

**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 FOUNDATION DIPLOMA FN EXAM  
QDF1 28 Apr 2024

**Subject Name :**

2024 Apr28: IIT M FN EXAM QDF1

**Creation Date :**

2024-04-16 12:17:02

**Duration :**

90

**Total Marks :**

974

**Display Marks:**

Yes

**Share Answer Key With Delivery Engine :**

Yes

**Actual Answer Key :**

Yes

**Calculator :**

Scientific

**Magnifying Glass Required? :**

No

**Ruler Required? :**

No

**Eraser Required? :**

No

**Scratch Pad Required? :**

No

**Rough Sketch/Notepad Required? :**

No

**Protractor Required? :**

No

**Show Watermark on Console? :**

Yes

**Highlighter :**

No

**Auto Save on Console?**

Yes

**Change Font Color :**

No

**Change Background Color :**

No

<b>Change Theme :</b>	No
<b>Help Button :</b>	No
<b>Show Reports :</b>	No
<b>Show Progress Bar :</b>	No

## **Group I**

<b>Group Number :</b>	1
<b>Group Id :</b>	64065318430
<b>Group Maximum Duration :</b>	0
<b>Group Minimum Duration :</b>	90
<b>Show Attended Group? :</b>	No
<b>Edit Attended Group? :</b>	No
<b>Break time :</b>	0
<b>Group Marks :</b>	974
<b>Is this Group for Examiner? :</b>	No
<b>Examiner permission :</b>	Cant View
<b>Show Progress Bar? :</b>	No
<b>Revisit allowed for group Instructions? :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Minimum Instruction Time :</b>	0
<b>Group Time In :</b>	Minutes
<b>Navigate To Group Summary From Last Question? :</b>	No
<b>Disable Submit Button During Assessment? :</b>	No
<b>Section Selection Time? :</b>	0
<b>No of Optional sections to be attempted :</b>	0

**Sem1 CT**

<b>Section Id :</b>	64065356651
<b>Section Number :</b>	1
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	17
<b>Number of Questions to be attempted :</b>	17
<b>Section Marks :</b>	100
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118629
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 1 Question Id : 640653814914 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 "FOUNDATION LEVEL : SEMESTER I:  
COMPUTATIONAL THINKING (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 :**

6406532730503. ✓ YES

6406532730504. ✗ NO

**Question Number : 2 Question Id : 640653814915 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

## Scores

SeqNo	Name	Gender	DateOfBirth	TownCity	Mathematics	Physics	Chemistry	Total
0	Bhuvanesh	M	7 Nov	Erode	68	64	78	210
■ ■ ■								
29	Naveen	M	13 Oct	Vellore	72	66	81	219

## Words

SeqNo	Word	PartOfSpeech	LetterCount
0	It	Pronoun	2
■ ■ ■			
64	cane.	Noun	4

## Library

SeqNo	Name	Author	Genre	Language	Pages	Publisher	Year
0	Igniting Minds	Kalam	Nonfiction	English	178	Penguin	2002
■ ■ ■							
29	Malgudi Days	Narayan	Fiction	English	150	Indian Thought	1943

## Olympics

SeqNo	Name	Gender	Nationality	Host country	Year	Sport	Medal
0	Karnam Malleswari	F	Indian	Australia	2000	Weightlifting	Bronze
■ ■ ■							
49	Michael Phelps	M	American	China	2008	Swimming	Gold

## Three sample cards out of 30 for Shopping Bills dataset

Item List {

SV Stores		Srivatsan 1		
Item	Category	Qty	Price	Cost
Carrots	Vegetables/Food	1.5	50	75
Soap	Toiletries	4	32	128
Tomatoes	Vegetables/Food	2	40	80
Bananas	Vegetables/Food	8	8	64
Socks	Footwear/Apparel	3	56	168
Curd	Dairy/Food	0.5	32	16
Milk	Dairy/Food	1.5	24	36
				567

Sun General		Vignesh 14		
Item	Category	Qty	Price	Cost
Phone Charger	Utilities	1	230	230
Razor Blades	Grooming	1	12	12
Razor	Grooming	1	45	45
Shaving Lotion	Grooming	0.8	180	144
Earphones	Electronics	1	210	210
Pencils	Stationery	3	5	15
				656

Big Bazaar		Sudeep 2		
Item	Category	Qty	Price	Cost
Baked Beans	Canned/Food	1	125	125
Chicken Wings	Meat/Food	0.5	600	300
Cocoa powder	Canned/Food	1	160	160
Capsicum	Vegetables/Food	0.8	180	144
Tie	Apparel	2	390	780
Clips	Household	0.5	32	16
				1525

Options :

6406532730505. ✓ Useful Data has been mentioned above.

6406532730506. ❀ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number : 2

Sub-Section Id : 640653118630

Question Shuffling Allowed : Yes

**Is Section Default? :**

null

**Question Number : 3 Question Id : 640653814917 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5**

**Question Label : Multiple Choice Question**

The following pseudocode is executed using the "Shopping Bills" dataset. Assume that customer names are distinct.

```
1 A = 0, N = 0
2 while(Table 1 has more rows){
3     Read the first row X in Table 1
4     Move X to Table 2
5     while(Table 1 has more rows) {
6         Read the first row Y in Table 1
7         if(X.CustomerName == Y.CustomerName){
8             A = A + 1
9             Move Y to Table 2
10        }
11        else{
12            Move Y to Table 3
13        }
14    }
15    if(A > N){
16        N = A
17    }
18    A = 0
19    Move all rows from Table 3 to Table 1
20 }
```

What will **N** represent at the end of the execution?

**Options :**

6406532730512. ❌ Minimum number of bills issued to a single customer

6406532730513. ✓ Maximum number of bills issued to a single customer

6406532730514. ❌ Number of distinct customers in the dataset

6406532730515. ❌ Maximum number of customers who purchased items from the same shop

**Question Number : 4 Question Id : 640653814923 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 5**

**Question Label : Multiple Choice Question**

The following pseudocode is executed using the "Scores" dataset. At the end of execution of below pseudocode, `first(D[c]) - last(D[c])` will represent the difference between highest and lowest Mathematics marks of the city `c`. Choose the correct code fragment.

```
1 D = {}
2 while(Table 1 has more rows){
3     Read the first row X in Table 1
4     if(isKey(D, X.TownCity)){
5         *****
6         ***** Fill the code*****
7         *****
8     }
9     else{
10        D[X.TownCity] = [X.Mathematics, X.Mathematics]
11    }
12    Move X to Table 2
13 }
```

**Options :**

```
1 if(first(D[X.TownCity]) > X.Mathematics){
2     D[X.TownCity] = [X.Mathematics, last(D[X.TownCity])]
3 }
4 if(last(D[X.TownCity]) < X.Mathematics){
5     D[X.TownCity] = [first(D[X.TownCity]), X.Mathematics]
6 }
```

6406532730529. ❌

```
1 if(first(D[X.TownCity]) < X.Mathematics){
2     D[X.TownCity] = [X.Mathematics, last(D[X.TownCity])]
3 }
4 if(last(D[X.TownCity]) > X.Mathematics){
5     D[X.TownCity] = [first(D[X.TownCity]), X.Mathematics]
6 }
```

6406532730530. ✓

```

1 if(last(D[X.TownCity]) < X.Mathematics){
2     D[X.TownCity] = [X.Mathematics, last(D[X.TownCity])]
3 }
4 if(first(D[X.TownCity]) > X.Mathematics){
5     D[X.TownCity] = [first(D[X.TownCity]), X.Mathematics]
6 }

```

6406532730531. \*

```

1 if(last(D[X.TownCity]) > X.Mathematics){
2     D[X.TownCity] = [X.Mathematics, last(D[X.TownCity])]
3 }
4 if(first(D[X.TownCity]) < X.Mathematics){
5     D[X.TownCity] = [first(D[X.TownCity]), X.Mathematics]
6 }

```

6406532730532. \*

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118631

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 5 Question Id : 640653814918 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 6**

**Question Label : Multiple Choice Question**

Let **X** and **Y** be two rows in the "Scores" table. We call **X** and **Y** partially matching if student **X** and **Y** either have the same gender or are from the same city, but not both.

Let **partialMatch(X, Y)** be a procedure to find whether **X** and **Y** are partially matching. Choose the correct implementation of the procedure **partialMatch**.

**Options :**

6406532730516. \*

```
1 Procedure partialMatch(X, Y)
2     A = False, B = False
3     if (X.Gender == Y.Gender){
4         A = True
5     }
6     if(X.TownCity == Y.TownCity){
7         B = True
8     }
9     if (A and B){
10        return(True)
11    }
12    return(False)
13 End partialMatch
```

```
1 Procedure partialMatch(X, Y)
2     A = False, B = False
3     if (X.Gender == Y.Gender){
4         A = True
5     }
6     if(X.TownCity == Y.TownCity){
7         B = True
8     }
9     if (A or B){
10        return(True)
11    }
12    return(False)
13 End partialMatch
```

6406532730517. ✘

6406532730518. ✓

```

1 Procedure partialMatch(X, Y)
2     A = False, B = False
3     if (X.Gender == Y.Gender){
4         A = True
5     }
6     if(X.TownCity == Y.TownCity){
7         B = True
8     }
9     if(not(A and B) and (A or B)){
10        return(True)
11    }
12   return(False)
13 End partialMatch

```

```

1 Procedure partialMatch(X, Y)
2     A = False, B = False
3     if (X.Gender == Y.Gender){
4         A = True
5     }
6     if(X.TownCity == Y.TownCity){
7         B = True
8     }
9     if((A and B) and not(A or B)){
10        return(True)
11    }
12   return(False)
13 End partialMatch

```

6406532730519. \*

**Question Number : 6 Question Id : 640653814924 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6**

**Question Label : Multiple Choice Question**

We call two sentences similar if both of them have the same number of words and satisfy the following conditions:

- The  $i^{th}$  word in the first sentence has the same part of speech as the  $i^{th}$  word in the second sentence, for  $1 \leq i \leq L$ , where  $L$  is the total number of words in either sentence.
- **aList** and **bList** are lists that contain the part of speech of words in two sentences **A** and **B** respectively.
- **isSimilar** is a procedure that accepts these two lists as parameters and checks for the similarity of **A** and **B**.

Choose the correct implementation of the procedure **isSimilar**.

### Options :

```
1 Procedure isSimilar(aList, bList)
2     if(length(aList) != length(bList)){
3         return(False)
4     }
5     cList = bList
6     foreach x in aList{
7         if(x != first(cList)){
8             return (False)
9         }
10        cList = rest(cList)
11    }
12    return(True)
13 End isSimilar
```

6406532730533. ✓

```
1 Procedure isSimilar(aList, bList)
2     if(length(aList) != length(bList)){
3         return(False)
4     }
5     cList = bList
6     foreach x in aList{
7         if(x == first(cList)){
8             return (False)
9         }
10        cList = rest(cList)
11    }
12    return(True)
13 End isSimilar
```

6406532730534. ❌

```
1 Procedure isSimilar(aList, bList)
2     if(length(aList) != length(bList)){
3         return(False)
4     }
5     cList = bList
6     foreach x in aList{
7         if(x != first(cList)){
8             return (True)
9         }
10        cList = rest(cList)
11    }
12    return(False)
13 End isSimilar
```

6406532730535. ✎

```
1 Procedure isSimilar(aList, bList)
2     if(length(aList) != length(bList)){
3         return(False)
4     }
5     cList = bList
6     foreach x in aList{
7         if(x == last(cList)){
8             return (False)
9         }
10        cList = init(cList)
11    }
12    return(True)
13 End isSimilar
```

6406532730536. ✎

**Question Number : 7 Question Id : 640653814925 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

The following pseudocode is executed using the "Words" dataset. Assume that the rows in the table are sorted in ascending order of sequence number.

```
1 inList = [], count = 0
2 while(Table 1 has more rows){
3     Read the first row X in Table 1
4     inList = inList ++ [[X.Word, X.PartOfSpeech]]
5     Move X to Table 2
6 }
7 ****
8 ****
9 *****Fill the code*****
10 ****
11 ****
```

Choose the correct code fragment so that, after executing the pseudocode above, **count** represents the number of nouns in the paragraph and **someVar** represents the number of words in the paragraph.

### Options :

```
1 someVar = length(inList)
2 foreach x in inList{
3     if (first(x) == "Noun"){
4         count = count + 1
5     }
6 }
```

6406532730537. ❌

```
1 someVar = length(inList)
2 foreach x in inList{
3     if (last(x) == "Noun"){
4         count = count + 1
5     }
6 }
```

6406532730538. ✓

6406532730539. ❌

```
1 someVar = 0
2 foreach x in inList{
3     if (last(x) == "Noun"){
4         count = count + 1
5     }
6     someVar = someVar + length(x)
7 }
```

```
1 somevar = 0
2 foreach x in inList{
3     if (last(x) == "Noun"){
4         count = count + 1
5         someVar = someVar + length(x)
6     }
7 }
```

6406532730540. ✘

**Sub-Section Number :**

4

**Sub-Section Id :**

640653118632

**Question Shuffling Allowed :**

Yes

**Is Section Default? :**

null

**Question Number : 8 Question Id : 640653814916 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Let **D** be a dictionary whose keys are strings and values are integers. For each key **A** in **D**, **D[A]** is the letter count of **A**. Choose the correct statement(s) about dictionary **D**.

**Options :**

6406532730507. ✘ For any two different keys **X** and **Y** in **D**, **D[X] != D[Y]** is always true

6406532730508. ✘ **isKey(D, 1)** is True

6406532730509. ✓ **keys(D)** returns a list of strings

6406532730510. ✓ D["cricket"] = 7

6406532730511. ✘ **keys(D)** may have duplicate elements

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118633

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 9 Question Id : 640653814919 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider the following pseudocode is executed using the "Words" dataset.

```
1 A = 0, flag = True
2 inList = [], outList = []
3 while(Table 1 has more rows){
4     Read the first row X in Table 1
5     if(flag){
6         inList = [X.Word]
7         flag = False
8     }
9     if(X.Word ends with a full stop){
10        outList = outList ++ [inList ++ [X.Word]]
11        A = A + 1
12        inList = []
13        flag = True
14    }
15    Move X to Table 2
16 }
```

At the end of the execution of above pseudocode, which of the following statements wil be true?

**Options :**

6406532730520. ✓ The value of **length(outList)** and **A** will be same.

6406532730521. ✗ **outList** represents list of lists of first word of each sentence

6406532730522. ✗ The value of **length(outList)** and **A** will be different.

6406532730523. ✓ **outList** represents list of lists of first and last word of each sentence in that order

**Question Number : 10 Question Id : 640653814926 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5 Max. Selectable Options : 0**

Question Label : Multiple Select Question

The following pseudocode is executed using the "Library" dataset. At the end of the execution, **N** captures the name of a book written in the 'Non-Fiction' genre with the maximum number of pages, and **A** captures the number of pages in the book.

```
1 A = 0, N = "None"
2 while(Table 1 has more rows){
3     Read the first row X in Table 1
4     if(X.Genre == "Non-Fiction" and X.Pages > A){
5         A = X.Pages
6         N = X.Name
7     }
8     Move X to Table 2
9 }
```

Suppose that the rows of the table are shuffled. Choose the **incorrect** options.

**Options :**

6406532730541. ✓ There might be a change in the value of **A**, based on the order of rows

6406532730542. ✓ The value of **N** does not depend on the order of rows.

6406532730543. ✓ There will be NO change in the values of both **A** and **N**, based on the order of rows

6406532730544. ❌ There might be a change in the value of **N**, based on the order of rows

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118634

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 11 Question Id : 640653814930 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider the following pseudocode for inserting an element into a sorted list in descending order. The pseudocode may have mistakes. Identify all such mistakes (if any).

```
1 Procedure SortedListInsert(l,x)
2     newList = []
3     inserted = True
4     foreach z in l{
5         if(not(inserted)){
6             if(x < z){
7                 newList = newList ++ [x]
8                 inserted = True
9             }
10        }
11        newList = [z] ++ newList
12    }
13    if(not(inserted)){
14        newList = newList ++ [x]
15    }
16    return(newList)
17 End SortedListInsert
```

### Options :

6406532730553. ✓ Line 3: variable 'inserted' is initialised to True so it will never enter the nested if block for comparison.

6406532730554. ❌ Line 6: inside if statement condition should be 'x > z'.

6406532730555. ✓ Line 11: [z] needs to be appended to the end of newList

6406532730556. ❌ Line 14: 'x' is appended to the end of the list instead of the beginning.

**Question Number : 12 Question Id : 640653814931 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Let **LA** be a non-empty list of integers. A list **LB** is constructed using the following pseudocode.

```
1 LA = [10, 20, 30, 40, 50]
2 LC = LA
3 LB = [LA]
4 while(length(LC) > 1){
5     LC = rest(LC)
6     LB = LB ++ [LC]
7 }
```

Which of the following will return **true** after the execution of above pseudocode?

**Options :**

6406532730557. ✘ **length(LB) == length(LA) - 1**

6406532730558. ✘ **LC == [10]**

6406532730559. ✘ **last(LB) == LA**

6406532730560. ✓ **init(first(rest(LB))) == [20, 30, 40]**

6406532730561. ✓ **first(last(LB)) == [50]**

6406532730562. ✘ **first(init(LB)) == [20, 30, 40, 50]**

**Sub-Section Number :**

7

**Sub-Section Id :**

640653118635

**Question Shuffling Allowed :**

No

**Is Section Default? :**

null

**Question Id : 640653814927 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

## Question Numbers : (13 to 14)

Question Label : Comprehension

The following pseudocode is executed using the "Scores" dataset.

```
1 A = 0, B = 0
2 while(Table 1 has more rows){
3     Read the first row X in Table 1
4     Flag = False
5     if(X.Gender != 'F' or X.Physics <= 90){
6         Flag = True
7     }
8     if(not Flag){
9         A = A + 1
10    if(X.Chemistry > 85){
11        B = B + 1
12    }
13 }
14 Move X to Table 2
15 }
```

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 13 Question Id : 640653814928 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

What will **A** represent at the end of the execution?

**Options :**

6406532730545. ✓ Number of female students whose Physics marks are at least 91

6406532730546. ✗ Number of male students whose Physics marks are at least 90

6406532730547. ✗ Number of female students whose Physics marks are at least 90

6406532730548. ✗ Number of male students whose Physics marks are at most 91

**Question Number : 14 Question Id : 640653814929 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

What will **B** represent at the end of the execution?

