROM country
                        WHERE continent = 'Asia'
                        UNION
                        SELECT countryID FROM country
                        WHERE continent = 'Europe');
```

**Options :**

- A. ✗ Capitals of all countries that belong to either Asia or Europe.

- B. ✖ Capitals of all countries that belong to both Asia and Europe.
- C. ✖ Capitals of all countries that belong to Asia but not Europe.
- D. ✔ Capitals of all countries that belong to neither Asia nor Europe.

**Question Number : 70 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider table Students given in Figure 7.

Students				
Name	Age	Country	Score	
Tom		13 Australia		70
Lucy		15 Scotland		95
Frank		16 Germany		76
Jane		13 Australia		49
Robert		16 Germany		93
Ryan		18 Ireland		56
Mike		13 Germany		84

Figure 7: Table Students

From the given options, choose the SQL query that returns the names and scores of students from Australia or Germany who scored more than the average of all students.

**Options :**

A. ✖ `SELECT Name, Score  
FROM Students  
WHERE Country = 'Australia' OR 'Germany'  
AND Score > (SELECT AVG(Score) FROM Students);`

B. ✖ `SELECT Name, Score AS S  
FROM Students  
WHERE (Country = 'Australia' OR Country = 'Germany')  
AND S.Score > AVG(Score);`

C. ✖ `SELECT Name, Score  
FROM Students  
WHERE Country = 'Australia' OR 'Germany'  
AND Score > AVG(Score);`

```
SELECT Name, Score
FROM Students
WHERE (Country = 'Australia' OR Country = 'Germany')
AND Score > (SELECT AVG(Score) FROM Students);
```

D. ✓

**Question Number : 71 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Which of the following expressions is/are true?

- a.  $r \cap s = \{t \mid t \in r \text{ or } t \in s\}$
- b.  $r \cup s = \{t \mid t \in r \text{ and } t \in s\}$
- c.  $r - s = \{t \mid t \in r \text{ or } t \notin s\}$
- d.  $r \cap s = r - (r - s)$

**Options :**

A. ✗ c and d

B. ✓ Only d

C. ✗ a, b & d

D. ✗ a and c

**Question Number : 72 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question



Consider two relations as shown in Figure 1:

courses_2019		courses_2020	
Code	Course	Code	Course
101	Data Science	100	Math
102	DBMS	103	JAVA
103	JAVA	104	Data Structure
104	Data Structure	106	Machine Learning
105	Operating System	107	Business Analytics

Figure 1: Relations course\_2019 and course\_2020

Identify the correct operation that results in the output shown in Figure 2.

Output	
Code	Course
100	Math
106	Machine Learning
107	Business Analytics

Figure 2: Output relation

Options :

- A. ✗  $courses_{2019} - courses_{2020}$
- B. ✓  $courses_{2020} - courses_{2019}$
- C. ✗  $courses_{2020} \cap courses_{2019}$
- D. ✗  $courses_{2019} \div courses_{2020}$

Question Number : 73 Question Type : MCQ

Correct Marks : 4

Question Label : Multiple Choice Question



Let  $X(A, B)$  and  $Y(C, D)$  be two relations with instances as shown in Figure 8.

X		Y	
A	B	C	D
4	5	4	5
5	4	6	7
6	6	6	8

Figure 8: Relations X and Y

Find the number of tuples returned by the following query:

$$\Pi_A(\sigma_{A=D}(X \times Y))$$

**Options :**

A. ✖ 5

B. ✖ 2

C. ✖ 3

D. ✔ 1

**Question Number : 74 Question Type : MSQ**

**Correct Marks : 4**

Question Label : Multiple Select Question

Consider the tables shown in Figure 3 and answer the question that follows.

suppliers		parts		
sup_num	sup_name	part_num	sup_num	part_qty
1001	Able	301	1001	32
1002	Peter	301	1004	17
1003	Molina	301	1002	41
1004	Nikki	302	1002	11
		302	1003	36
		302	1001	16
		303	1004	25
		304	1002	35
		304	1003	40

Figure 3: Table suppliers and table parts

Identify the SQL statements that find the names of suppliers who supply parts with *part\_num* 303 or 304 or both.

**Options :**

- A. ✗  
`SELECT sup_name  
FROM suppliers s, parts p  
WHERE s.sup_num = p.sup_num  
AND part_num = 303 OR part_num = 304;`
- B. ✓  
`SELECT sup_name  
FROM suppliers s, parts p  
WHERE s.sup_num = p.sup_num  
AND (part_num = 303 OR part_num = 304);`
- C. ✓  
`SELECT sup_name  
FROM suppliers s, parts p  
WHERE s.sup_num = p.sup_num AND part_num = 303  
UNION  
SELECT sup_name FROM suppliers s, parts p  
WHERE s.sup_num = p.sup_num AND part_num = 304;`
- D. ✗  
`SELECT sup_name  
FROM suppliers s, parts p  
WHERE s.sup_num = p.sup_num  
AND part_num = 303 AND part_num = 304;`

**Question Number : 75 Question Type : MSQ**

**Correct Marks : 4**

Question Label : Multiple Select Question

Consider the relational schema given in Figure 4 and answer the question that follows.

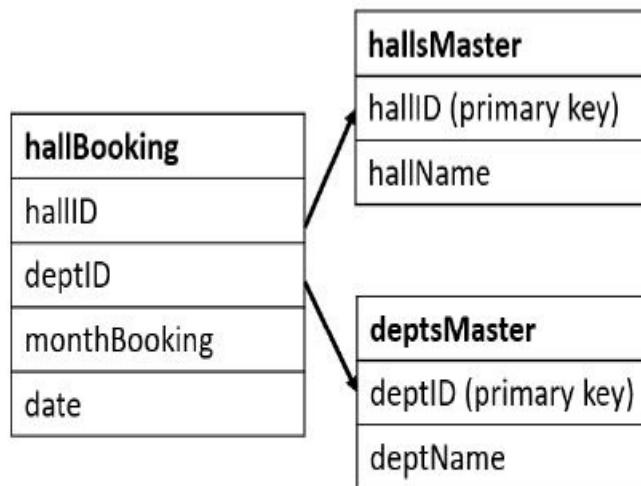


Figure 4: Hall Booking Relational Schema

Find the names of ALL departments that have booked at least one hall in the month of January.

**Options :**