**Options :**

6406532730549. ❌ Number of students whose Physics marks are at most 90 and Chemistry marks are at least 86

6406532730550. ✓ Number of female students whose Physics marks are at least 91 and Chemistry marks are at least 86

6406532730551. ❌ Number of female students whose Physics marks are at least 90 and Chemistry marks are at most 85

6406532730552. ❌ Number of male students whose Physics marks are at least 91 and Chemistry marks are at least 86

**Sub-Section Number :** 8

**Sub-Section Id :** 640653118636

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653814920 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (15 to 16)**

Question Label : Comprehension

Consider the pseudocode given below where **intA** is a positive integer and **listL** is a non-empty list of positive integers.

```
1 X = calculate(intA, listL)
2 Procedure calculate(A, L)
3     if(length(L) == 0){
4         return(A)
5     }
6     else{
7         if(A > first(L)){
8             A = first(L)
9         }
10        return(calculate(A, rest(L)))
11    }
12 End calculate
```

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 15 Question Id : 640653814921 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

How many times will the procedure **calculate** be called, including the initial call in line 1?

**Options :**

6406532730524. ❌ **length(listL)**

6406532730525. ❌ **length(listL) - 1**

6406532730526. ✓ **length(listL) + 1**

6406532730527. ❌ **Depends on the elements in listL**

**Question Number : 16 Question Id : 640653814922 Question Type : SA Calculator : None**

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

**Correct Marks : 5**

**Question Label :** Short Answer Question

**If intA = 6 and listL = [4,7,3,8,5] then, what will the value of X be at the end of the execution of given pseudocode?**

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

3

**Question Id : 640653814935 Question Type : COMPREHENSION Sub Question Shuffling**

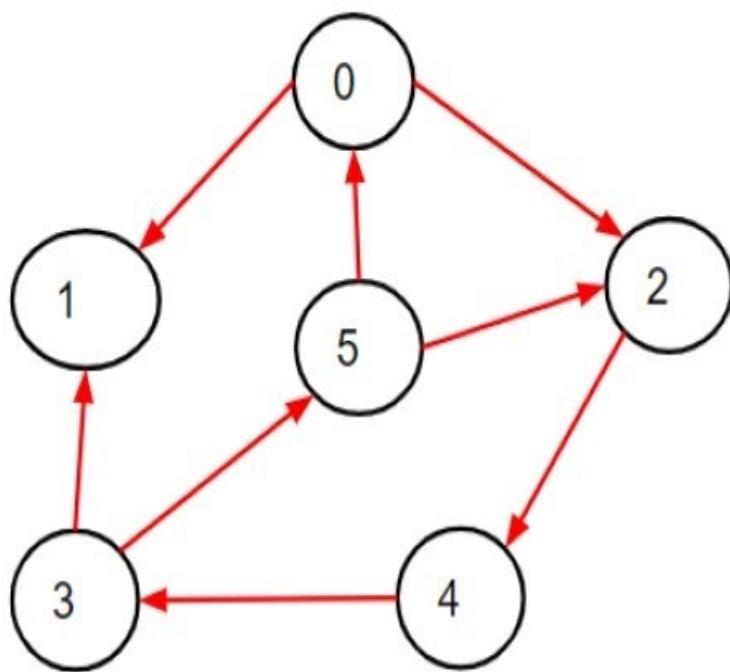
**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (17 to 18)**

Question Label : Comprehension

Let  $M$  be the adjacency matrix of the graph  $G$  as shown below and consider the procedure **Dosomething** given below.



```
1 Procedure Dosomething(M, q)
2     count = 0
3     foreach i in rows(M){
4         if(M[i][q] == 1 or M[q][i] == 1){
5             count = count + 1
6         }
7     }
8     return(count)
9 End Dosomething
```

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 17 Question Id : 640653814936 Question Type : SA Calculator : None**

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

**Correct Marks : 5**

Question Label : Short Answer Question

What will the value of **B** be at the end of the execution of the pseudocode given below?

```
B = Dosomething(M, 4)
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Number :** 18 **Question Id :** 640653814937 **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

What will the value of **B** be at the end of execution of pseudocode given below?

```
1 | B = Dosomething(M, 5)
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

3

**Sub-Section Number :** 9

**Sub-Section Id :** 640653118637

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653814932 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix

**Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

## Question Numbers : (19 to 20)

Question Label : Comprehension

Consider the procedure **evaluate** as shown below, where **P** and **Q** are the lists of same length. If **L1** = [4, 0, 2, 4] and **L2** = [3, 1, 5, 3] then answer the given subquestions.

```
1 Procedure evaluate(P, Q)
2     if(P == []){
3         return(P)
4     }
5     else{
6         c = last(P) + last(Q)
7         return([c] ++ evaluate(init(P), init(Q)))
8     }
9 End evaluate
```

### Sub questions

Question Number : 19 Question Id : 640653814933 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 5

Question Label : Multiple Choice Question

What will **evaluate(L1, L2)** return?

Options :

6406532730563. ✘

6406532730564. ✘ [7, 1, 7, 7]

6406532730565. ✓ [7, 7, 1, 7]

6406532730566. ✘ [7, 7, 7, 7]

Question Number : 20 Question Id : 640653814934 Question Type : MCQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 5

Question Label : Multiple Choice Question

What will **evaluate(L1, L2)** return if **line 6** and **line 7** is replaced with below pesudocode?

```
1 | c = first(P) + first(Q)
2 | return([c] ++ evaluate(rest(P), rest(Q)))
```

**Options :**

6406532730567. ✘ []

6406532730568. ✓ [7, 1, 7, 7]

6406532730569. ✘ [7, 7, 1, 7]

6406532730570. ✘ [7, 7, 7, 7]

**Question Id : 640653814938 Question Type : COMPREHENSION Sub Question Shuffling**

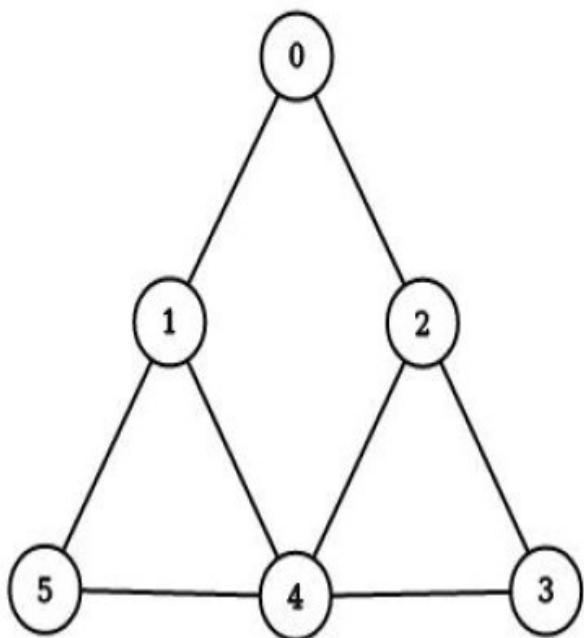
**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (21 to 22)**

Question Label : Comprehension

Consider the following graph with six nodes. M is a  $6 \times 6$  adjacency matrix corresponding to this graph. Assume that M has already been computed.



```
1 D = []
2 L = []
3 D[4] = -1
4 D, L = searchPath(M, D, L, 4)
5 Procedure searchPath(graph, P, S, i)
6     S = S ++ [i]
7     foreach j in columns(graph){
8         if(graph[i][j] == 1 and not(isKey(P, j))){
9             P[j] = i
10            P, S = searchPath(graph, P, S, j)
11        }
12    }
13    return(P, S)
14 End searchPath
```

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 21 Question Id : 640653814939 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5**

**Question Label : Multiple Choice Question**

What will the value of **L** be after execution of the given pseudocode?

**Options :**

6406532730573. ✘ **L** = [4, 0, 1, 2, 3, 5]

6406532730574. ✓ **L** = [4, 1, 0, 2, 3, 5]

6406532730575. ✘ **L** = [4, 1, 2, 3, 5, 0]

6406532730576. ✘ **L** = [4, 0, 2, 3, 5, 1]

**Question Number : 22 Question Id : 640653814940 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5**

Question Label : Multiple Choice Question

What will the value of **D** be after execution of the given pseudocode?

**Options :**

6406532730577. ✘ **D** = {4:-1, 1:4, 0:2, 2:0, 3:2, 5:1}

6406532730578. ✓ **D** = {4:-1, 1:4, 0:1, 2:0, 3:2, 5:1}

**D** = {4:-1, 2:4, 0:1, 1:5, 3:2, 5:4}

6406532730579. ✘

6406532730580. ✘ **D** = {4:-1, 2:4, 0:1, 2:0, 3:2, 5:4}

## Sem2 Intro to Python

**Section Id :**

64065356652

**Section Number :**

2

<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	18
<b>Number of Questions to be attempted :</b>	18
<b>Section Marks :</b>	50
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118638
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 23 Question Id : 640653814941 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 "FOUNDATION LEVEL : SEMESTER II:  
INTRODUCTION TO 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 :**

6406532730581. ✓ YES

6406532730582. \* NO

**Question Number : 24 Question Id : 640653814942 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

# Useful Data

## Presentation

There are two types of blocks that you would see in all the questions:

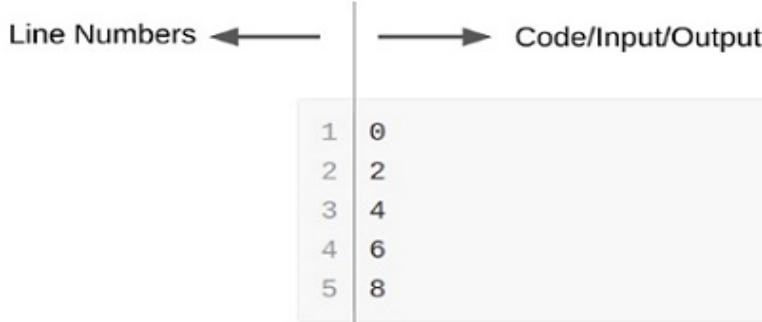
### Code

```
1 for x in range(10):
2     if x % 2 == 0:
3         print(x)
```

### Input or Output

```
1 0
2 2
3 4
4 6
5 8
```

In both the blocks, please note that the region to the left of the thin vertical line — | — corresponds to line-numbers. Do not confuse the line numbers with the content of the code or the input-output. Just to be clear:



### Useful information

#### range

Sample behaviour of the `range` function:

- `range(5)` corresponds to the sequence `0, 1, 2, 3, 4`
- `range(1, 5)` corresponds to the sequence `1, 2, 3, 4`
- `range(1, 1)` is the empty sequence

#### // operator

`//` is the floor division operator. `5 // 2` is `2` and *not* `2.5`

#### NAT → integer

For all NAT questions in this exam, the answer will always be an integer and not a float value. If the answer to a question is `18`, then just enter that value. Do *not* enter `18.0`.

## Options :

6406532730583. ✓ Useful Data has been mentioned above.

6406532730584. ❗ This data attachment is just for a reference & not for an evaluation.

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118639

**Question Shuffling Allowed :** Yes

**Is Section Default? :**

null

**Question Number : 25 Question Id : 640653814943 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 university has the following grading system:

Marks	Grade
$90 \leq M \leq 100$	S
$80 \leq M < 90$	A
$70 \leq M < 80$	B
$M < 70$	U

Which of the following snippets computes and prints the grade after accepting the marks as input?

Assume that the input entered by the user will be an integer and will lie only in the range [0, 100].

**Snippet-1**

```
1 marks = int(input())
2 if marks >= 90:
3     grade = 'S'
4 elif marks >= 80:
5     grade = 'A'
6 elif marks >= 70:
7     grade = 'B'
8 else:
9     grade = 'U'
10 print(grade)
```

**Snippet-2**

```
1 marks = int(input())
2 if marks >= 90:
3     grade = 'S'
4 if marks >= 80:
5     grade = 'A'
6 if marks >= 70:
7     grade = 'B'
8 else:
9     grade = 'U'
10 print(grade)
```

**Options :**

6406532730585. ✓ Only snippet-1 is correct

6406532730586. ✗ Only snippet-2 is correct

6406532730587. ✗ Both snippets are correct

6406532730588. ✗ Both snippets are incorrect

**Question Number : 26 Question Id : 640653814944 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

What is the output of the following snippet of code?

```
1 def some_fun(string):
2     vow = "aeiouAEIOU"
3     # '' is the empty string
4     if string == '':
5         return 0
6     if string[0] in vow:
7         return 1 + some_fun(string[1:])
8     else:
9         return some_fun(string[1:])
10
11 result = some_fun("IITM BS")
12 print(result)
```

**Options :**

6406532730589. ✗ 6

6406532730590. ✗ 1

6406532730591. ✓ 2

6406532730592. ✗ 7

**Question Number : 27 Question Id : 640653814945 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**

`check_service` is a method of the class `Car` that updates the attribute `service_required` to the Boolean literal `True` if the attribute `mileage` is over 50,000 miles, indicating that the car needs servicing and `False` otherwise. Select the correct implementation of this method.

**Options :**

```
1 def check_service(self):
2     if self.mileage > 50000:
3         self.service_required = True
4     else:
5         self.service_required = False
```

6406532730593. ✓

```
1 def check_service():
2     if self.mileage > 50000:
3         self.service_required = True
4     else:
5         self.service_required = False
```

6406532730594. ✗

```
1 def check_service(self):
2     if mileage > 50000:
3         self.service_required = True
4     else:
5         self.service_required = False
```

6406532730595. ✗

```
1 def check_service(self):
2     if self.mileage >= 50000:
3         service_required = True
4     else:
5         service_required = False
```

6406532730596. ✗

**Question Number : 28 Question Id : 640653814946 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**

What is the output of the following snippet of code?

```
1 | L = [x * 10 if x % 10 == 0 else x * 5 for x in range(1, 10)]  
2 | print(L)
```

**Options :**

1 | [10, 20, 30, 40, 50, 60, 70, 80, 90]

6406532730597. ✘

1 | [5, 10, 15, 20, 25, 30, 35, 40, 45]

6406532730598. ✓

1 | [0, 5, 10, 15, 20, 25, 30, 35, 40]

6406532730599. ✘

1 | [0, 10, 20, 30, 40, 50, 60, 70, 80]

6406532730600. ✘

**Question Number : 29 Question Id : 640653814947 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**

`products` is a list of dictionaries in which each dictionary in the list has the following keys:

- `product` : Represents the name of a product (string).
- `price` : Represents the price of a product (int).
- `brand` : Represents the brand of a product (string).

Consider the function given below:

```
1 def func(products):
2     laptops = [P for P in products if P['product'] == 'Laptop']
3     earphones = [P for P in products if P['product'] == 'Earphone']
4     combos = [(L, E) for L in laptops for E in earphones
5                if L['brand'] == E['brand']]
6
7     combo = combos[0]
8     # abs(-2) == 2, abs(2) == 2
9     mdiff = abs(combo[0]['price'] - combo[1]['price'])
10    for L, E in combos:
11        diff = abs(L['price'] - E['price'])
12        if diff > mdiff:
13            combo, mdiff = (L, E), diff
14    return combo
```

Select the option from below that describes the value returned by `func`.

**Options :**

6406532730601. ❌ The function returns the pair of 'Laptop' and 'Earphone' products with the minimum price difference, considering only products with the same brand.

6406532730602. ✓ The function returns the pair of 'Laptop' and 'Earphone' products with the maximum price difference, considering only products with the same brand.

6406532730603. ❌ The function returns the pair of 'Laptop' and 'Earphone' products with the minimum price difference, considering all available products without considering the brand.

6406532730604. ❌ The function returns the pair of 'Laptop' and 'Earphone' products with the maximum price difference, considering all available products without considering the brand.

**Question Number : 30 Question Id : 640653814948 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

What are the contents of the file `out.txt` after executing the following snippet of code?

```
1 def write(M):
2     m, n = len(M), len(M[0])
3     f = open('out.txt', 'w')
4     for i in range(m):
5         for j in range(n):
6             line = str(M[i][j]) + ','
7             if i != m - 1 and j == n - 1:
8                 line += '\n'
9             f.write(line)
10    f.close()
11
12 write([[1, 2, 3], [4, 5, 6], [7, 8, 9]])
```

### Options :

1	1,2,3,
2	4,5,6,
3	7,8,9,

6406532730605. ✓

1	1,2,3
2	4,5,6
3	7,8,9

6406532730606. ✗

1	1,2,3,4,5,6,7,8,9,
---	--------------------

6406532730607. ✗

1	1,2,3,4,5,6,7,8,9
---	-------------------

6406532730608. ✗

**Sub-Section Number :**

3

**Sub-Section Id :**

640653118640

**Question Shuffling Allowed :**

Yes

**Is Section Default? :**

null

**Question Number : 31 Question Id : 640653814949 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following snippets of code:

**Code-1**

```
1 | L = [1, 2, 3]
2 | L.append(4)
```

**Code-2**

```
1 | S = set([1, 2, 3])
2 | S[0] = 4
```

**Code-3**

```
1 | D = dict()
2 | D['one'] = 1
3 | print(D[1])
```

Select all true statements.

**Options :**

6406532730609. ❌ Code-1 will throw an error in line-2

6406532730610. ✓ Code-2 will throw an error in line-2

6406532730611. ✓ Code-3 will throw an error in line-3

6406532730612. ✓ Code-1 will run without any error

6406532730613. ❌ Code-2 will run without any error

**Question Number : 32 Question Id : 640653814950 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

## Question Label : Multiple Select Question

`M` is a  $m \times n$  matrix, with  $m \neq n$ . We wish to calculate the sum of each row and store the sums in a list called `row_sums`. Note that `row_sums` will have  $m$  elements. Select all correct implementations.

### Options :

6406532730614. ✓

```
1 | row_sums = [sum(row) for row in M]
```

6406532730615. ✓

```
1 | row_sums = []
2 | for i in range(len(M)):
3 |     row_sums.append(sum(M[i]))
```

6406532730616. ❌

```
1 | row_sums = []
2 | for i in range(len(M)):
3 |     val = 0
4 |     for j in range(len(M)):
5 |         val += M[i][j]
6 |     row_sums.append(val)
```

6406532730617. ❌

```
1 | row_sums = []
2 | val = 0
3 | for i in range(len(M)):
4 |     for j in range(len(M)):
5 |         val += M[i][j]
6 |     row_sums.append(val)
```

**Question Number : 33 Question Id : 640653814951 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following snippet of code.

```
1 n = 51
2 count = 0
3
4 while n > 0:
5     if n % 2 == 0:
6         break
7     if n % 3 == 0:
8         n = n - 2
9         continue
10    n = n - 2
11    count += 1
12
13 print(count)
```

Select all correct statements about the output of this code.

**Options :**

6406532730618. ❌ It is the number of odd positive integers less than or equal to **51** that are divisible by **3**.

6406532730619. ❌ It is the number of even positive integers less than or equal to **51** that are divisible by **3**.

6406532730620. ✓ It is the number of odd positive integers less than or equal to **51** that are **not** divisible by **3**.

6406532730621. ✓ The output of the above code is **17**.

6406532730622. ❌ The output of the above code is **9**.

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118641

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 34 Question Id : 640653814952 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

What is the output of the following snippet of code?

```
1 def calculate(m, n):
2     if m < n:
3         return 0
4     return 1 + calculate(m - n, n)
5
6 c1 = calculate(5, 1)
7 c2 = calculate(10, 2)
8 c3 = calculate(15, 3)
9 print(c1 + c2 + c3)
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

15

**Question Number :** 35 **Question Id :** 640653814953 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 3

**Question Label :** Short Answer Question

`words.txt` is a text file with the following contents:

```
1 | with consistency you can achieve anything
```

There is exactly one space between any pair of consecutive words. What is the output of the following snippet of code?

```
1 | def do_something(filename):
2 |     f = open(filename, 'r')
3 |     maxword = '' # empty string
4 |     space = ' ' # there is one space between the quotes
5 |     for line in f:
6 |         words = line.strip().split(space)
7 |         for word in words:
8 |             if len(word) > len(maxword):
9 |                 maxword = word
10 | f.close()
11 | return len(maxword)
12 |
13 | print(do_something('words.txt'))
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

11

**Question Number :** 36 **Question Id :** 640653814954 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 3

**Question Label :** Short Answer Question

What is the output of the following snippet of code?

```
1 L = [1, 5, 3, 2, 4, 9, 2, 8, 4, 1, 3, 6]
2
3 n = len(L)
4 for i in range(1, n):
5     if L[i - 1] > L[i]:
6         temp = L[i - 1]
7         L[i - 1] = L[i]
8         L[i] = temp
9
10 print(L[-1])
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

9

**Question Number :** 37 **Question Id :** 640653814956 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 3

**Question Label :** Short Answer Question

What is the output of the following snippet of code?

```
1 given = '14[576]91'
2 word = '' # empty string
3 index = 0
4 flag = False
5 while index < len(given):
6     char = given[index]
7     if char == '[':
8         flag = True
9     if flag and char not in '[ ]':
10        word += char
11    if char == ']':
12        break
13    index += 1
14
15 print(int(word))
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

576

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118642

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number :** 38 **Question Id :** 640653814955 **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

What is the output of the following snippet of code?

```
1 keys = list(range(1, 21, 2))
2 # list(range(1, 5, 2)) == [1, 3]
3 values = [10 - x for x in keys]
4 D = dict()
5
6 for i in range(len(keys)):
7     D[keys[i]] = values[i]
8 all_keys_values = set(keys).union(set(values))
9 # {1, 2, 3}.union({4, 5, 6}) == {1, 2, 3, 4, 5, 6}
10
11 count = 0
12 for x in all_keys_values:
13     if ((x in D) and
14         (D[x] in D) and
15         (D[D[x]] == x)):
16         count += 1
17
18 print(count)
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

5

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118643

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653814957 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0  
**Question Numbers :** (39 to 40)  
**Question Label :** Comprehension

Consider the class `Vehicle`:

```
1 class Vehicle:
2     def __init__(self, model, price):
3         self.model = model
4         self.price = price
5
6     def change_price(self, new_price):
7         self.price = new_price
8
9     def print_info(self):
10        print(f'Vehicle model: {self.model}')
11        print(f'Vehicle price: {self.price}')
```

`Car` is a sub-class of `Vehicle`:

```
1 class Car(Vehicle):
2     count = 0
3
4     def __init__(self, model, price, fuel_type):
5         super().__init__(model, price)
6         self.fuel_type = fuel_type
7         Car.count += 1
8
9     def is_electric(self):
10        return self.fuel_type == 'Electric'
11
12    def print_info(self):
13        super().print_info()
14        print('Vehicle is a car')
15        print(f'Fuel type: {self.fuel_type}')
```

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 39 Question Id : 640653814958 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 1.5**

**Question Label : Multiple Choice Question**

What is the output of the following snippet of code?

```
1 car = Car('Swift', 700000, 'Petrol')
2 car.change_price(800000)
3 car.print_info()
```

**Options :**

- 1 Vehicle model: Swift
- 2 Vehicle price: 700000

6406532730628. ✘

- 1 Vehicle model: Swift
- 2 Vehicle price: 800000

6406532730629. ✘

- 1 Vehicle is a car
- 2 Fuel type: Petrol

6406532730630. ✘

- 1 Vehicle model: Swift
- 2 Vehicle price: 700000
- 3 Vehicle is a car
- 4 Fuel type: Petrol

6406532730631. ✘

- 1 Vehicle model: Swift
- 2 Vehicle price: 800000
- 3 Vehicle is a car
- 4 Fuel type: Petrol

6406532730632. ✓

**Question Number : 40 Question Id : 640653814959 Question Type : SA Calculator : None**

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

**Correct Marks : 1.5**

**Question Label : Short Answer Question**

`showroom` represents a list of objects of type `Car`. What is the output of the following snippet of code?

```
1 Car.count = 0
2 showroom = [Car('Swift', 700000, 'Petrol'),
3             Car('Model 3', 50000, 'Electric'),
4             Car('City', 800000, 'Petrol'),
5             Car('Nexon EV', 1200000, 'Electric')]
6 count = 0
7 for car in showroom:
8     if car.is_electric():
9         count = count + 1
10
11 print(count)
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Sub-Section Number :** 7

**Sub-Section Id :** 640653118644

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653814960 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (41 to 42)

Question Label : Comprehension

Study the following code and answer the given subquestions.

```

1 n = ? # assume that n is initialized with some value
2 fruits = ['apple', 'banana', 'cherry']
3 string = '' # empty string
4 except_count = 0
5
6 for fruit in fruits:
7     try:
8         for i in range(int(n)):
9             try:
10                 string += fruit[i]
11             except:
12                 except_count += 1
13     except:
14         print("unsupported")

```

The given subquestions are independent of each other. Think of each subquestion as a separate execution of the code snippet given above.

### **Sub questions**

**Question Number : 41 Question Id : 640653814961 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

**Question Label : Short Answer Question**

If the value of `except_count` is 7 at the end of the execution and `n` is an integer, what is the value of `n`?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

8

**Question Number : 42 Question Id : 640653814962 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

From the options given below, what could be the value of `n` so that `unsupported` is printed in the output at least once?

**Options :**

6406532730635. ❌ "-2"

6406532730636. ❌ -2

6406532730637. ✓ "5.4"

6406532730638. ❌ 5.4

## Sem1 Maths1

<b>Section Id :</b>	64065356653
<b>Section Number :</b>	3
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	15
<b>Number of Questions to be attempted :</b>	15
<b>Section Marks :</b>	50
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118645

**Question Shuffling Allowed :**

No

**Is Section Default? :**

null

**Question Number : 43 Question Id : 640653814963 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 "FOUNDATION LEVEL : SEMESTER I: MATHEMATICS FOR DATA SCIENCE 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.**

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

**Options :**

6406532730639. ✓ YES

6406532730640. ✗ NO

**Question Number : 44 Question Id : 640653814964 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

**Instructions:**

- There are some questions which have functions with discrete valued domains (such as day, month, year etc). For simplicity, we treat them as continuous functions.
- For NAT type question, enter only one right answer even if you get multiple answers for that particular question.

**Options :**

6406532730641. ✓ Instructions has been mentioned above.

6406532730642. ✖ This Instructions is just for a reference & not for an evaluation.

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118646

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

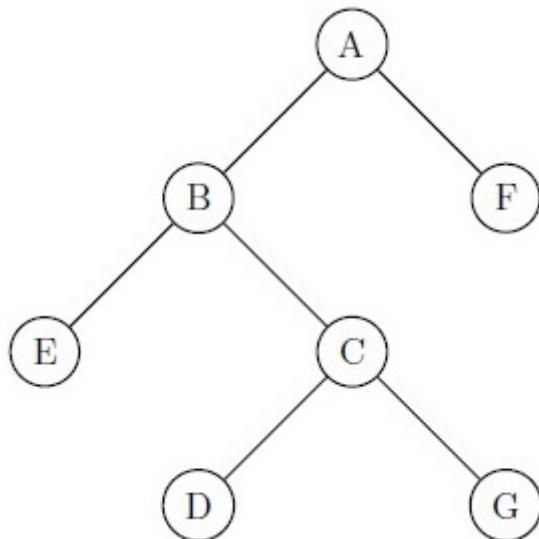
**Question Number : 45 Question Id : 640653814973 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

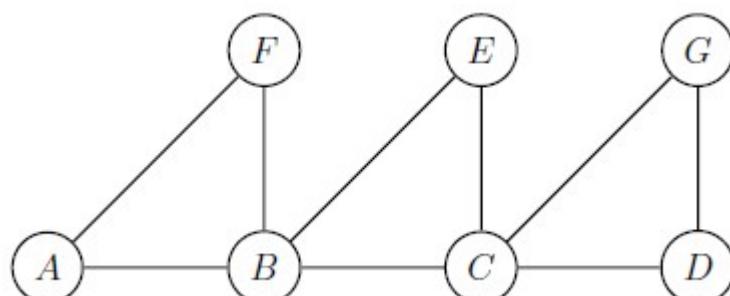
**Correct Marks : 4**

Question Label : Multiple Choice Question

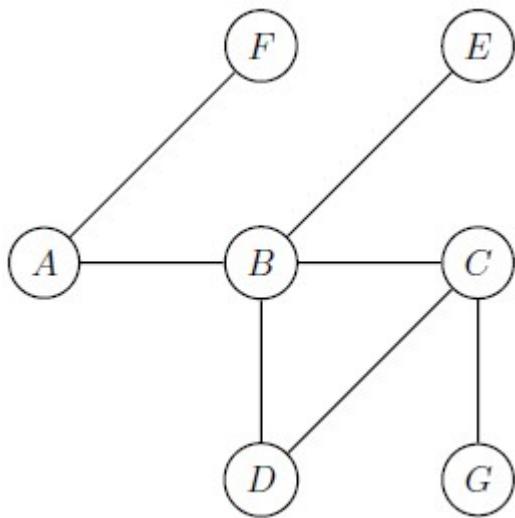
The DFS (Depth First Search) tree of a graph starting with vertex A is shown below. Choose the option which might be the original graph.



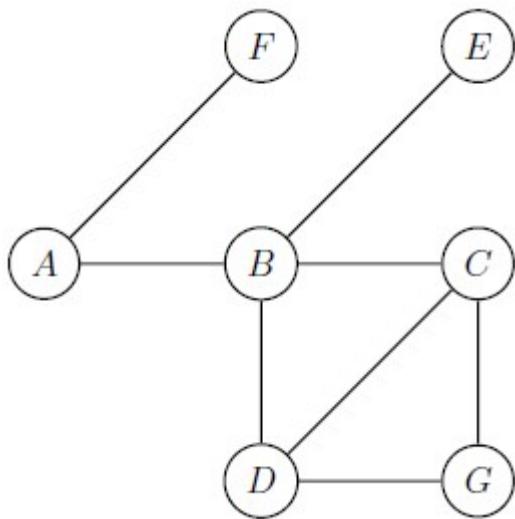
**Options :**



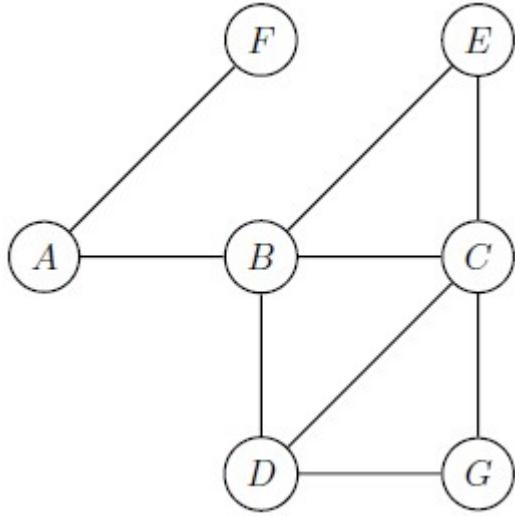
6406532730658. ✖



6406532730659. ✓



6406532730660. ✗



6406532730661. ✗

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118647

**Question Shuffling Allowed :** Yes

**Is Section Default? :**

null

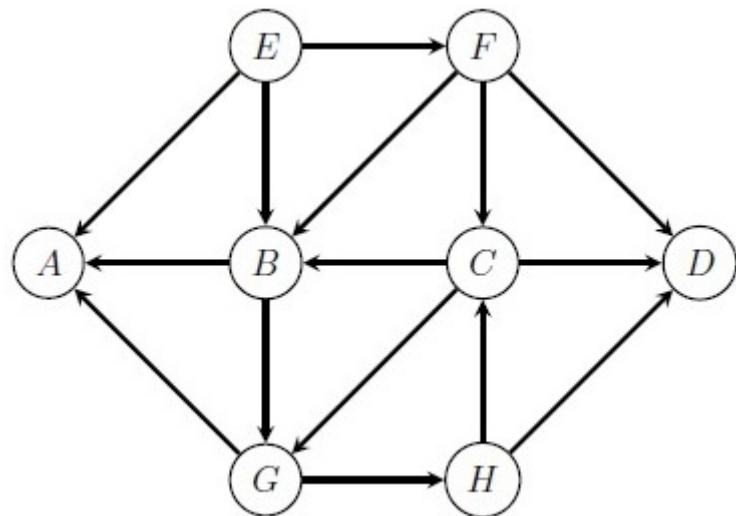
**Question Number : 46 Question Id : 640653814972 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following are valid topological orderings of the given DAG ?



**Options :**

6406532730654. ✘ E, F, C, B, A, G, H, D

6406532730655. ✘ E, F, B, C, G, A, H, D

6406532730656. ✓ E, F, C, B, G, A, H, D

6406532730657. ✓ E, F, C, B, G, H, D, A

**Question Number : 47 Question Id : 640653814974 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Suppose  $A = \{a, b, c, d\}$  and  $B = \{p, q, r, s\}$  are two sets. Consider the following relations on  $A \times B$ .

- $R_1 = \{(a, p), (c, r), (d, q)\}$
- $R_2 = \{(a, s), (b, s), (c, p), (d, r)\}$
- $R_3 = \{(a, p), (b, r), (b, s), (d, q)\}$
- $R_4 = \{(a, r), (b, p), (c, q), (d, s)\}$

Which of the following statements are correct?

**Options :**

6406532730662. ✘  $R_2, R_3$ , and  $R_4$  are functions.

6406532730663. ✓  $R_2$  and  $R_4$  are functions.

6406532730664. ✘  $R_2$  is an injective function.

6406532730665. ✓  $R_4$  is a bijective function.

**Question Number : 48 Question Id : 640653814988 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following statements is/are true about the function  $f(x) = |x^2 - 4x + 3| + 17$ ?

**Options :**

6406532730682. ✓  $f$  is defined for all  $x \in \mathbb{R}$ .

6406532730683. ✘  $f$  is an injective function.

6406532730684. ✓ The range of  $f$  is  $[17, \infty)$ .

6406532730685. ✘ The minimum value of  $f$  is 0.

<b>Sub-Section Id :</b>	640653118648
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

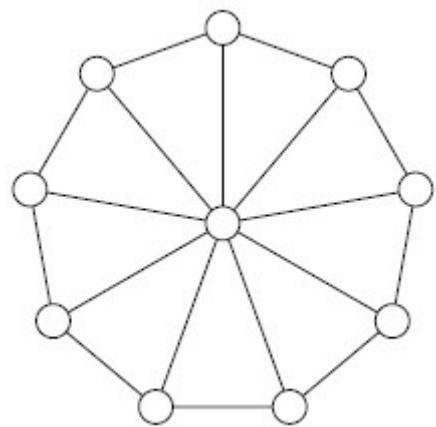
**Question Number : 49 Question Id : 640653814971 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

What is the minimum number of colours required to colour the graph given below?



**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

4

**Question Number : 50 Question Id : 640653814992 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

$$\text{If the function } f(x) = \begin{cases} Ax - B & \text{if } x \leq -1 \\ 2x^2 + 3Ax + B & \text{if } -1 < x \leq 1 \\ 4 & \text{if } x > 1 \end{cases}$$

is continuous for all  $x \in \mathbb{R}$ , then find the value of  $A - B$ .

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118649

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653814975 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (51 to 52)**

Question Label : Comprehension

A person is climbing stairs and he stops at a point  $P$  on the stairs after reaching two third of the total distance of stairs. The stairs forms an isosceles triangle with the floor and wall. Assume the origin  $(0, 0)$  at the intersection of the wall and floor and the stairs is to the right of the wall.

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 51 Question Id : 640653814976 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

**Question Label :** Short Answer Question

Find the angle between the stairs and the wall (in degrees).

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

45

**Question Number :** 52 **Question Id :** 640653814977 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

If the distance between the bottom of the stairs and the wall is 3m, the  $y$ -coordinate of  $P$  is

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Id :** 640653814989 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix

**Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (53 to 54)

Question Label : Comprehension

Find  $\lim_{n \rightarrow \infty} a_n$  for the given sequences.

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 53 Question Id : 640653814990 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

$$\{a_n\} \text{ such that } a_n = \frac{11n^3 + 2n^2 - 1}{n^3 + 3n}$$

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

11

**Question Number : 54 Question Id : 640653814991 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

$$\{a_n\} \text{ such that } a_n = \frac{1}{8} + \frac{(-1)^n}{n}$$

**Note:**Enter your answer correctly to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

## 0.12 to 0.13

<b>Sub-Section Number :</b>	6
<b>Sub-Section Id :</b>	640653118650
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Id : 640653814965 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

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

Question Label : Comprehension

Consider an undirected graph  $G$  with 12 vertices, where the degree of each vertex is at least 2 and at most 5.

Based on the above data, answer the given subquestions.

### **Sub questions**

**Question Number : 55 Question Id : 640653814966 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Determine the minimum number of edges the graph  $G$  can have.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

**Question Number : 56 Question Id : 640653814967 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Determine the maximum number of edges the graph  $G$  can have.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

30

**Question Id : 640653814978 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (57 to 60)**

Question Label : Comprehension

Consider the following function :

$$f(x) = \begin{cases} -e^{x+2} & x < -2 \\ \frac{-x^4}{16} & -2 \leq x < 0 \\ (x-2)^3 & 0 \leq x \leq 2 \\ 4-x & x > 2 \end{cases}$$

Are the given statements about the function  $f(x)$  true or false?

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 57 Question Id : 640653814979 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

**Question Label :** Multiple Choice Question

The limit of  $f(x)$  at  $x = 2$  does not exist.

**Options :**

6406532730668. ✓ TRUE

6406532730669. ✗ FALSE

**Question Number : 58 Question Id : 640653814980 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

The limit of  $f(x)$  at  $x = 0$  exists and it's equal to  $f(0) = -8$ . i.e.  $f(x)$  is continuous at  $x = 0$ .