```
SELECT deptName FROM deptsMaster
WHERE deptID NOT IN (SELECT deptID FROM hallBooking
                     WHERE monthBooking = 'Jan');
```

A. ✖

```
SELECT deptName FROM deptsMaster
WHERE deptID = (SELECT deptID FROM hallBooking
                WHERE monthBooking = 'Jan');
```

B. ✖

```
SELECT deptName FROM deptsMaster
WHERE deptID IN (SELECT deptID FROM hallBooking
                 WHERE monthBooking = 'Jan');
```

C. ✔

```
SELECT deptName FROM deptsMaster
WHERE deptID = ANY (SELECT deptID FROM hallBooking
WHERE monthBooking = 'Jan');
```

D. ✓

**Question Number : 76 Question Type : SA**

**Correct Marks : 3**

Question Label : Short Answer Question

Consider the relational schema given in Figure 5.

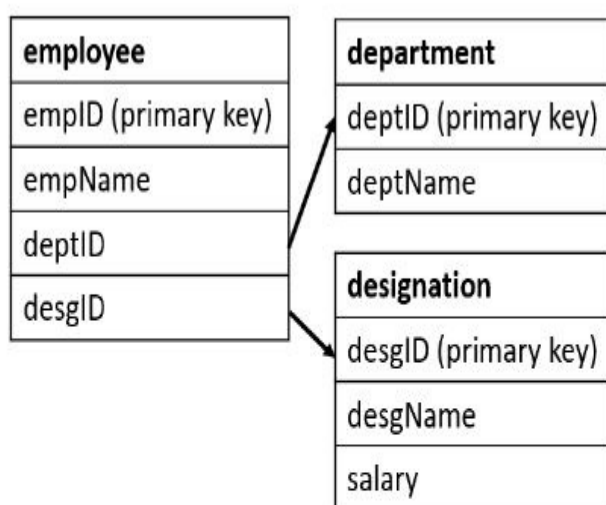


Figure 5: Employee Schema

If the relations **employee**, **designation** and **department** have 100, 6, 5 rows respectively, what is the maximum number of rows returned by the following query?