**Options :**

6406532730670. ✗ TRUE

6406532730671. ✓ FALSE

**Question Number : 59 Question Id : 640653814981 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

The limit of  $f(x)$  at  $x = -2$  exists and it's equal to  $f(-2) = -1$ . i.e.  $f(x)$  is continuous at  $x = -2$ .

**Options :**

6406532730672. ✓ TRUE

6406532730673. ✗ FALSE

**Question Number : 60 Question Id : 640653814982 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

$f(x)$  is continuous on the entire real line.

**Options :**

6406532730674. ✘ TRUE

6406532730675. ✓ FALSE

**Question Id : 640653814983 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (61 to 64)**

Question Label : Comprehension

Consider a polynomial function

$f(x) = 3x^5 - 25x^3 + 60x + 47$  which is defined in  $\mathbb{R}$ .

Answer the given sub-questions.

**Sub questions**

**Question Number : 61 Question Id : 640653814984 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

How many critical points does  $f(x)$  have?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

4

**Question Number : 62 Question Id : 640653814985 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Is the statement True or False:  $f(x)$  is decreasing in the set  $(-\infty, -2] \cup (-1, 2)$  and  $x = 1$  is a saddle point.

**Options :**

6406532730677. ✘ TRUE

6406532730678. ✓ FALSE

**Question Number : 63 Question Id : 640653814986 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Is the statement True or False:  $f(x)$  is increasing in the set  $(-2, -1) \cup (2, \infty)$  and  $x = -1$  is a point of local maxima.

**Options :**

6406532730679. ✘ TRUE

6406532730680. ✓ FALSE

**Question Number : 64 Question Id : 640653814987 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

**Question Label :** Short Answer Question

How many points of local minima does  $f(x)$  have?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Id : 640653814993 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (65 to 66)**

Question Label : Comprehension

Suppose  $f$  is a real valued function defined on  $\mathbb{R}$ . Let  $f(x+y) = f(x)f(y)$  for all  $x, y \in \mathbb{R}$  and  $f(1) = 7$  and  $f'(0) = 2$ .

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 65 Question Id : 640653814994 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the value of  $f(0)$ ?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number : 66 Question Id : 640653814995 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the value of  $f'(1)$ ?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

14

**Sub-Section Number :** 7

**Sub-Section Id :** 640653118651

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653814968 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (67 to 68)**

Question Label : Comprehension

Consider the following adjacency matrix

$$\begin{array}{ccccc} & A & B & C & D & E \\ A & \left( \begin{array}{ccccc} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \end{array} \right) \\ B & \\ C & \\ D & \\ E & \end{array}$$

which represents graph  $G$  which has 5 vertices  $A, B, C, D$  and  $E$ .

Based on the above data, answer the given subquestions.

### **Sub questions**

**Question Number : 67 Question Id : 640653814969 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following is true about the graph  $G$ ?

#### **Options :**

6406532730645. ✓ The vertices  $A, B, D$  and  $E$  are reachable from vertex  $C$ .

6406532730646. ✗ The longest path in the graph  $G$  starts with vertex  $C$  and ends with vertex  $E$ .

6406532730647. ✓ The graph  $G$  is a directed acyclic graph.

6406532730648. ✓ The longest path in the graph  $G$  has length 3, in terms of number of edges.

**Question Number : 68 Question Id : 640653814970 Question Type : MSQ Is Question**

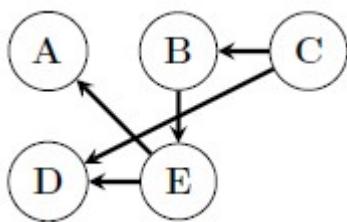
**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

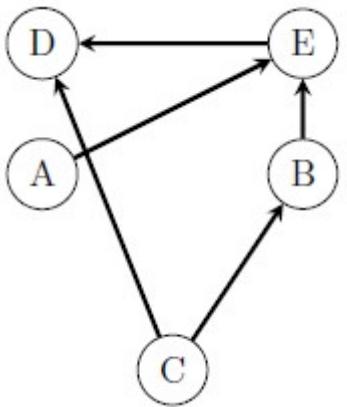
Question Label : Multiple Select Question

Which of the following graph(s) is represented by the given adjacency matrix?

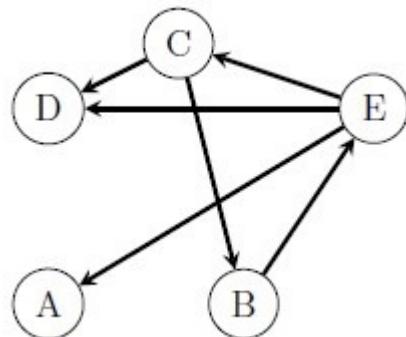
#### **Options :**



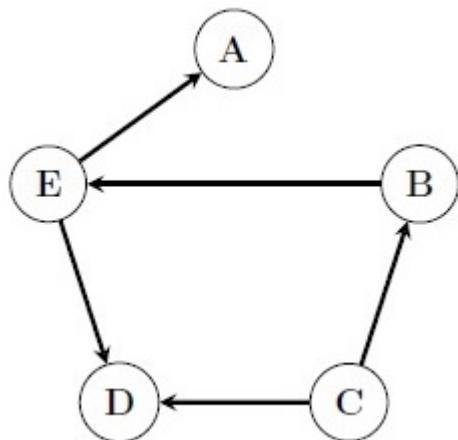
6406532730649. ✓



6406532730650. ✗



6406532730651. ✗



6406532730652. ✓

<b>Section Id :</b>	64065356654
<b>Section Number :</b>	4
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	15
<b>Number of Questions to be attempted :</b>	15
<b>Section Marks :</b>	50
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118652
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 69 Question Id : 640653814996 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 "FOUNDATION LEVEL: SEMESTER II:  
MATHEMATICS FOR DATA SCIENCE II (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 :**

6406532730691. ✓ YES

6406532730692. ✗ NO

**Sub-Section Number :** 2**Sub-Section Id :** 640653118653**Question Shuffling Allowed :** Yes**Is Section Default? :** null**Question Number : 70 Question Id : 640653815001 Question Type : MCQ Is Question****Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0****Correct Marks : 2**

Question Label : Multiple Choice Question

Let  $S = \{v_1, v_2, v_3, v_4\}$  be a subset of  $\mathbb{R}^3$ . Select all true statements.**Options :**6406532730702. ✓  $S$  is linearly dependent.6406532730703. ✗  $S$  is linearly independent.6406532730704. ✗ Deleting any one element from  $S$  turns it into a basis.6406532730705. ✗  $\text{span}(S) = \mathbb{R}^3$ **Sub-Section Number :** 3**Sub-Section Id :** 640653118654**Question Shuffling Allowed :** Yes**Is Section Default? :** null

**Question Number : 71 Question Id : 640653815022 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Let  $f(x, y) = 2x^4 - 8\sqrt{y} - 7$ . Choose the correct options from the following:

**Options :**

6406532730745. ✓  $f$  is increasing at the point  $(1, 4)$ , if  $y$  is fixed and  $x$  is varied.

6406532730746. ✗  $f$  is decreasing at the point  $(1, 4)$ , if  $y$  is fixed and  $x$  is varied.

6406532730747. ✓  $f$  is decreasing at the point  $(1, 4)$ , if  $x$  is fixed and  $y$  is varied.

6406532730748. ✗ None of these

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118655

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 72 Question Id : 640653814997 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Let  $A$  and  $B$  be two square matrices of the same order. Select all true statements.

**Options :**

6406532730693. ✓ The  $i^{\text{th}}$  column of  $AB$  is a linear combination of the columns of  $A$ .

6406532730694. ✓ The  $i^{\text{th}}$  row of  $AB$  is a linear combination of the rows of  $B$ .

6406532730695. ✗ The  $i^{\text{th}}$  column of  $AB$  is a linear combination of the columns of  $B$ .

6406532730696. ✗ The  $i^{\text{th}}$  row of  $AB$  is a linear combination of the rows of  $A$ .

**Question Number : 73 Question Id : 640653815002 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the matrix  $A = \begin{bmatrix} a & b & b \\ a & a & b \\ a & a & a \end{bmatrix}$ . If  $A$  is invertible, which of the following conditions must be satisfied? Select all conditions that apply.

**Options :**

6406532730706. ✓  $a \neq b$

6406532730707. ✓  $a \neq 0$

6406532730708. ✗  $a = b$

6406532730709. ✗  $a = b = 0$

6406532730710. ✗  $a = 0$

**Sub-Section Number :**

5

**Sub-Section Id :**

640653118656

**Question Shuffling Allowed :**

Yes

**Is Section Default? :**

null

**Question Number : 74 Question Id : 640653815017 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Choose the correct option(s) from the following:

**Options :**

6406532730735. ✓ The orthonormal set obtained from  $\{(0, 1), (-1, 3)\}$  using Gram-Schmidt process is  $\{(0, 1), (-1, 0)\}$ .

6406532730736. ✗  $\begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}$  is an orthogonal matrix.

6406532730737. ✓ Let  $W = \{(x, y, z) \in \mathbb{R}^3 : x + 2y + z = 0\}$ . If  $u = (1, -1, 1)$  and if  $P_W$  is the projection from  $\mathbb{R}^3$  to  $W$ , then  $P_W(u) = u$ .

6406532730738. ✗ The determinant of a matrix formed by 3 orthonormal vectors in  $\mathbb{R}^3$  is always 1.

**Question Number : 75 Question Id : 640653815021 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Choose the option(s) for which the limit exists.

**Options :**

6406532730741. ✗  $\lim_{(x,y) \rightarrow (0,0)} \frac{3x^2y}{x^4 + y^2}$

6406532730742. ✗  $\lim_{(x,y) \rightarrow (0,0)} \frac{|xy|}{x^2 + y^2}$ .

6406532730743.

✓  $\lim_{(x,y) \rightarrow (\pi,1)} \frac{x}{y} - \sin xy.$

6406532730744. ✓  $\lim_{(x,y) \rightarrow (1,1)} \frac{5x^2 - 6xy + y^2}{x^2 - y^2}$

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118657

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653814998 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (76 to 77)**

Question Label : Comprehension

Let  $x = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}$  and  $y = \begin{bmatrix} y_1 \\ \vdots \\ y_n \end{bmatrix}$  be two non-zero column vectors in  $\mathbb{R}^n$ .

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 76 Question Id : 640653814999 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

What is the dimension of  $xy^T$ ?

**Options :**

6406532730697.

✓  $n \times n$

6406532730698. ✖  $1 \times n$

6406532730699. ✖  $n \times 1$

6406532730700. ✖  $1 \times 1$

**Question Number : 77 Question Id : 640653815000 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

What is the rank of  $xy^T$ ?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

1

**Sub-Section Number : 7**

**Sub-Section Id : 640653118658**

**Question Shuffling Allowed : No**

**Is Section Default? : null**

**Question Id : 640653815003 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

## **Question Numbers : (78 to 80)**

Question Label : Comprehension

Let  $A$  be a  $3 \times 5$  matrix.

Based on the above data, answer the given subquestions.

### **Sub questions**

**Question Number : 78 Question Id : 640653815004 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

How many solutions does  $Ax = 0$  have?

**Options :**

6406532730711. ✘ Exactly one solution

6406532730712. ✓ Infinitely many solutions

6406532730713. ✘ No solution

6406532730714. ✘ Insufficient data. This depends on the entries of  $A$ .

**Question Number : 79 Question Id : 640653815005 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

How many solutions does  $A^T x = 0$  have?

**Options :**

6406532730715. ✘ Exactly one solution

6406532730716. ✘ Infinitely many solutions

6406532730717. ✘ No solution

6406532730718. ✓ Insufficient data. This depends on the entries of  $A$ .

**Question Number : 80 Question Id : 640653815006 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Let  $T : \mathbb{R}^5 \rightarrow \mathbb{R}^3$  be the linear transformation whose matrix representation is  $A$  with respect to the standard basis for both domain and co-domain.

Which of the following is true?

**Options :**

6406532730719. ✓  $T$  could be onto, but it can never be one-one

6406532730720. ✗  $T$  could be one-one, but it can never be onto

6406532730721. ✗  $T$  could be both one-one and onto

**Question Id : 640653815007 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (81 to 83)**

Question Label : Comprehension

Find the dimension of the given vector spaces in the subquestions.

**Sub questions**

**Question Number : 81 Question Id : 640653815008 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

$U = \{x \in \mathbb{R}^4 \mid \langle x, u \rangle = 0 \text{ where } u = (1, -1, 2, -1)\}$  is a subspace of  $\mathbb{R}^4$  and the dot product is used as the inner product.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

3

**Question Number :** 82 **Question Id :** 640653815009 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

$$V = \left\{ \begin{bmatrix} x & 0 & y \\ 0 & 0 & 0 \\ 0 & x+y & 0 \end{bmatrix} : x, y \in \mathbb{R} \right\},$$

where  $V$  is a subspace of  $M_{3 \times 3}(\mathbb{R})$ , the vector space of all  $3 \times 3$  real matrices.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Number :** 83 **Question Id :** 640653815010 **Question Type :** SA **Calculator :** None

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

**Correct Marks : 1**

**Question Label :** Short Answer Question

$$W = \{(x, y, z) : x + y - 2z = 0$$

and  $2x - y + z = 0$  and  $x, y, z \in \mathbb{R}\},$

where  $W$  is a subspace of  $\mathbb{R}^3$ .

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Sub-Section Number :** 8

**Sub-Section Id :** 640653118659

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653815011 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix

**Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (84 to 85)

**Question Label :** Comprehension

Let  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be the linear transformation given by

$$T(x) = x \text{ for all } x \in \mathbb{R}^2.$$

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number :** 84 **Question Id :** 640653815012 **Question Type :** MCQ **Is Question Mandatory :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction**

**Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Which of the following is the matrix representation of  $T$  with respect to the basis  $\{(1, 1), (-1, 1)\}$  for the domain and the standard ordered basis for the co-domain?

**Options :**

6406532730725. ✓  $\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$

6406532730726. ✗  $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

6406532730727. ✗  $\begin{bmatrix} 0.5 & 0.5 \\ -0.5 & 0.5 \end{bmatrix}$

6406532730728. ✗  $\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$

**Question Number : 85 Question Id : 640653815013 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following are valid matrix representations of  $T$  with suitable bases for the domain and co-domain? Note that the bases could be different for the domain and co-domain.

**Options :**

6406532730729. ✓  $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

6406532730730.

✖  $\begin{bmatrix} 6 & 3 \\ 4 & 2 \end{bmatrix}$

6406532730731. ✓  $\begin{bmatrix} -1 & 4 \\ 3 & 0 \end{bmatrix}$

6406532730732. ✖  $\begin{bmatrix} -2 & 1 \\ 2 & -1 \end{bmatrix}$

**Question Id : 640653815014 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (86 to 87)**

Question Label : Comprehension

If  $(a, b)$  is the point on the line  $y = -x$  nearest to the point  $(2, -4)$ ,

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 86 Question Id : 640653815015 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Short Answer Question

find  $a$ .

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas :** PlainText

**Possible Answers :**

3

**Question Number :** 87 **Question Id :** 640653815016 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 2

Question Label : Short Answer Question

find  $b$ .

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

-3

**Question Id :** 640653815018 **Question Type :** COMPREHENSION **Sub Question Shuffling**

**Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix

**Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (88 to 89)

Question Label : Comprehension

Answer the given subquestions:

**Sub questions**

**Question Number :** 88 **Question Id :** 640653815019 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 2

Question Label : Short Answer Question

Suppose the function  $T(x, y, z) = \frac{xz}{x^2 + y^2}$

represents temperature at the point

$(x, y, z)$  in a room and  $(u_1, u_2, u_3)$

is the unit vector in the direction in  
which the temperature increases most  
rapidly at the point  $(1, 0, 1)$ .

Find  $u_1 + u_2 + u_3$ .

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0

**Question Number : 89 Question Id : 640653815020 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Suppose  $a$  is the rate of change  
of the function  $f(x, y, z) = x^3yz^2$   
at the point  $(-1, 2, 1)$  in  
the direction where  $f$  decreases  
most rapidly. Find  $a^2$ .

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

**Question Id : 640653815023 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (90 to 92)**

Question Label : Comprehension

Let  $f(x, y) = x^3 + y^3 - 3(x + y^2)$ .

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 90 Question Id : 640653815024 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Short Answer Question

How many critical points are there for  $f$ ?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

**4**

**Question Number : 91 Question Id : 640653815025 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Short Answer Question

How many saddle points are there for  $f$ ?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Number :** 92 **Question Id :** 640653815026 **Question Type :** MSQ **Is Question**

**Mandatory :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Correct Marks :** 2 **Max. Selectable Options :** 0

Question Label : Multiple Select Question

Choose the correct option(s) from the following:

**Options :**

6406532730751. ✓  $f$  has a local minimum at the point (1,2).

6406532730752. ✗  $f$  has a local maximum at the point (1,2).

6406532730753. ✗  $f$  has a local maximum at the point (1, 0).

6406532730754. ✓  $f$  has a local maximum at the point (-1, 0).

**Sub-Section Number :** 9

**Sub-Section Id :** 640653118660

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653815027 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (93 to 95)

Question Label : Comprehension

Answer the given subquestions about the functions

$$u(x, y) = xy + 2e^x \text{ and } v(x, y) = y^2 + ye^x$$

### Sub questions

**Question Number : 93 Question Id : 640653815028 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

If  $L_u(x, y)$  is the linear approximation of the function  $u(x, y)$  at point  $(1, 2)$

and  $L_u(2, 3) = a + be$ , and if

$L_v(x, y)$  is the linear approximation

of the function  $v(x, y)$  at point  $(2, 1)$

and  $L_v(2, 3) = c + de^2$ , where  $a, b, c, d$

are integers,

find  $a + b$ .

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

9

**Question Number : 94 Question Id : 640653815029 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

If  $L_u(x, y)$  is the linear approximation of the function  $u(x, y)$  at point  $(1, 2)$  and  $L_u(2, 3) = a + be$ , and if  $L_v(x, y)$  is the linear approximation of the function  $v(x, y)$  at point  $(2, 1)$  and  $L_v(2, 3) = c + de^2$ , where  $a, b, c, d$  are integers,

find  $c + d$ .

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

8

**Question Number :** 95 **Question Id :** 640653815030 **Question Type :** MSQ Is Question

**Mandatory :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Correct Marks :** 4 **Max. Selectable Options :** 0

Question Label : Multiple Select Question

Choose the correct option(s) from the following:

**Options :**

6406532730757. ✓  $z = 2y + (3 + 2e^2)x - 2e^2 - 6$  is the tangent plane to the function  $u(x, y)$  at the point  $(2, 3)$ .