```
SELECT * FROM employee RIGHT OUTER JOIN department
ON employee.deptID = department.deptID;
```

**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 :

104

Question Number : 77 Question Type : SA

Correct Marks : 3

Question Label : Short Answer Question

Consider the relations given in Figure 9.

Hid	Name	City
H001	Taj	Mumbai
H002	Marriott	Kolkata
H003	Oberoi	Mumbai
H004	Hyatt	Bangalore
H005	Park	Kolkata
H006	Adam Inn	Bangalore

Table Hotel

Hid	Roomid	Bookingfrom	Bookingto
H004	R67	12/07/2020	15/07/2020
H002	R24	23/05/2020	01/06/2020
H002	R24	03/06/2020	08/06/2020
H005	R01	30/09/2020	05/10/2020
H001	R43	29/12/2020	03/01/2021

Table Bookings

Figure 9: Hotels Booking Schema

Let  $x$  be the number of tuples returned by  $Bookings \bowtie Hotel$  and  $y$  be the number of tuples returned by  $\sigma_{Bookings.Hid=Hotel.Hid}(Bookings \times Hotel)$ . Then, what is the value of  $x - y$ ?

**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 :

0

Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group



## Comprehension Questions : No

### Question Numbers : (78 to 79)

Question Label : Comprehension

Use the schema given below to answer the given subquestions that follow.

FLIS Schema

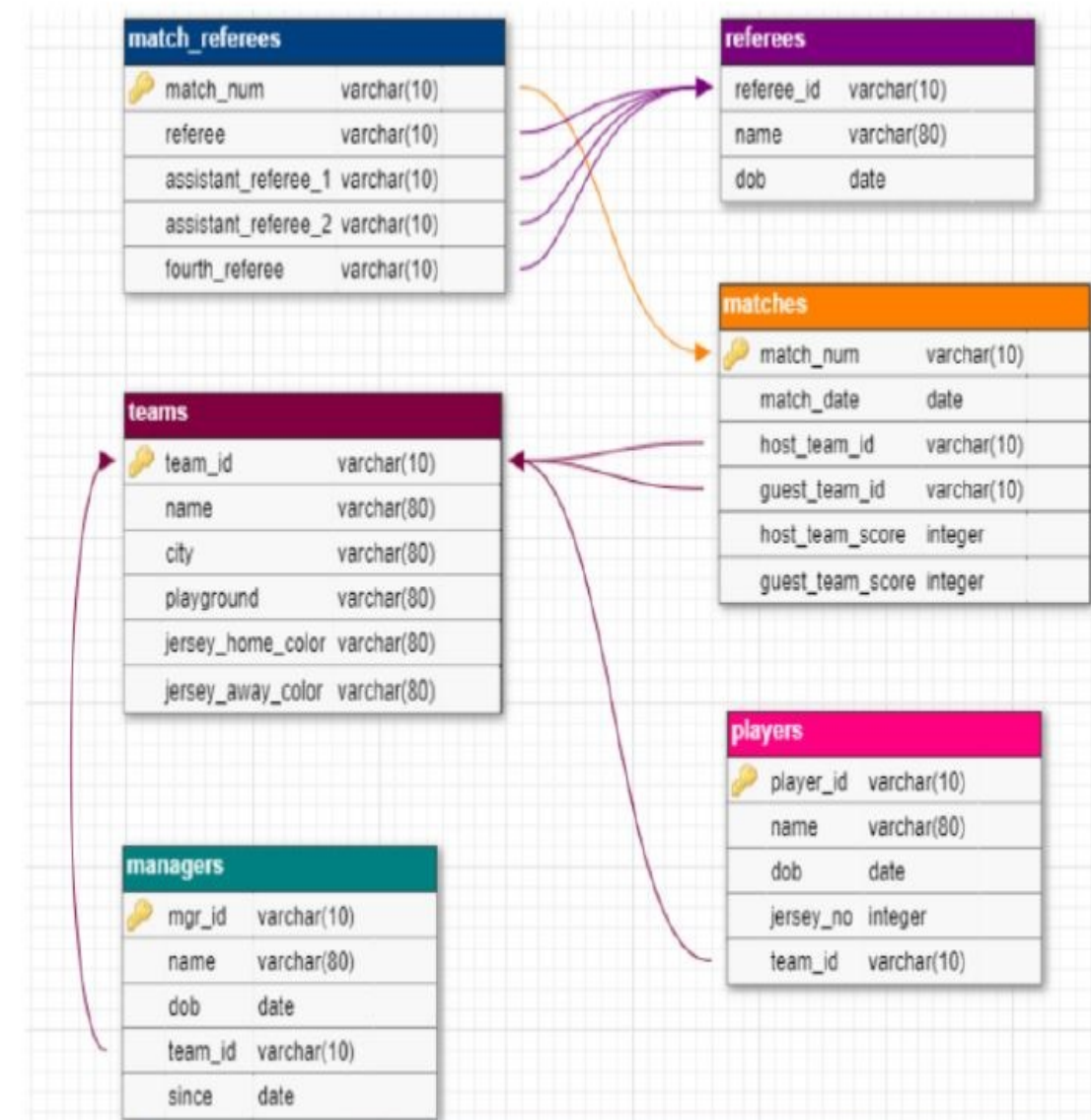


Figure 10: Football League Information System

## Sub questions

Question Number : 78 Question Type : SA

Correct Marks : 5

Question Label : Short Answer Question

Write an SQL statement to find the name of the fourth referee of the match with match number (*match\_num*) "M0003".

**NOTE:** Your answer should not exceed 300 words.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** No

**Max Word Count :** 300

**Show Word Count :** Yes

**Single Line Response :** No

**Number of Rows :** 10

**Number Of Columns :** 70

**Text Areas :** PlainText

**Question Number : 79 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

Write an SQL statement to find the names of referees who have been the main referee for at least one match.

**NOTE:** Your answer should not exceed 300 words.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** No

**Max Word Count :** 300

**Show Word Count :** Yes

**Single Line Response :** No

**Number of Rows :** 10

**Number Of Columns :** 70

**Text Areas :** PlainText

# App Dev 1

Number of Questions : 17  
Section Marks : 50  
Enable Mark as Answered Mark for Review and Clear Response : Yes

Question Number : 80 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: MODERN APPLICATION DEVELOPMENT 1"

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 :

A. ✓ YES

B. ✗ NO

Question Number : 81 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Consider the server response shown below:  
HTTP/2.0 500 Internal Server Error  
Which of the following is true?

Options :

A. ✗ HTTP/2.0 indicates that no server is available.

B. ✗ 500 is the protocol.

C. ✓ "Internal Server Error" is a status message.



D. ✖ None of these

**Question Number : 82 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following Python code segment and select the correct output.

```
from jinja2 import Template
class Player:
    def __init__(self, name1, name2):
        self.P1 = name1
        self.P2 = name2

    def get_fName(self):
        return self.P1

    def get_sName(self):
        return self.P2

player = Player("James", "Martin")
person = Player("Michael", "Adam")

tm = Template("The captain of the team is {{ per.get_sName() }} and the
               vice-captain of the team is {{per.get_fName() }}.")
info = tm.render(per=player)
print(info)
```

**Options :**

- A. ✖ The captain of the team is James and the vice-captain of the team is Martin.
- B. ✔ The captain of the team is Martin and the vice-captain of the team is James.
- C. ✖ The captain of the team is Michael and the vice-captain of the team is Adam.
- D. ✖ The captain of the team is Adam and the vice-captain of the team is Michael.

**Question Number : 83 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following statements is valid in the context of the 'foreign key'?

**Options :**

- A. ✖ A foreign key cannot consist of more than one attribute (or column).
- B. ✖ A foreign key can never be null.
- C. ✖ A foreign key is always unique.
- D. ✔ A foreign key is used to establish the relationship between data from different tables.

**Question Number : 84 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

What does v stand for in the following statement?

```
curl -v http://127.0.0.1:8000
```

Note: No space or uppercase letter is allowed in the answer.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

verbose

**Question Number : 85 Question Type : MSQ**

**Correct Marks : 3**

Question Label : Multiple Select Question

Which of the following is/are true for a web server?

**Options :**

- A. ✔ A web server is a program that processes and sends responses to clients requesting for web resources.
- B. ✖ The web server always responds to a client request with an HTML document.
- C. ✖ All the web resources hosted by a web server must be HTML files.

D. ✓ A web server can host multiple websites.

**Question Number : 86 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following HTML file.

```
<!DOCTYPE html>
<head>
  <title>Document</title>
  <style>
    div{
      position: relative;
      height: 150px;
      width: 150px;
      border: 2px solid black;
    }
    #box-1{
      z-index: 1;
      top: 50px;
      background-color: red;
    }
    #box-2{
      z-index: 0;
      top: 25px;
      background-color: blue;
    }
  </style>
</head>
<body>
  <div id="box-1"></div>
  <div id="box-2"></div>
</body>
</html>
```

How will the browser render the HTML file given above?

**Options :**

- A. ✓ It will display two square boxes, red and blue, with the red box partially covering the blue box.
- B. ✗ It will display two square boxes, red and blue, with the blue box partially covering the red box.

C. ✖ It will display two square boxes with no overlapping.

D. ✖ It will display only the red square box.

**Question Number : 87 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Which of the following code segments will display the result given below?

## Welcome to IITM ONLINE DEGREE

### Bsc Degree courses

- DBMS
- JAVA
- Intro to Python

VI. Week  
VII. Week  
VIII. Week

**Options :**

```
<!DOCTYPE html>
<html>
<body>
<h1> Welcome to IITM ONLINE DEGREE </h1>
<h2> Bsc Degree courses</h2>

<ol>
  <li>DBMS</li>
  <li>JAVA</li>
  <li>Intro to Python</li>
</ol>
<ul type="I" start="6">
  <li>Week</li>
  <li>Week</li>
  <li>Week</li>
</ul>
</body>
</html>
```

A. ✖

B. ✖

```
<!DOCTYPE html>
<html>
<body>

<h1> Welcome to IITM ONLINE DEGREE </h1>
<h2> Bsc Degree courses</h2>

<ul>
  <li>DBMS</li>
  <li>JAVA</li>
  <li>Intro to Python</li>
</ul>

<ol type="I" start="6">
  <li> VI. Week</li>
  <li>VII. Week</li>
  <li>VIII. Week</li>
</ol>
</body>
</html>
```

```
<!DOCTYPE html>
<html>
<body>

<h1> Welcome to IITM ONLINE DEGREE </h1>
<h2> Bsc Degree courses</h2>
<ul>
  <li>DBMS</li>
  <li>JAVA</li>
  <li>Intro to Python</li>
</ul>

<ol type="I" start="6">
  <li>Week</li>
  <li>Week</li>
  <li>Week</li>
</ol>
</body>
</html>
```

C. ✓

D. ✗

```
<!DOCTYPE html>
<html>
<body>

<h1> Welcome to IITM ONLINE DEGREE </h1>
<h2> Bsc Degree courses</h2>

<ul>
  <li>DBMS</li>
  <li>JAVA</li>
  <li>Intro to Python</li>
</ul>

<ol>
  <li>VI. Week</li>
  <li>VII. Week</li>
  <li>VIII. Week</li>
</ol>
</body>
</html>
```

**Question Number : 88 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

What will be the output of the following Python code?