6406532730758. ✓  $x(t) = 2 + \frac{t}{\sqrt{2}}, y(t) = 3 + \frac{t}{\sqrt{2}}, z(t) = (6 + 2e^2) + \frac{t}{\sqrt{2}}(5 + 2e^2)$  is the tangent line of the function  $u(x, y)$  at the point  $(2, 3)$  in the direction of  $(1, 1)$ .

6406532730759. ✓

$z = 3e^2x + (6 + e^2)y - 6e^2 - 9$  is the tangent plane to the function  $v(x, y)$  at the point  $(2, 3)$ .

$x(t) = 2 + \frac{t}{\sqrt{2}}, y(t) = 3 + \frac{t}{\sqrt{2}}, z(t) = (9 + 3e^2) + \frac{t}{\sqrt{2}}(3 + 2e^2)$  is the tangent line of the function  $v(x, y)$  at the point  $(2, 3)$  in the direction of  $(1, 1)$ .  
6406532730760. \*

## Sem2 Statistics2

<b>Section Id :</b>	64065356655
<b>Section Number :</b>	5
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	12
<b>Number of Questions to be attempted :</b>	12
<b>Section Marks :</b>	40
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118661
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 96 Question Id : 640653815031 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 "FOUNDATION LEVEL : SEMESTER II: STATISTICS FOR DATA SCIENCE II (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 :**

6406532730761. ✓ YES

6406532730762. ✗ NO

**Question Number : 97 Question Id : 640653815032 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

Use the following information if required:

1.  $F_Z$  values.

$$F_Z(-1.75) = 0.04, F_Z(-0.175) = 0.43, F_Z(-1.645) = 0.05, F_Z(1) = 0.84134, F_Z(-1) = 0.15866$$

$$2. \int e^{ax} dx = \frac{e^{ax}}{a}.$$

$$3. e^{-2} = 0.14, e^{-0.5} = 0.61, e^{-1} = 0.37.$$

$$4. \text{ If } X \sim \text{Normal}(0, \sigma^2), \text{ then } M_X(\lambda) = e^{\lambda^2 \sigma^2 / 2}$$

Discrete random variables:

Distribution	PMF ( $f_X(k)$ )	CDF ( $F_X(x)$ )	$E[X]$	$\text{Var}(X)$
Uniform( $A$ ) $A = \{a, a+1, \dots, b\}$	$\frac{1}{n}, \quad x = k$ $n = b - a + 1$ $k = a, a+1, \dots, b$	$\begin{cases} 0 & x < 0 \\ \frac{k-a+1}{n} & k \leq x < k+1 \\ & k = a, a+1, \dots, b-1, b \\ 1 & x \geq n \end{cases}$	$\frac{a+b}{2}$	$\frac{n^2-1}{12}$
Bernoulli( $p$ )	$\begin{cases} p & x = 1 \\ 1-p & x = 0 \end{cases}$	$\begin{cases} 0 & x < 0 \\ 1-p & 0 \leq x < 1 \\ 1 & x \geq 1 \end{cases}$	$p$	$p(1-p)$
Binomial( $n, p$ )	${}^n C_k p^k (1-p)^{n-k}, \quad k = 0, 1, \dots, n$	$\begin{cases} 0 & x < 0 \\ \sum_{i=0}^k {}^n C_i p^i (1-p)^{n-i} & k \leq x < k+1 \\ & k = 0, 1, \dots, n \\ 1 & x \geq n \end{cases}$	$np$	$np(1-p)$
Geometric( $p$ )	$(1-p)^{k-1} p, \quad k = 1, \dots, \infty$	$\begin{cases} 0 & x < 0 \\ 1 - (1-p)^k & k \leq x < k+1 \\ & k = 1, \dots, \infty \end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$
Poisson( $\lambda$ )	$\frac{e^{-\lambda} \lambda^k}{k!}, \quad k = 0, 1, \dots, \infty$	$\begin{cases} 0 & x < 0 \\ e^{-\lambda} \sum_{i=0}^k \frac{\lambda^i}{i!} & k \leq x < k+1 \\ & k = 0, 1, \dots, \infty \end{cases}$	$\lambda$	$\lambda$

Continuous random variables:

Distribution	PDF ( $f_X(k)$ )	CDF ( $F_X(x)$ )	$E[X]$	$\text{Var}(X)$
Uniform $[a, b]$	$\frac{1}{b-a}, a \leq x \leq b$	$\begin{cases} 0 & x \leq a \\ \frac{x-a}{b-a} & a < x < b \\ 1 & x \geq b \end{cases}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
Exp( $\lambda$ )	$\lambda e^{-\lambda x}, x > 0$	$\begin{cases} 0 & x \leq 0 \\ 1 - e^{-\lambda x} & x > 0 \end{cases}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$
Normal( $\mu, \sigma^2$ )	$\frac{1}{\sigma\sqrt{2\pi}} \exp\left(\frac{-(x-\mu)^2}{2\sigma^2}\right),$ $-\infty < x < \infty$	No closed form	$\mu$	$\sigma^2$
Gamma( $\alpha, \beta$ )	$\frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}, x > 0$		$\frac{\alpha}{\beta}$	$\frac{\alpha}{\beta^2}$
Beta( $\alpha, \beta$ )	$\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1} (1-x)^{\beta-1}$ $0 < x < 1$		$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

1. **Markov's inequality:** Let  $X$  be a discrete random variable taking non-negative values with a finite mean  $\mu$ . Then,

$$P(X \geq c) \leq \frac{\mu}{c}$$

2. **Chebyshev's inequality:** Let  $X$  be a discrete random variable with a finite mean  $\mu$  and a finite variance  $\sigma^2$ . Then,

$$P(|X - \mu| \geq k\sigma) \leq \frac{1}{k^2}$$

3. **Weak Law of Large numbers:** Let  $X_1, X_2, \dots, X_n \sim \text{iid } X$  with  $E[X] = \mu, \text{Var}(X) = \sigma^2$ .

Define sample mean  $\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{n}$ . Then,

$$P(|\bar{X} - \mu| > \delta) \leq \frac{\sigma^2}{n\delta^2}$$

4. **Using CLT to approximate probability:** Let  $X_1, X_2, \dots, X_n \sim \text{iid } X$  with  $E[X] = \mu, \text{Var}(X) = \sigma^2$ .

Define  $Y = X_1 + X_2 + \dots + X_n$ . Then,

$$\frac{Y - n\mu}{\sqrt{n}\sigma} \approx \text{Normal}(0, 1).$$

5. Bias of an estimator:  $\text{Bias}(\hat{\theta}, \theta) = E[\hat{\theta}] - \theta$ .

6. Method of moments: Sample moments,  $M_k(X_1, X_2, \dots, X_n) = \frac{1}{n} \sum_{i=1}^n X_i^k$

Procedure: For one parameter  $\theta$

- Sample moment:  $m_1$
- Distribution moment:  $E(X) = f(\theta)$
- Solve for  $\theta$  from  $f(\theta) = m_1$  in terms of  $m_1$ .
- $\hat{\theta}$ : replace  $m_1$  by  $M_1$  in the above solution.

7. Likelihood of i.i.d. samples: Likelihood of a sampling  $x_1, x_2, \dots, x_n$ , denoted

$$L(x_1, \dots, x_n) = \prod_{i=1}^n f_X(x_i; \theta_1, \theta_2, \dots)$$

8. Maximum likelihood (ML) estimation:

$$\theta_1^*, \theta_2^*, \dots = \arg \max_{\theta_1^*, \theta_2^*, \dots} \prod_{i=1}^n f_X(x_i; \theta_1, \theta_2, \dots)$$

9. Bayesian estimation: Let  $X_1, \dots, X_n \sim \text{i.i.d. } X$ , parameter  $\Theta$ .

Prior distribution of  $\Theta$ :  $\Theta \sim f_\Theta(\theta)$ .

Samples,  $S : (X_1 = x_1, \dots, X_n = x_n)$

Posterior:  $\Theta | (X_1 = x_1, \dots, X_n = x_n)$

Bayes' rule: Posterior  $\propto$  Prior  $\times$  Likelihood

Posterior density  $\propto f_\Theta(\theta) \times P(X_1 = x_1, \dots, X_n = x_n | \Theta = \theta)$

10. Normal samples with unknown mean and known variance:

$X_1, \dots, X_n \sim \text{i.i.d. Normal}(M, \sigma^2)$ .

Prior  $M \sim \text{Normal}(\mu_0, \sigma_0^2)$ .

Posterior mean:  $\hat{\mu} = \bar{X} \left( \frac{n\sigma_0^2}{n\sigma_0^2 + \sigma^2} \right) + \mu_0 \left( \frac{\sigma^2}{n\sigma_0^2 + \sigma^2} \right)$

## 11. Hypothesis Testing

- Test for mean

Case (1): When population variance  $\sigma^2$  is known ( $z$ -test)

Test	$H_0$	$H_A$	Test statistic	Rejection region
right-tailed	$\mu = \mu_0$	$\mu > \mu_0$	$T = \bar{X}$ $Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$	$\bar{X} > c$
left-tailed	$\mu = \mu_0$	$\mu < \mu_0$	$T = \bar{X}$ $Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$	$\bar{X} < c$
two-tailed	$\mu = \mu_0$	$\mu \neq \mu_0$	$T = \bar{X}$ $Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}$	$ \bar{X} - \mu_0  > c$

Case (2): When population variance  $\sigma^2$  is unknown ( $t$ -test)

Test	$H_0$	$H_A$	Test statistic	Rejection region
right-tailed	$\mu = \mu_0$	$\mu > \mu_0$	$T = \bar{X}$ $t_{n-1} = \frac{\bar{X} - \mu_0}{S/\sqrt{n}}$	$\bar{X} > c$
left-tailed	$\mu = \mu_0$	$\mu < \mu_0$	$T = \bar{X}$ $t_{n-1} = \frac{\bar{X} - \mu_0}{S/\sqrt{n}}$	$\bar{X} < c$
two-tailed	$\mu = \mu_0$	$\mu \neq \mu_0$	$T = \bar{X}$ $t_{n-1} = \frac{\bar{X} - \mu_0}{S/\sqrt{n}}$	$ \bar{X} - \mu_0  > c$

- $\chi^2$ -test for variance:

Test	$H_0$	$H_A$	Test statistic	Rejection region
right-tailed	$\sigma = \sigma_0$	$\sigma > \sigma_0$	$T = \frac{(n-1)S^2}{\sigma_0^2} \sim \chi_{n-1}^2$	$S^2 > c^2$
left-tailed	$\sigma = \sigma_0$	$\sigma < \sigma_0$	$T = \frac{(n-1)S^2}{\sigma_0^2} \sim \chi_{n-1}^2$	$S^2 < c^2$
two-tailed	$\sigma = \sigma_0$	$\sigma \neq \sigma_0$	$T = \frac{(n-1)S^2}{\sigma_0^2} \sim \chi_{n-1}^2$	$S^2 > c^2$ where $\frac{\alpha}{2} = P(S^2 > c^2)$ or $S^2 < c^2$ where $\frac{\alpha}{2} = P(S^2 < c^2)$

- Two samples  $z$ -test for means:

Test	$H_0$	$H_A$	Test statistic	Rejection region
right-tailed	$\mu_1 = \mu_2$	$\mu_1 > \mu_2$	$T = \bar{X} - \bar{Y}$ $\bar{X} - \bar{Y} \sim \text{Normal}\left(0, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)$ if $H_0$ is true	$\bar{X} - \bar{Y} > c$
left-tailed	$\mu_1 = \mu_2$	$\mu_1 < \mu_2$	$T = \bar{Y} - \bar{X}$ $\bar{Y} - \bar{X} \sim \text{Normal}\left(0, \frac{\sigma_2^2}{n_2} + \frac{\sigma_1^2}{n_1}\right)$ if $H_0$ is true	$\bar{Y} - \bar{X} > c$
two-tailed	$\mu_1 = \mu_2$	$\mu_1 \neq \mu_2$	$T = \bar{X} - \bar{Y}$ $\bar{X} - \bar{Y} \sim \text{Normal}\left(0, \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)$ if $H_0$ is true	$ \bar{X} - \bar{Y}  > c$

- Two samples  $F$ -test for variances

Test	$H_0$	$H_A$	Test statistic	Rejection region
one-tailed	$\sigma_1 = \sigma_2$	$\sigma_1 > \sigma_2$	$T = \frac{S_1^2}{S_2^2} \sim F_{(n_1-1, n_2-1)}$	$\frac{S_1^2}{S_2^2} > 1 + c$
one-tailed	$\sigma_1 = \sigma_2$	$\sigma_1 < \sigma_2$	$T = \frac{S_1^2}{S_2^2} \sim F_{(n_1-1, n_2-1)}$	$\frac{S_1^2}{S_2^2} < 1 - c$
two-tailed	$\sigma_1 = \sigma_2$	$\sigma_1 \neq \sigma_2$	$T = \frac{S_1^2}{S_2^2} \sim F_{(n_1-1, n_2-1)}$	$\frac{S_1^2}{S_2^2} > 1 + c_R$ where $\frac{\alpha}{2} = P(T > 1 + c_R)$ or $\frac{S_1^2}{S_2^2} < 1 - c_L$ where $\frac{\alpha}{2} = P(T < 1 - c_L)$

## Options :

6406532730763. ✓ Useful Data has been mentioned above.

6406532730764. ❗ This data attachment is just for a reference & not for an evaluation.

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118662

**Question Shuffling Allowed :** Yes

**Is Section Default? :**

null

**Question Number : 98 Question Id : 640653815033 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

Suppose the moment generating function of a random variable  $X$  is given by

$$M_X(\lambda) = e^{2\lambda^2}$$

Find the value of  $P(-4 < X < 4)$  in terms of  $F_Z$ , where  $F_Z$  is the CDF of a standard normal variable  $Z$ .

**Options :**

6406532730765. ✘  $F_Z(1) - F_Z(-1)$

6406532730766. ✘  $F_Z(-1) - F_Z(1)$

6406532730767. ✓  $F_Z(2) - F_Z(-2)$

6406532730768. ✘  $F_Z(-2) - F_Z(2)$

**Question Number : 99 Question Id : 640653815035 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 100 samples  $X_1, X_2, \dots, X_{100} \sim \text{iid Normal}(\mu, 16)$ . Let the null and alternative hypothesis be  $H_0 : \mu = 1$  and  $H_A : \mu = -1$ . Suppose  $T = \frac{X_1 + X_2 + \dots + X_{100}}{100}$ . Consider a test that rejects  $H_0$  if  $T < c$  for some constant  $c$ . What is the power of the test in terms of ' $c$ '?

**Options :**

6406532730770. ✘  $1 - F_Z \left( \frac{5c + 5}{2} \right)$

6406532730771. ✓  $F_Z \left( \frac{5c + 5}{2} \right)$

6406532730772. ✘  $1 - F_Z \left( \frac{5c - 5}{2} \right)$

6406532730773. ✘  $F_Z \left( \frac{5c - 5}{2} \right)$

**Question Number : 100 Question Id : 640653815037 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 situation and match them with suitable test statistics and hypothesis test:

Suppose we observe samples from a normal distribution, where the variance is unknown. We want to check whether the variance is greater than  $\sigma^2$ . What test statistic and test can be applied to this situation?

**Options :**

6406532730778. ✘ Test Statistic:  $T = \text{Sample mean}$ , Hypothesis test:  $t$ -test.

6406532730779. ✘ Test Statistic:  $T = \text{Sample mean}$ , Hypothesis test:  $\chi^2$ -test.

6406532730780. ✓ Test Statistic:  $T = \text{Sample variance}$ , Hypothesis test:  $\chi^2$ -test.

6406532730781. ❖ Test Statistic:  $T$  = Sample variance, Hypothesis test:  $F$ -test.

<b>Sub-Section Number :</b>	3
<b>Sub-Section Id :</b>	640653118663
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 101 Question Id : 640653815036 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Suppose  $X_1, X_2, \dots, X_5$  are i.i.d. samples from a distribution  $X$  with an unknown mean  $\mu$  and variance  $\sigma^2$ . Let  $\hat{\mu}_1, \hat{\mu}_2$  and  $\hat{\mu}_3$  be three estimators of  $\mu$  given as

$$\hat{\mu}_1 = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{5},$$

$$\hat{\mu}_2 = \frac{X_1 + X_2}{2} + X_3,$$

$$\hat{\mu}_3 = \frac{2X_1 + X_2}{3}.$$

Which of the following option(s) is(are) true?

**Options :**

6406532730774. ✓  $\hat{\mu}_1$  is an unbiased estimator of  $\mu$ .

6406532730775. ❖  $\hat{\mu}_2$  is an unbiased estimator of  $\mu$ .

6406532730776. ✓  $\hat{\mu}_3$  is an unbiased estimator of  $\mu$ .

6406532730777. ❖ All three are biased.

<b>Sub-Section Number :</b>	4
<b>Sub-Section Id :</b>	640653118664
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 102 Question Id : 640653815034 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

The amount of time (in minutes) a postal clerk spends with a customer follows an exponential distribution with parameter  $\lambda$ . The timings (in minutes) from a random sample of 5 customers are as follows:

13, 10, 15, 13, 14

Find the maximum likelihood estimate of  $\lambda$  for the given sample. Enter the answer correct to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

0.06 to 0.10

<b>Sub-Section Number :</b>	5
<b>Sub-Section Id :</b>	640653118665
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Id : 640653815038 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Question Numbers : (103 to 104)**

Question Label : Comprehension

The probability mass function of a random variable  $X$  is given as

$x$	0	1	2	3
$P(X = x)$	$\frac{2\theta}{3}$	$\frac{\theta}{3}$	$\frac{2(1 - \theta)}{3}$	$\frac{(1 - \theta)}{3}$

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 103 Question Id : 640653815039 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Consider a random sample  $(1, 0, 1, 2, 2, 0, 3, 1, 2, 1)$ .

Find the method of moments estimate of  $\theta$  for the given sample. Enter the answer correct to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

0.49 to 0.55

**Question Number : 104 Question Id : 640653815040 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 random sample  $(3, 0, 1, 2, 3, 2, 1, 0, 2, 1)$ .

Find the maximum likelihood estimate of  $\theta$  for the given sample.

**Options :**

6406532730783. ✘  $\frac{1}{10}$

6406532730784. ✘  $\frac{1}{4}$

6406532730785. ✓  $\frac{1}{2}$

6406532730786. ✘  $\frac{31}{60}$

**Question Id : 640653815041 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (105 to 106)**

Question Label : Comprehension

We wish to estimate the probability  $p$  of getting the number five on a biased die using a Bayesian estimator. Consider 10 independent throws and let  $X$  be the number of times five appears on the die. Assume the prior distribution of  $p$  to be Beta(2, 2).