```
from jinja2 import Template
num = Template("Numbers:{% for num in [0,1,2,3,4,5,6,7]
                if num%2==0 %} {{num}},{% endfor %}")
out = num.render()
print(out)
```

**Options :**

- A. ✖ The code will generate: SyntaxError: invalid syntax.
- B. ✖ Numbers: 0, 2, 4, 6
- C. ✔ Numbers: 0, 2, 4, 6,
- D. ✖ Numbers: 1, 3, 5, 7

**Question Number : 89 Question Type : MCQ**



**Correct Marks : 3**

Question Label : Multiple Choice Question

What will be the output of the following code snippet?

```
from jinja2 import Template
my_number=Template("The required numbers are: {% for num in
                    range(0,20) if num%2==1 or
                    num%3==1 %}{{num}}" "_{% endfor %}")
print(my_number.render())
```

**Options :**

- A. ✓ The required numbers are: 1\_3\_4\_5\_7\_9\_10\_11\_13\_15\_16\_17\_19\_
- B. ✗ The required numbers are: 1,3,4,5,7,9,10,11,13,15,16,17,19
- C. ✗ The required numbers are: 1 3 4 5 7 9 10 11 13 15 16 17 19
- D. ✗ None of these

**Question Number : 90 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

A template file and a templating code are given below.  
Template file: named as 'index.html'

```
<!DOCTYPE html>
<html>
  <head>
    <title>{{ data }}</title>
  </head>
  <body>
    <h1> {{ heading }} </h1>
    {{ paragraph }}
    {% for i in items %}
      {{ i }}
    {% endfor %}
  </body>
</html>
```

Templating code: named as 'main.py'

```
from jinja2 import Template
with open("index.html") as j:
    template = Template(j.read())
    print(template.render(
        heading="This is my first level heading",
        data = "Home Page",
        paragraph="This is the list of programming languages.",
        items= ["Python","C++", "Java"]
    ))
```

What will be the output of the above Python code?

**Options :**

```
<!DOCTYPE html>
<html>
  <head>
    <title>Home Page</title>
  </head>
  <body>
    This is the list of programming languages.
    Python
    C++
    Java
  </body>
</html>
```

A. ✖

B. ✖



```
<!DOCTYPE html>
<html>
  <head>
  </head>
  <body>
    <h1> This is my first level heading </h1>
    This is the list of programming languages.

    Python

    C++

    Java

  </body>
</html>
```

```
<!DOCTYPE html>
<html>
  <head>
    <title>Home Page</title>
  </head>
  <body>
    <h1> This is my first level heading </h1>
    This is the list of programming languages.

    Python

    C++

    Java

  </body>
</html>
```

C. ✓

D. ✗ None of these

**Question Number : 91 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

What will be output of the following code?

```
from jinja2 import Template
template = """{% for year in years%}{% if (year%4) != 0 %}{{ year }}
               {{ leap_year }}{% else %}{{year}} {{not_leap_year}}{% endif %}
               {% endfor %}"""

data = {
    "leap_year": "is a leap year.",
    "not_leap_year": "is not a leap year.",
    "years" : [2020, 2021]
}

jinja_template = Template(template)
print(jinja_template.render(data))
```

**Options :**

- ☐ 2020 is a leap year.
- A. ✖ 2021 is not a leap year.
- ☐ 2020 is not a leap year.
- B. ✔ 2021 is a leap year.
- ☐ 2020 is not a leap year.
- C. ✖ 2021 is a not a leap year.
- ☐ 2020 is a leap year.
- D. ✖ 2021 is a leap year.

**Question Number : 92 Question Type : MCQ**

**Correct Marks : 3**

**Question Label : Multiple Choice Question**

Consider the following code.

```
from flask import Flask
app = Flask(__name__)

@app.route("/course/<converter:variable_name>")
def app_dev(variable_name):
    return variable_name
```

Suppose the flask application is running on `http://127.0.0.1:5000`, and you need to decide the type of 'converter' in the app route. If the browser renders "diploma/app\_dev" for the URL `http://127.0.0.1:5000/course/diploma/app_dev`, which one of the following is the correct converter for this purpose?

**Options :**

- A. ✖ string
- B. ✔ path
- C. ✖ Both string and path
- D. ✖ None of these

**Question Number : 93 Question Type : MCQ**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Let  $L = \{ 'i', 't', 'm' \}$  be a complete character set (i.e., only these symbols need to be represented in the set). What is the minimum number of bits required to represent 'iitm' in this character set?

**Note:** You can create your own character encoding method, but each character should be encoded using same number of bits.

**Options :**

- A. ✔ 8
- B. ✖ 12
- C. ✖ 16
- D. ✖ 20

**Question Number : 94 Question Type : MCQ**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the following tables.

1) Table 1: records

record_id	matches	runs	highest_score	format	average	player_id
1	39	2679	212	test	46.19	1
2	227	9206	264	odi	48.96	1
3	92	7547	254	test	52.05	2
4	254	12169	183	odi	59.07	2
5	114	8765	278	test	50.66	3
6	228	9577	176	odi	53.55	3
7	77	7540	239	test	61.8	4
8	128	4378	164	odi	43.35	4
9	86	7311	335	test	48.1	5
10	128	5455	179	odi	45.08	5

2) Table 2: players

player_id	country	name	role
1	India	Rohit Sharma	opening_batsman
2	India	Virat Kohli	middle_order_batsman
3	South Africa	AB de Villiers	middle_order_batsman
4	Australia	Steven Smith	middle_order_batsman
5	Australia	David Warner	opening_batsman

What will be the output of the following code?

```
SELECT players.name
FROM players
INNER JOIN records ON records.player_id = players.player_id
WHERE records.matches > 50 and records.format = "test"
ORDER BY highest_score
LIMIT 1;
```

**Options :**

A. ✖ Rohit Sharma

B. ✔ Steven Smith

C. ✖ Virat Kohli

D. ✖ David Warner

**Correct Marks : 4.5**

Question Label : Short Answer Question

Suppose a client machine C is communicating with a data center D located 7500 km away from C. Assume that the TCP connection has been established and is kept alive. If each new request can be sent only after receiving an acknowledgement from D for the previous request, then what is the maximum number of requests that can be sent from C to D in one second? (Assume speed of light in cable is  $2 \times 10^8$  m/s).

**NOTE:** Your answer should not exceed 300 words.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** No

**Max Word Count :** 600

**Show Word Count :** Yes

**Single Line Response :** No

**Number of Rows :** 10

**Number Of Columns :** 70

**Text Areas :** PlainText

**Question Number : 96 Question Type : SA**

**Correct Marks : 4.5**

Question Label : Short Answer Question



Consider the following code and determine the final value of the properties: border, color, font-weight, font-size and padding that will be applied to the p element by the browser.

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <title>Welcome</title>
    <style>
      .class1 {
        border: 2px solid green;
        color: blue;
        font-weight: normal;
        font-size: 3em;
      }

      .class2 {
        border: 3px solid yellow;
      }

      #id1 {
        font-size: 2em;
      }

      p {
        font-weight: bold;
        font-size: 4em;
        padding: 20px;
      }
    </style>
  </head>
  <body>
    <p class="class1 class2" id="id1" style="color: yellow">
      Welcome to iitm online degree programme.
    </p>
  </body>
</html>
```

**NOTE:** Your answer should not exceed 300 words.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** No

**Max Word Count :** 600

**Show Word Count :** Yes

**Single Line Response :** No

**Number of Rows :** 10

**Number Of Columns :** 70

**Text Areas :** PlainText