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 105 Question Id : 640653815042 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

Out of 10 throws, if five appeared a total of four times, find the posterior distribution of  $p$ .

**Options :**

6406532730787. ❌ Binomial(10, 0.5)

6406532730788. ❌ Beta(5, 7)

6406532730789. ✓ Beta(6, 8)

6406532730790. ❌ Beta(4, 6)

**Question Number : 106 Question Id : 640653815043 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Find the posterior mean using the correct prior from the previous subquestions. Enter the answer correct to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

0.40 to 0.46

**Question Id : 640653815044 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (107 to 108)**

Question Label : Comprehension

A new curing process developed for a certain type of cement results in a mean compressive strength of 5000 kilograms per square centimeter with a standard deviation of 120 kilograms. Let the null and alternative hypothesis be  $H_0 : \mu = 5000$  and  $H_A : \mu < 5000$ . A random sample of 100 pieces of cement is tested and critical region is defined to be  $\bar{X} < 4979$ .

Based on the above data, answer the given subquestions.

### **Sub questions**

**Question Number : 107 Question Id : 640653815045 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

Find the  $P$ -value. Enter the answer correct to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

0.01 to 0.07

**Question Number : 108 Question Id : 640653815046 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Find the power of the test against the alternative  $\mu = 4967$ . Enter the answer correct to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.81 to 0.87

**Question Id : 640653815047 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (109 to 110)**

Question Label : Comprehension

Suppose a random variable  $X$  represents the waiting time (in minutes) in a hospital and the PDF of  $X$  is

$$f(x) = \begin{cases} ke^{-x/15}, & 0 < x < \infty, \\ 0, & \text{otherwise.} \end{cases}$$

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 109 Question Id : 640653815048 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

Find the value of  $k$  such that  $f(x)$  is a valid PDF.

**Options :**

6406532730794. ✘ 15

6406532730795. ✓  $\frac{1}{15}$

6406532730796. ✘ 1

6406532730797. ❌ Cannot be determined.

**Question Number : 110 Question Id : 640653815049 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the probability that waiting time for a patient will be at most 30 minutes?

Enter the answer correct to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

0.83 to 0.89

**Question Id : 640653815050 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (111 to 113)**

Question Label : Comprehension

The joint PMF of two discrete random variables  $X$  and  $Y$  is given as

$\backslash$	$X$	0	1	2
$Y$				
0	0.124	0.116	0.029	
1	0.072	0.12	0.019	
2	0.103	0.032	0.385	

Joint PMF of  $X$  and  $Y$

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 111 Question Id : 640653815051 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Find the value of  $f_X(0)$ . Enter the answer correct to three decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

0.297 to 0.302

**Question Number : 112 Question Id : 640653815052 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

**Question Label :** Short Answer Question

Find the value of  $f_Y(0)$ . Enter the answer correct to three decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.263 to 0.272

**Question Number :** 113 **Question Id :** 640653815053 **Question Type :** MCQ **Is Question**

**Mandatory :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Correct Marks :** 1

Question Label : Multiple Choice Question

What is the value of  $f_{Y|X=0}(1)$ ?

**Options :**

6406532730801. ✓ 0.241

6406532730802. ✗ 0.072

6406532730803. ✗ 0.388

6406532730804. ✗ 0

## DBMS

**Section Id :** 64065356656

**Section Number :** 6

**Section type :** Online

**Mandatory or Optional :** Mandatory

<b>Number of Questions :</b>	20
<b>Number of Questions to be attempted :</b>	20
<b>Section Marks :</b>	50
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118666
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 114 Question Id : 640653815054 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 : DATA BASE MANAGEMENT SYSTEM (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 :**

6406532730805. ✓ YES

6406532730806. ✗ NO

<b>Sub-Section Id :</b>	640653118667
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 115 Question Id : 640653815056 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the relation  $R(A, B, C, D, E)$  and the functional dependencies set  $\mathcal{F} = \{AD \rightarrow E, B \rightarrow D, BC \rightarrow A, E \rightarrow A, AB \rightarrow C, AC \rightarrow B\}$ . Let  $R1(A, B, C, D)$  be one of the decomposed relations. Find out the number of candidate keys applicable to  $R1(A, B, C, D)$ .

**Options :**

6406532730811. ✘ 1

6406532730812. ✘ 2

6406532730813. ✓ 3

6406532730814. ✘ 4

**Question Number : 116 Question Id : 640653815058 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Let us consider the following statistics for searching a condition within a given relation.

- Number of blocks containing record of the relation ( $b$ ) = 400
- Time to transfer one block ( $t_b$ ) = 0.6 milliseconds
- Time for one seek ( $t_s$ ) = 8 milliseconds

What will be the average cost of selection query on a key attribute using linear search file scan?

**Options :**

6406532730819. ✘ 166 milliseconds

6406532730820. ✘ 12.8 milliseconds

6406532730821. ✓ 128 milliseconds

6406532730822. ✘ 16.6 milliseconds

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118668

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 117 Question Id : 640653815057 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 relational schema:

$\text{prescription}(\text{doctor\_id}, \text{doctor\_name}, \text{patient\_id}, \text{patient\_name}, \text{medicine\_id}, \text{medicine\_name})$ ,

where the domains of all the attributes consist of atomic values. Consider the following

FDs for the relation  $\text{prescription}$ .

- $\text{doctor\_id} \rightarrow \text{doctor\_name}$ ,
- $\text{patient\_id} \rightarrow \text{patient\_name}$ ,
- $\text{medicine\_id} \rightarrow \text{medicine\_name}$ ,
- $\text{doctor\_id} \rightarrow\rightarrow \text{patient\_id}$ ,
- $\text{doctor\_id} \rightarrow\rightarrow \text{medicine\_id}$

From among the decompositions given, identify the one that is in 4NF.

**Options :**

6406532730815. ✘  $(\text{doctor\_id}, \text{doctor\_name})$ ,  
 $(\text{patient\_id}, \text{patient\_name})$ ,  
 $(\text{medicine\_id}, \text{medicine\_name})$ ,

6406532730816. ✘  $(\text{doctor\_id}, \text{doctor\_name})$ ,  
 $(\text{patient\_id}, \text{patient\_name})$ ,  
 $(\text{medicine\_id}, \text{medicine\_name})$ ,  
 $(\text{doctor\_id}, \text{patient\_id}, \text{medicine\_id})$

6406532730817. ✘  $(\text{doctor\_id}, \text{doctor\_name}, \text{patient\_id}, \text{patient\_name})$ ,  
 $(\text{doctor\_id}, \text{doctor\_name}, \text{medicine\_id}, \text{medicine\_name})$

6406532730818. ✓  $(\text{doctor\_id}, \text{doctor\_name})$ ,  
 $(\text{patient\_id}, \text{patient\_name})$ ,  
 $(\text{medicine\_id}, \text{medicine\_name})$ ,  
 $(\text{doctor\_id}, \text{patient\_id})$ ,  
 $(\text{doctor\_id}, \text{medicine\_id})$

**Sub-Section Number :**

4

**Sub-Section Id :**

640653118669

**Question Shuffling Allowed :**

Yes

**Is Section Default? :**

null

**Question Number : 118 Question Id : 640653815055 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

**Question Label : Multiple Choice Question**

Consider the table Students given below:

ID	Name	Department	Marks
001	Harry	Comp. Sci.	90
002	Louis	Maths	88
003	Liam	History	80
004	Niall	Comp. Sci.	86
005	Zayn	History	91
006	Luke	Geography	82
007	Ashton	Maths	87
008	Bradley	Music	78
009	Connor	Biology	92
010	Alex	Music	100

Let hash function  $h(x)$  generate 16-bit binary hash values for the distinct elements in *Department* attribute:

Comp. Sci.- 1100 0010 1110 0101

History- 1000 1010 0101 1110

Maths- 0111 1100 0011 0110

Geography- 1110 0101 0000 1101

Music- 0100 1010 1111 1011

Biology- 0011 1111 1010 0101

If we insert the records in the following order:

Harry, Liam, Niall, Connor, Bradley, Luke, Louis, Zayn, Alex, Ashton.

Considering bucket size as 2, using dynamic hashing technique, which one of the following denotes the correct distribution of records in hash buckets?

**Options :**

6406532730807. ✓

3
Harry
Niall

2
Liam
Zayn

3
Luke

3
Louis
Ashton

2
Connor

3
Bradley
Alex

6406532730808. \*

3
Liam
Niall

2
Harry
Zayn

3
Luke

3
Louis
Ashton

2
Connor

3
Bradley
Alex

6406532730809. ✶

3
Liam
Niall

2
Harry
Zayn

3
Luke

3
Louis
Alex

2
Connor

3
Bradley
Ashton

6406532730810. ✶

3
Liam
Niall

2
Harry
Zayn

3
Luke

3
Connor
Ashton

2
Louis

3
Bradley
Alex

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118670

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 119 Question Id : 640653815060 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

**Choose the correct statement(s):**

**Options :**

6406532730827. ❖ Time complexity of searching in a BST is O(nlogn)

6406532730828. ✓ In a B+ tree the leaf nodes are linked using a link list

6406532730829. ✗ Sparse indices are generally faster than dense indices for locating records.

6406532730830. ✓ B tree does not allow duplicate search-key values

**Question Number : 120 Question Id : 640653815061 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Choose the correct statement(s):

**Options :**

6406532730831. ✓ In Raid 0 architecture, the space utilization is always 100 percent.

6406532730832. ✗ In Raid 1 architecture, the data is striped over different disks.

6406532730833. ✓ In Raid 4 architecture, the striping unit consists of a disk block

6406532730834. ✓ In Raid 5 architecture, the parity blocks are uniformly distributed over all the disks

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118671

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

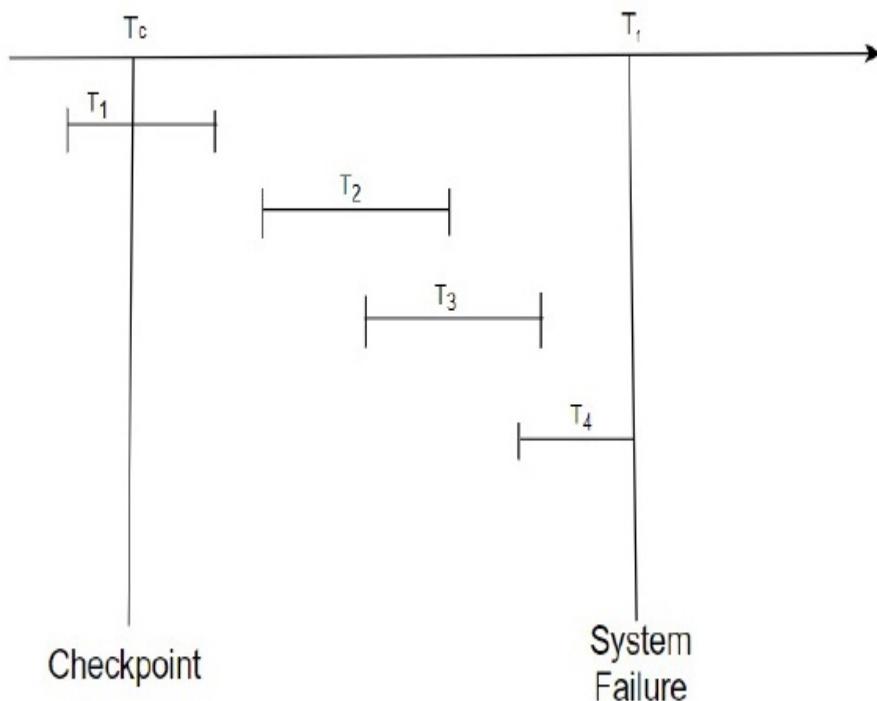
**Question Number : 121 Question Id : 640653815062 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the figure as shown below that consists of four transactions  $T_1, T_2, T_3$  and  $T_4$ .



If system failure occurs then which of the following will be true?

**Options :**

6406532730835. ✘  $T_1$  needs to be undone

6406532730836. ✘  $T_2$  can be ignored

6406532730837. ✓  $T_1, T_2$  and  $T_3$  need to be redone

6406532730838. ✓  $T_4$  needs to be undone

**Question Number : 122 Question Id : 640653815066 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider three transaction  $T_5, T_{10}, T_{15}$  having time-stamps 5, 10 and 15 respectively. Which of the following options is/are correct according to deadlock prevention Wait-Die Scheme?

**Options :**

6406532730851. ✓ If  $T_5$  requests a data item held by  $T_{10}$  then  $T_5$  will "wait"

6406532730852. ✗ If  $T_5$  requests a data item held by  $T_{10}$  then  $T_{10}$  will "wait"

6406532730853. ✗ If  $T_{15}$  requests a data item held by  $T_{10}$ , then  $T_{10}$  will be killed ("die")

6406532730854. ✓ If  $T_{15}$  requests a data item held by  $T_{10}$ , then  $T_{15}$  will be killed ("die")

**Sub-Section Number :** 7

**Sub-Section Id :** 640653118672

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 123 Question Id : 640653815059 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the ER Diagram given below for the UEFA Champions League:

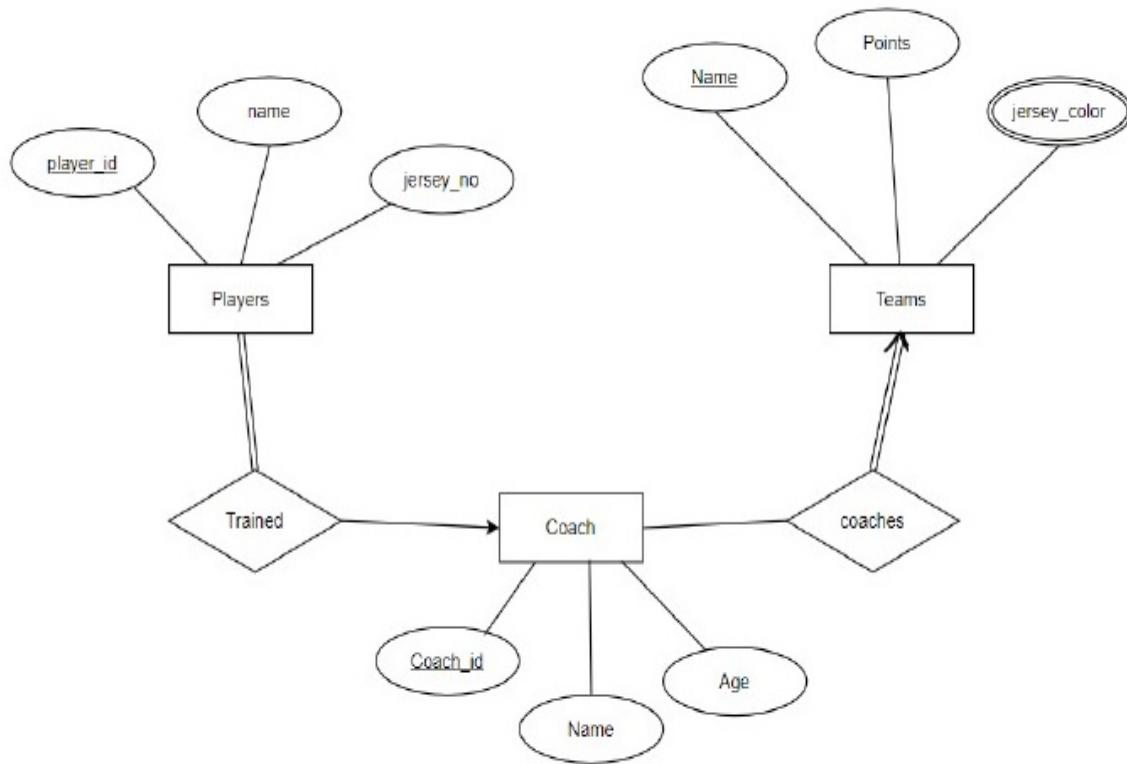


Figure 1: UCL ERD

Which of the following statements is/are true?

**Options :**

6406532730823. ❌ One team cannot have more than one coach

6406532730824. ✓ There might exist a coach who is not training any player

6406532730825. ❌ A coach can be coaching more than one team

6406532730826. ✓ A player can have only one coach

**Question Number : 124 Question Id : 640653815063 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider the following relations:

*players(pid, name, age, jersey\_no)*

*teams(team\_name, matches, points, pid)*

Choose the correct TRC or DRC expression which is equivalent to the below SQL query.

```
SELECT p.name, t.points  
FROM players p natural join teams t  
WHERE p.jersey_no = 7
```

**Options :**

6406532730839. ✓  $\{x \mid \exists p \in \text{players} \exists t \in \text{teams}(p.pid = t.pid \wedge p.jersey\_no = 7 \wedge x.name = p.name \wedge x.points = t.points)\}$

6406532730840. ✗  $\{x \mid \exists p \in \text{players} \exists t \in \text{teams}(p.pid = t.pid \wedge p.jersey\_no = 7 \wedge x.name = p.name)\}$

6406532730841. ✓  $\{\langle b, o \rangle \mid \exists a, b, c, d(\langle a, b, c, d \rangle \in \text{players} \wedge d = 7) \wedge \exists m, n, o, p(\langle m, n, o, p \rangle \in \text{teams} \wedge a = p)\}$

6406532730842. ✗  $\{\langle b, o \rangle \mid \exists a, b, c, d(\langle a, b, c, d \rangle \in \text{players} \wedge d = 7) \wedge \exists m, n, o, p(\langle m, n, o, p \rangle \in \text{teams})\}$

**Question Number : 125 Question Id : 640653815064 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider you are designing a database schema for a university management system. One of the key relations, R, represents information about courses offered, including details such as course code (X), instructor (Y), course title (Z), and maximum enrollment capacity (W). The functional dependencies for this relation are as follows:

$$\mathcal{F} = \{X \rightarrow Y, YZ \rightarrow W, W \rightarrow X\}$$

During the normalization process, you decide to decompose R into two relations: R1(XY) and R2(YZW). Your goal is to ensure that this decomposition preserves all the information without any loss. Determine whether this decomposition is lossless or lossy. If it is lossy, identify which additional functional dependency from the following would make the decomposition lossless.

Choose the correct option(s).

**Options :**

6406532730843. ✘  $XW \rightarrow Y$

6406532730844. ✓  $Y \rightarrow Z$

6406532730845. ✘  $Z \rightarrow W$

6406532730846. ✓  $Y \rightarrow W$

**Question Number : 126 Question Id : 640653815065 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Imagine you're designing a database for a library management system where books are categorized based on their genres, authors, and publication years. The schema includes a relation Books(*Title, Author, Genre, Year*) to store information about the books available in the library.

Choose the correct sets of functional dependencies for the relation Books(*Title, Author, Genre, Year*) under which Books is in 2NF but not in 3NF.

**Options :**

6406532730847. ✖  $\{Title \rightarrow (Author, Genre, Year)\}$

6406532730848. ✓  $\{Title \rightarrow (Author, Genre), Genre \rightarrow Year\}$

6406532730849. ✖  $\{Author \rightarrow Genre, Genre \rightarrow Year\}$

6406532730850. ✓  $\{Title \rightarrow (Author, Genre), (Author, Genre) \rightarrow Year\}$

**Question Number : 127 Question Id : 640653815067 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following two schedules S1 and S2 and three transactions  $T_1, T_2, T_3$ :

S1 :  $R_2(X); R_3(Y); W_2(X); R_1(X); W_3(Y); W_1(X); R_2(Y); W_2(Y);$   
S2 :  $R_3(X); W_3(X); W_2(X); W_2(Y); W_3(Z); R_1(Z); R_1(X); W_1(Y);$

where  $R_i(X)$  denotes a read operation by transaction  $T_i$  on a data item X,  $W_i(X)$  denotes a write operation by transaction  $T_i$  on a data item X.

Which among the following statements is/are correct?

**Options :**

6406532730855. ✓ S1 and S2 are Conflict Serializable.

6406532730856. ✖ S1 and S2 are not Conflict Serializable.

6406532730857. ✓ S1 and S2 are View Serializable.

6406532730858. ❌ S1 and S2 are not View Serializable.

<b>Sub-Section Number :</b>	8
<b>Sub-Section Id :</b>	640653118673
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 128 Question Id : 640653815072 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

Consider the following schedule S with three transactions T1, T2 and T3:

S: R2(D); W2(D); R1(A); W1(A); R3(C); W3(C);

The number of serial schedule for given schedule S is....

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

6

<b>Sub-Section Number :</b>	9
<b>Sub-Section Id :</b>	640653118674
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 129 Question Id : 640653815068 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Consider the relational schema  $R(A, B, C, D, E, F, G)$  with the given list of functional dependencies:

$$\mathcal{F} = \{A \rightarrow BC, D \rightarrow A, E \rightarrow G, CD \rightarrow F\}$$

Calculate the number of non-prime attributes.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

5

**Sub-Section Number :** 10

**Sub-Section Id :** 640653118675

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 130 Question Id : 640653815070 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

Consider the following monthly backup schedule used by a company:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1/ Full	2/ Incremental	3/ Incremental	4/ Differential	5/ Incremental	6/ Incremental	7/ Differential
8/ Incremental	9/ Incremental	10/ Differential	11/ Incremental	12/ Incremental	13/ Differential	14/ Incremental
15/ Incremental	16/ Differential	17/ Incremental	18/ Incremental	19/ Differential	20/ Incremental	21/ Incremental
22/ Differential	23/ Incremental	24/ Incremental	25/ Differential	26/ Incremental	27/ Incremental	28/ Differential
29/ Incremental	30/ Incremental					

Let A be the number of backup sets that need to be loaded for a complete recovery, if there is a system failure on the 11th day of the month (after the backup for the day had been completed). Let B be the number of backup sets that need to be loaded for a complete recovery , if there is a system failure on the 25th day of the month (before the backup for the day had been completed). What will be the value of B-A?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number :** 131 **Question Id :** 640653815071 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 3

**Question Label :** Short Answer Question

Consider the following schedule S with four transactions T1, T2, T3, T4:

S: R2(A), W2(A), W4(A), W4(B), R3(B), W1(C), R4(C), R3(C), R2(D), W3(D)

Where, Ri(A) denotes a read operation by transaction Ti on a data item A, Wi(A) denotes a write operation by transaction Ti on a data item A.

What is the possible number of conflict serializable schedules of the above schedule S?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Sub-Section Number :** 11

**Sub-Section Id :** 640653118676

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 132 Question Id : 640653815069 Question Type : SA Calculator : None**

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

**Correct Marks : 4**

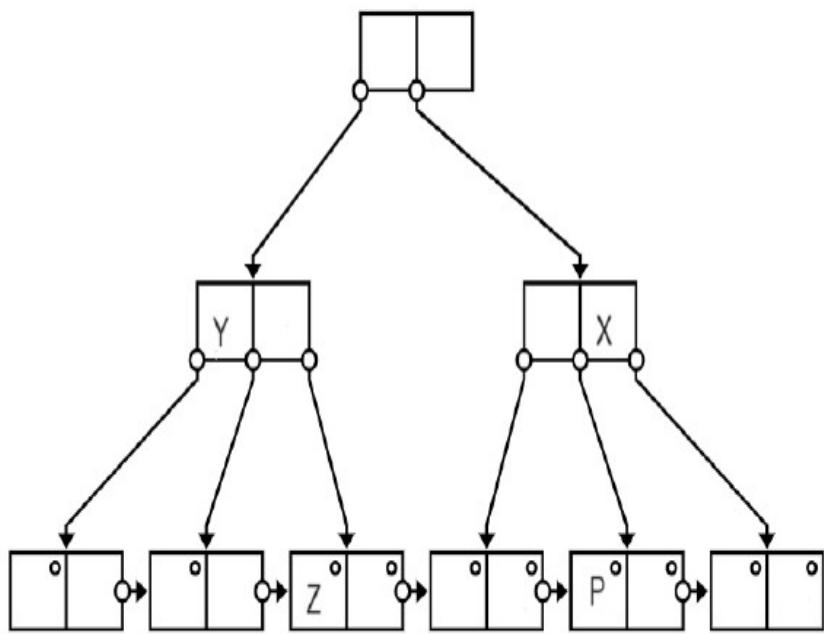
**Question Label :** Short Answer Question

The following key values are inserted into a  $B^+$  tree of order 3 in the given sequence.

The tree is initially empty.

5,9,13,17,3,11,1,20,14,7

Given below is the structure of the tree after creation:



What will be the result of the following expression?

$$X + 2Y - 3Z + P$$

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

21

**Sub-Section Number :** 12

**Sub-Section Id :** 640653118677

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653815073 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix

**Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers : (133 to 134)****Question Label :** Comprehension

Consider the table Points\_Table given below to answer the given subquestions.

Team_ID	Team_Name	Country	Wins	Losses	Draw	Total_Points
001	Barcelona	Spain	8	1	2	16
002	Real Madrid	Spain	6	3	3	12
003	Arsenal	England	5	4	3	10
004	Man United	England	4	5	2	8
005	PSG	France	4	4	3	8
006	Bayern	Germany	3	6	2	6
007	Man City	England	2	4	5	4

Table 1: Points\_Table

**Sub questions****Question Number : 133 Question Id : 640653815074 Question Type : SA Calculator : None****Response Time : N.A Think Time : N.A Minimum Instruction Time : 0****Correct Marks : 3****Question Label :** Short Answer Question

What will be the output of the following SQL query:

```
SELECT Count(*)  
FROM ( ( SELECT Team_Name, Country  
        FROM Points_Table) AS P  
      NATURAL JOIN ( SELECT Country, Team_ID, Draw, Total_Points  
                    FROM Points_Table) AS Q )  
WHERE Draw>2 and Total_Points<12
```

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

**Question Number : 134 Question Id : 640653815075 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Choose the correct expression(s) for the statement given below:

Name all the teams from England, with atmost 5 wins and at least 3 draws.

**Options :**

6406532730865. ✓  $\{M | \exists P \in Points\_Table (P.Country = 'England' \wedge P.Wins \leq 5 \wedge P.Draw \geq 3 \wedge M.Team\_Name = P.Team\_Name)\}$

6406532730866. ✗  $\Pi_{Team\_Name} (\sigma_{Country='England' \wedge Wins \leq 5 \wedge Draw \geq 3} (Points\_Table))$

6406532730867. ✗  $\{M | \exists P \in Points\_Table (P.Country = 'England' \wedge P.Wins \leq 5 \wedge P.Draw > 3)\}$

6406532730868. ✓  $\Pi_{Team\_Name} (\sigma_{Country='England' \wedge Wins \leq 5 \wedge Draw \geq 3} (Points\_Table))$

## PDSA

**Section Id :** 64065356657

**Section Number :** 7

**Section type :** Online

**Mandatory or Optional :** Mandatory

**Number of Questions :** 24

<b>Number of Questions to be attempted :</b>	24
<b>Section Marks :</b>	100
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118678
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 135 Question Id : 640653815076 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 (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 :**

6406532730869. ✓ YES

6406532730870. ✘ NO

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118679

**Question Shuffling Allowed :**

Yes

**Is Section Default? :**

null

**Question Number : 136 Question Id : 640653815077 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

**Question Label : Multiple Choice Question**

Here is a function to return the minimum value in a list of integers. There is a logical error in this function.

```
1 def min_bad(L):
2     mymin = 0
3     for i in range(len(L)):
4         if L[i] < mymin:
5             mymin = L[i]
6     return(mymin)
```

Select the input list for which `min_bad` produces incorrect output.

**Options :**

6406532730871. ✘ [-1, 3, 4, -2]

6406532730872. ✘ [-1, 0, 1, 2]

6406532730873. ✘ [-1, -2, -3, -4]

6406532730874. ✓ [4, 3, 2, 1]

**Question Number : 137 Question Id : 640653815078 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

$$f1(n) = 3n^2 + 2n$$

$$f2(n) = 3n + (\log n)^2$$

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

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

$$f5(n) = 2^n \log n$$

Arrange the above functions in **decreasing** order of asymptotic complexity.

**Options :**

6406532730875. ❌  $f5(n), f1(n), f2(n), f4(n), f3(n)$

6406532730876. ❌  $f5(n), f1(n), f3(n), f2(n), f4(n)$

6406532730877. ❌  $f5(n), f1(n), f4(n), f3(n), f2(n)$

6406532730878. ✓  $f5(n), f1(n), f2(n), f3(n), f4(n)$

**Question Number : 138 Question Id : 640653815079 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the following insertion sort algorithm:

```
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] < L[j-1]):
8             (L[j],L[j-1]) = (L[j-1],L[j])
9             j = j-1
10    return(L)
```

What will be the time complexity of the given insertion sort if the input list consists of  $n$  identical elements?

**Options :**

6406532730879. ✘  $O(n^2)$

6406532730880. ✘  $O(\log n)$

6406532730881. ✘  $O(n \log n)$

6406532730882. ✓  $O(n)$

**Question Number : 139 Question Id : 640653815081 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

The following sequence of queue operations is performed on a Queue:

- 1 Enqueue(10)
- 2 Enqueue(20)
- 3 Dequeue
- 4 Enqueue(20)
- 5 Dequeue
- 6 Enqueue(10)
- 7 Enqueue(20)
- 8 Dequeue
- 9 Dequeue
- 10 Dequeue

The sequence of values removed from the Queue is\_\_.

**Options :**

6406532730888. ✘ 20, 10, 20, 10, 20

6406532730889. ✘ 20, 20, 10, 10, 20

6406532730890. ✓ 10, 20, 20, 10, 20

6406532730891. ✘ 10, 20, 10, 20, 20

**Question Number : 140 Question Id : 640653815082 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

A hash table of size 8 (index 0 to 7) uses open addressing with hash function  $h(k) = k \bmod 8$ , and linear probing. The following elements are added into the hash table, which was initially empty.

17, 11, 85, 26, 46 and 50

The key value 50 is stored at which index of the hash table?

**Options :**

6406532730892. ✘ 2

6406532730893. ✘ 3

6406532730894. ✓ 4

6406532730895. ✗ 5

**Question Number : 141 Question Id : 640653815083 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

You are given a computer network represented as an adjacency list. Each node in the network represents a computer, and an edge between two nodes indicates a network connection. A virus has infected one of the computers. The virus spreads from an infected computer to each of its neighbors in one time step. Your task is to find the minimum number of time steps required for the virus to infect all computers in the network.

Which of the following algorithm is best suited and efficient for solving this problem?

**Options :**

6406532730896. ✓ Breadth-first search.

6406532730897. ✗ Depth-first search.

6406532730898. ✗ Dijkstra's Algorithm

6406532730899. ✗ Bellman-Ford algorithm

**Question Number : 142 Question Id : 640653815086 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

A student wants to join in Diploma in Computer Science. The Diploma has 11 courses. There are some courses have pre-requisite to enroll and complete. The rules are below:

- Course 1 must be finished before course 3 and 4.
- Course 2 must be finished before course 6.
- Course 3 must be finished before course 5.
- Course 5 must be finished before course 8 and 9.
- Course 6 must be finished before course 7.
- Course 7 must be finished before course 5.
- Course 8 must be finished before course 10.
- Course 9 must be finished before course 11.

There no limit about choosing number of courses in a semester. The student can enroll multiple courses in a semester, keeping in mind the constraints above. What is the minimum number of semesters required to complete the Diploma?

**Options :**

6406532730908. ✘ 5

6406532730909. ✓ 6

6406532730910. ✘ 7

6406532730911. ✘ 8

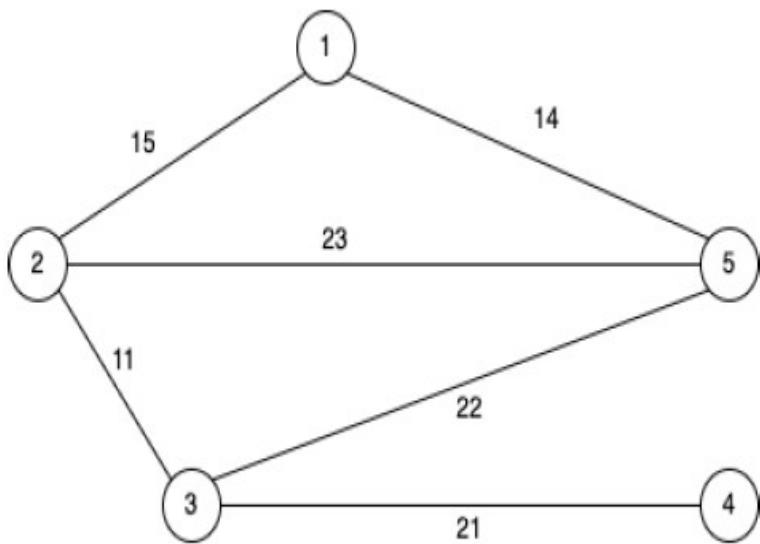
**Question Number : 143 Question Id : 640653815088 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the given graph below:



Which of the following is the correct sequence of edges added to the minimum spanning tree when **Prim's algorithm** is applied on this graph with **5** as the source vertex?

**Options :**

6406532730913. ❌ [(5,1),(3,2),(1,2),(3,4)]

6406532730914. ✓ [(5,1),(1,2),(2,3),(3,4)]

6406532730915. ❌ [(5,1),(3,4),(3,2),(2,1)]

6406532730916. ❌ [(5,1),(3,2),(3,4),(2,1)]

**Question Number : 144 Question Id : 640653815090 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the elements **71, 45, 56, 98, 33, 48 and 96** inserted into empty binary search tree in the same sequence. Which element will be inserted in the lowest level?

**Options :**

6406532730918. ✘ 56

6406532730919. ✘ 33

6406532730920. ✘ 96

6406532730921. ✓ 48

**Question Number : 145 Question Id : 640653815091 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

A Priority-Queue is implemented as a Max-Heap. Initially, the max-heap is [30, 18, 17, 14, 12]. Two new elements 19 and 22 are inserted in the given Max-Heap in that order. Max-Heap after the insertion of the elements is\_\_.

**Options :**

6406532730922. ✘ [30, 18, 22, 19, 17, 14, 12]

6406532730923. ✘ [30, 18, 22, 17, 14, 12, 19]

6406532730924. ✘ [30, 18, 22, 14, 12, 19, 17]

6406532730925. ✓ [30, 18, 22, 14, 12, 17, 19]

**Question Number : 146 Question Id : 640653815092 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

What is the maximum height of a AVL tree with 7 nodes? Consider that the height of the tree with single node is 1.

**Options :**

6406532730926. ✓ 4

6406532730927. ✗ 5

6406532730928. ✗ 3

6406532730929. ✗ 7

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118680

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 147 Question Id : 640653815080 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

```
1 class Node:  
2     def __init__(self,data):  
3         self.data = data  
4         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` pointer that points to the first node of the linked list.

Let the linked list have `n` elements. Which of the following statement(s) is/are true?

**Options :**

6406532730883. ✗ Any element can be directly accessed in the linked list in constant time.

6406532730884. ✗ Insertion of the new node at the end of the linked list takes constant time.

6406532730885. ✓ Insertion of the new node at the end of the linked list takes  $O(n)$  time.

6406532730886. ✓ Deletion of the last node of the linked list takes  $O(n)$  time.

6406532730887. ✗ If linked list is sorted, binary search takes  $O(\log n)$  time for search.

**Question Number : 148 Question Id : 640653815084 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider an undirected unweighted graph  $G$  with following set of vertices ( $V$ ) and edges ( $E$ ):

$$V = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7\}$$

$$E = \{(v_1, v_2), (v_1, v_3), (v_1, v_4), (v_2, v_4), (v_2, v_5), (v_3, v_4), (v_4, v_5), (v_5, v_6), (v_6, v_7)\}.$$

A Breadth First Search(BFS) on the graph  $G$  is performed with  $v_1$  as start vertex. Which of the following is/are the tree edge(s)?

**Options :**

6406532730900. ✗  $(v_2, v_4)$

6406532730901. ✓  $(v_1, v_4)$

6406532730902. ✗  $(v_3, v_4)$

6406532730903. ✓  $(v_5, v_6)$

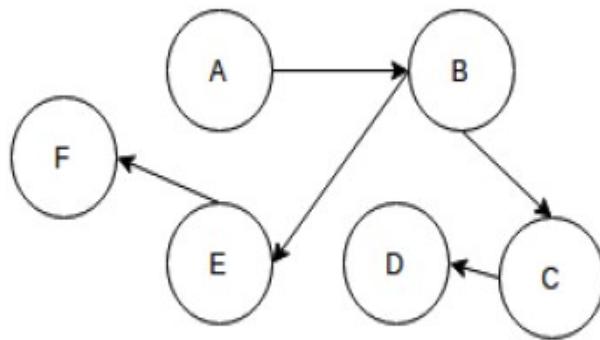
**Question Number : 149 Question Id : 640653815085 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider the graph given below



Which of the following is/are correct topological ordering of the given graph?

**Options :**

6406532730904. ✓ A - B - C - D - E - F

6406532730905. ✗ A - B - E - D - F - C

6406532730906. ✓ A - B - E - C - F - D

6406532730907. ✗ A - B - C - D - F - E

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118681

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

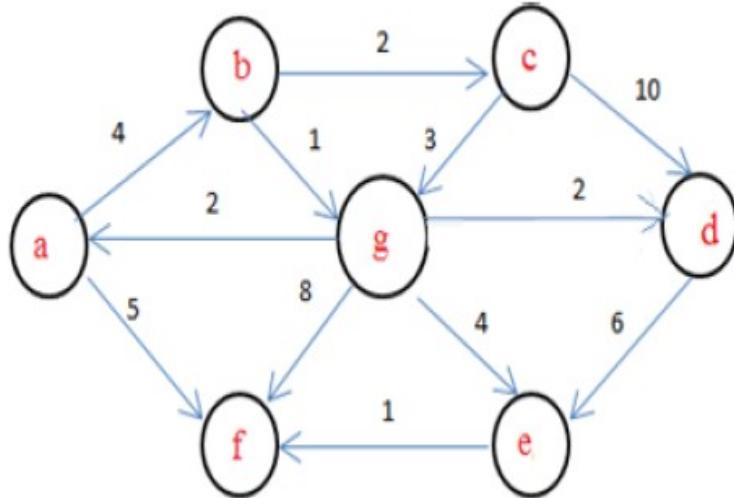
**Question Number : 150 Question Id : 640653815087 Question Type : SA Calculator : None**

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

**Correct Marks : 4**

Question Label : Short Answer Question

In the given graph below, what is the minimum cost to reach vertex **f** from vertex **b**?



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

6

**Question Number :** 151 **Question Id :** 640653815089 **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 a complete binary tree **T** with 17 nodes. The number of leaf nodes in **T** is \_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

**Question Number : 152 Question Id : 640653815093 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**

An entire message is created using characters from the set  $S = \{A, B, C, D, E\}$ . The probability of occurrence of each character is given in the table below.

A	B	C	D	E
0.17	0.11	0.24	0.33	0.15

How many bits will be used to encode the message `ABCDE` using Huffman codes?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

12

**Question Number : 153 Question Id : 640653815094 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**

In a list `L`, two elements `L[i]` and `L[j]` form a inversion if `L[i] > L[j]` and `i < j`. The total number of inversions for the list `L = [2, 3, 5, 9, 7, 1, 4]` is\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas :** PlainText

**Possible Answers :**

9

**Question Number :** 154 **Question Id :** 640653815095 **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 function MoM

```
1 def MoM(L): # Median of medians
2     if len(L) <= 5:
3         L.sort()
4         return(L[len(L)//2])
5     # Construct list of block medians
6     M = []
7     for i in range(0,len(L),5):
8         X = L[i:i+5]
9         X.sort()
10        M.append(X[len(X)//2])
11    return(MoM(M))
```

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

```
1 [6,3,9,11,10,15,12,13,14,16,1,4,2,3,1]
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

9

**Question Number :** 155 **Question Id :** 640653815099 **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 two strings:

$$S_1 = abaabaa$$

$$S_2 = bababba$$

The length of the **longest common subword(substring)** for string  $S_1$  and  $S_2$  is \_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

3

**Question Number : 156 Question Id : 640653815100 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

Let G be a simple graph with 20 vertices. The size of the minimum vertex cover of G is 8. What is the size of the maximum independent set of graph G?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

12

**Sub-Section Number :**

5

**Sub-Section Id :**

640653118682

**Question Shuffling Allowed :**

No

**Is Section Default? :**

null

**Question Id : 640653815096 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (157 to 158)**

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 : 157 Question Id : 640653815097 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**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 :**

6406532730933. ✓ `max(Lis[i], Lis[j]+1)`

6406532730934. ✗ `max(Lis[i], Lis[j])`

6406532730935. ✗ `max(Lis[i], Lis[j+1]+1)`

6406532730936. ✗ `max(Lis[i], Lis[j-1]+1)`

**Question Number : 158 Question Id : 640653815098 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

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

**Options :**

6406532730937. ✗  $O(n)$

6406532730938. ✗  $O(n \log n)$

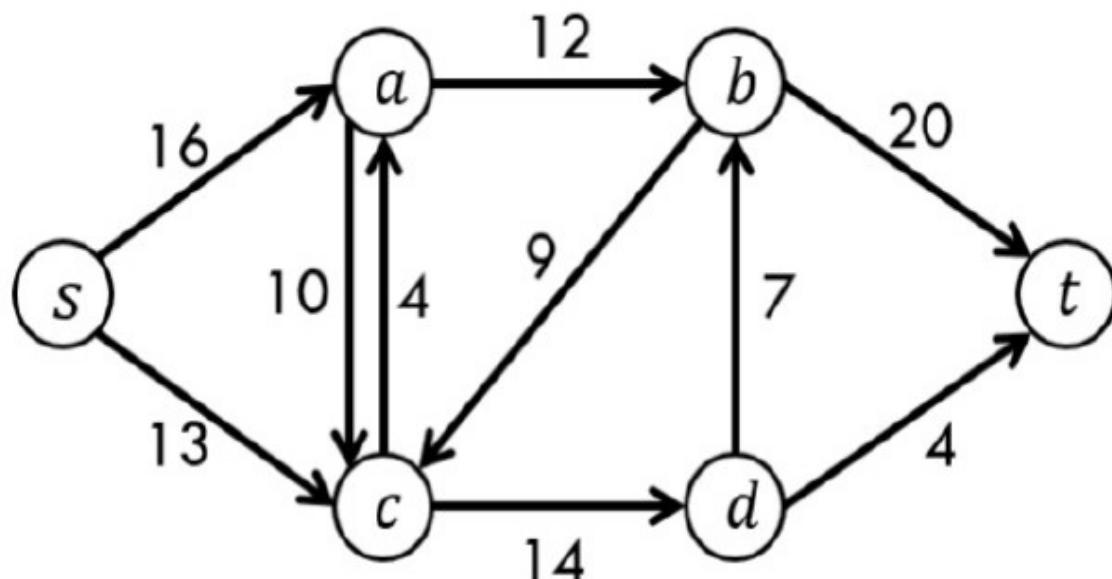
6406532730939. ✗  $O(\log n)$

6406532730940. ✓  $O(n^2)$

**Question Id : 640653815101 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Question Numbers : (159 to 160)**

Question Label : Comprehension

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



Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 159 Question Id : 640653815102 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

The value of the maximum flow in the given network is \_\_

**Options :**

6406532730943. ✘ 21

6406532730944. ✘ 24

6406532730945. ✓ 23

**Question Number : 160 Question Id : 640653815103 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

We want to increase the current maximum flow in a given network by capacity 2 from the vertex  $s$  to  $t$ . Select the edge, if we increase the capacity of that edge by 2, the maximum flow from  $s$  to  $t$  should be increased by 2.

**Options :**

6406532730947. ✶ (a, b)

6406532730948. ✶ (d, b)

6406532730949. ✶ (b, t)

6406532730950. ✓ (d, t)

## AppDev1

**Section Id :** 64065356658

**Section Number :** 8

**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

<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118683
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 161 Question Id : 640653815104 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 : 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.**

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

**Options :**

6406532730951. ✓ YES

6406532730952. ✗ NO

<b>Sub-Section Number :</b>	2
<b>Sub-Section Id :</b>	640653118684
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 162 Question Id : 640653815105 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 Python code snippet.

```
from string import Template as makeTemplate
from jinja2 import Template
import sys

var = sys.argv[0]

data = {"var1": "Data scientist", "var2": "programming",
        "var3": "statistical", "var4": "insights"}

temp = "{{var1}} creates $var2 code with $var3 knowledge to create
{{var4}}."

if var == "1":
    temp = makeTemplate(temp)
    output = temp.substitute(data)
    print(output)
else:
    temp = Template(temp)
    output = temp.render(data)
    print(output)
```

What will be printed on the terminal for the command `python app.py 1 2` ?

**Options :**

`{{var1}} creates programming code with statistical knowledge to
create {{var4}}.`

6406532730953. \*

`Data scientist creates $var2 code with $var3 knowledge to create
insights.`

6406532730954. ✓

`{{var1}} creates $var2 code with $var3 knowledge to create {{var4}}`

6406532730955. \*

Data scientist creates programming code with statistical knowledge to create insights.

6406532730956. ✘

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118685

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 163 Question Id : 640653815106 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following flask application running locally on <http://127.0.0.1:5000> ?

```
from flask import Flask

app = Flask(__name__)

@app.route('/home/<string:url>')
def get_url_str(url):
    return "string "+url

@app.route('/home/<path:url>')
def get_url_pth(url):
    return "path "+url

app.run(debug = True)
```

Which of the following URLs will throw a 404 Not Found error?

**Options :**

6406532730957. ✘ <http://127.0.0.1:5000/home/modules>

6406532730958. ✘ <http://127.0.0.1:5000/home/modules/chapters/one>

6406532730959. ✘ <http://127.0.0.1:5000/home/library/modules/chapters/one>

6406532730960. ✓ None

**Question Number : 164 Question Id : 640653815108 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following view function.

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

@app.route('/student', methods = ['GET', 'POST'])
def show_details():
    cred = request.args
    details = {
        'Stream': cred['dept'],
        'Roll': cred['roll'],
        'Course': cred['course']
    }
    return details

app.run()
```

If this flask app is running locally on <http://127.0.0.1:5000>, which of the following URLs will be handled by the controller correctly?

**Options :**

6406532730965. ✘ [http://127.0.0.1:5000?dept=data\\_science&roll=cs1001&course=cs2003](http://127.0.0.1:5000?dept=data_science&roll=cs1001&course=cs2003)

6406532730966.

\* [http://127.0.0.1:5000/data\\_science/cs1001/cs2003](http://127.0.0.1:5000/data_science/cs1001/cs2003)

6406532730967. ✓ [http://127.0.0.1:5000/student?dept=data\\_science&roll=cs1001&course=cs2003](http://127.0.0.1:5000/student?dept=data_science&roll=cs1001&course=cs2003)

6406532730968. \* [http://127.0.0.1:5000/student/data\\_science/cs1001/cs2003](http://127.0.0.1:5000/student/data_science/cs1001/cs2003)

**Question Number : 165 Question Id : 640653815110 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following is true about the term “stateless” in the client-server model?

**Options :**

6406532730973. \* The server responds to the client based on the previous state.

6406532730974. \* The server uses FTP protocol to respond to the client's request.

6406532730975. \* Server use the URL to convey information to the client.

6406532730976. ✓ Server is not required to maintain any state of client or session during transactions between client and server.

**Question Number : 166 Question Id : 640653815121 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

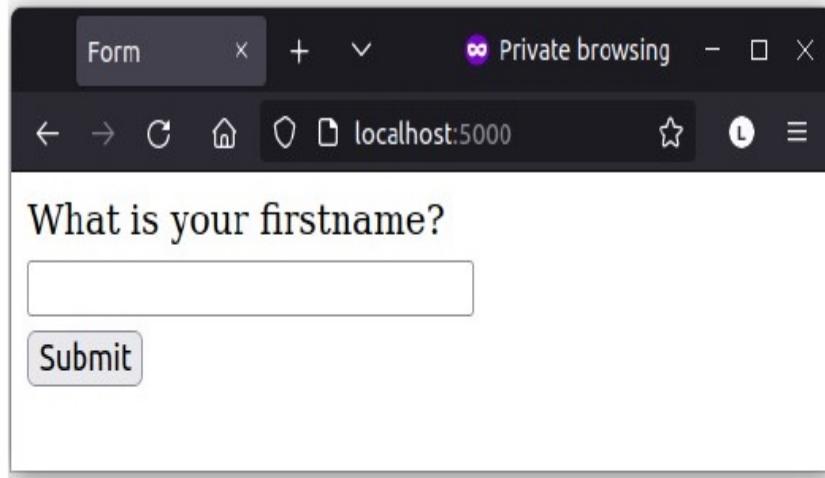
Question Label : Multiple Choice Question

Consider the following snippet of HTML and its output rendered on the browser:

post

index.html

```
<form action="/" method="POST">
    <label for="fname">What is your first name?</label><br>
    <input type="text" name="fname" id="fname"><br>
    <input type="submit" value="Submit">
</form>
```



Which HTTP request would be sent to the server if the user enters "Mahesh" into the text box and clicks submit?

**Options :**

6406532731013. ✘ GET

6406532731014. ✓ POST

6406532731015. ✘ PUT

6406532731016. ✘ DELETE

**Question Number : 167 Question Id : 640653815133 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the below JavaScript statement(s) are used to print information on the browser's console?

**Options :**

6406532731061. ✘ window.alert()

6406532731062. ✓ console.log()

6406532731063. ✘ document.write()

6406532731064. ✘ None of these

**Question Number : 168 Question Id : 640653815136 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which command of the below command creates a new branch in GIT?

**Options :**

6406532731073. ✘ git new-branch <branch\_name>

6406532731074. ✓ git branch <branch\_name>

6406532731075. ✘ git new <branch\_name>

6406532731076. ✘ git create-branch <branch\_name>

**Question Number : 169 Question Id : 640653815137 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following statements and select the correct option:

**Statement 1:** In a database, an index can only be created on one column of a table.

**Statement 2:** Indexes cannot be created on columns which have duplicate values.

**Options :**

6406532731077. ✘ Statement 1 is true & statement 2 is false

6406532731078. ✘ Statement 2 is true & statement 1 is false

6406532731079. ✘ Both statements 1 and 2 are true

6406532731080. ✓ Both statements 1 and 2 are false

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118686

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 170 Question Id : 640653815109 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**

In the code snippet given below, what should come in place of **code 1** and **code 2** such that one book can have multiple sections and the converse does not hold true?

```
from sqlalchemy import ForeignKey
from sqlalchemy import Integer, Column
from sqlalchemy.orm import DeclarativeBase
from sqlalchemy.orm import relationship

class Base(DeclarativeBase):
    pass

class Section(Base):
    __tablename__ = "section_table"
    id = Column(Integer, primary_key=True)
    # write your code 1 here

class Book(Base):
    __tablename__ = "book_table"
    id = Column(Integer, primary_key=True)
    # write your code 2 here
```

### Options :

code 1: book\_id=Column(Integer, ForeignKey("book\_table.id"))  
code 2: books = relationship("Section")

6406532730969. ✘

code 1: books = relationship("Section")  
code 2: section\_id=Column(Integer, ForeignKey("book\_table.id"))

6406532730970. ✘

code 1: books = relationship("Book")  
code 2: section\_id=Column(Integer, ForeignKey("section\_table.id"))

6406532730971. ✘

code 1: book\_id=Column(Integer, ForeignKey("book\_table.id"))  
code 2: sections = relationship("Book")

6406532730972. ✓

**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 flask app and Jinja2 template.

app.py

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

@app.route('/')
def index():
    return render_template("index.html", data=['Harry', 'Karl', 'John',
'Jason', 'Ros'])

app.run()
```

index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>Macro</title>
</head>
<body>
    {% macro unordered_list(items)%}
        <ul>
            {% for item in items %}
                {% if item|length <= 4 %}<br/>
                    <li>{{item}}</li>
                {% endif %}
            {% endfor %}
        </ul>
    {% endmacro %}
    {{ unordered_list(data) }}
</body>
</html>
```

If the flask app is running locally on <http://127.0.0.1:5000>. What will be the output on the browser for the base URL?

**Options :**

6406532730977. ❌

- Harry
- Karl
- John
- Jason
- Ros

- Karl

6406532730978. ✘ • John

- Harry

6406532730979. ✘ • Jason

- Karl

- John

- Ros

6406532730980. ✓ • Ros

**Question Number : 172 Question Id : 640653815116 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

Match the following types of testing with their functionality.

A. White Box Testing	1. Beta Testing
B. User Acceptance testing	2. One step beyond integration Testing
C. System testing	3. Simulates actual user interaction, allows to script browser
D. System testing Automation	4. Considers internal functioning of the system

Which of the following is the correct matching?

**Options :**

6406532730993. ✘ A → 1, B → 2, C → 3, D → 4

6406532730994. ✘ A → 4, B → 3, C → 2, D → 1

6406532730995. ✓ A → 4, B → 1, C → 2, D → 3

6406532730996. ✘ A → 3, B → 2, C → 1, D → 4

**Question Number : 173 Question Id : 640653815117 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 flask application.

```
from flask import Flask, render_template, request
app = Flask(__name__)

@app.route('/')
def square():
    val = request.args

    if val['num'] == '':
        return "<h1>Enter a valid number</h1>"
    elif val['num'].isalpha()==True:
        return "<h1>Invalid number</h1>"
    else:
        out = (int(val['num'])) * (val['num'])
        return f'<h1>{out}</h1>'

if(__name__ == "__main__"):
    app.run(debug=True)
```

If this flask app is running locally on <http://localhost:5000>, what is the output for the URL <http://localhost:5000/?num=2> ?

**Options :**

6406532730997. ✘ 4

6406532730998.

✓ 22

6406532730999. ✖ ValueError

6406532731000. ✖ 2

**Question Number : 174 Question Id : 640653815120 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 Python code snippet.

log.py

```
import logging
import sys

logging.basicConfig(level=logging.WARNING,
                    format='%(asctime)s - %(levelname)s - %(message)s')

def check_val(value):
    if value < 0:
        raise ValueError("Invalid value: Please enter a positive value.")
    else:
        logging.info("Value added: %s", value)

try:
    input_value = int(sys.argv[1])
    check_val(input_value)
except ValueError as ve:
    logging.exception("Exception occurred: %s", str(ve))
```

What will be the output on the terminal for the command: python log.py -34 ?

**Options :**

6406532731009. ✖ 2023-08-14 21:01:05,684 - INFO - Value added: 34

2023-08-14 21:01:05,684 - WARNING - Value added: 34

6406532731010. ✘

Error: Exception occurred: Invalid value: Please enter a positive value.

6406532731011. ✓

6406532731012. ✘ None.

**Question Number : 175 Question Id : 640653815122 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

You have a DRAM module with bus width of 64 bits, clock speed of 2 GHz, and operating in DDR (double-data-rate or two values per clock cycle) mode. What is the maximum bandwidth (in Giga-bytes per second) of data transfer achievable with this module?

**Options :**

6406532731017. ✘ 16

6406532731018. ✘ 8

6406532731019. ✓ 32

6406532731020. ✘ 128

**Question Number : 176 Question Id : 640653815124 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 flask resource created using flask\_restful.

```
from flask import Flask, request
from flask_restful import Api, Resource, reqparse

app = Flask(__name__)
api = Api(app)

parser = reqparse.RequestParser()
parser.add_argument("val")

class RestApi(Resource):
    def post(self, val):
        arg1 = parser.parse_args()
        arg2 = request.args
        return {
            "Course_1": arg1["val"],
            "Course_2": arg2["val"],
            "Course_3": val
        }

api.add_resource(RestApi, "/api/courses/<val>")
app.run(debug = True)
```

If the application is running locally on `http://127.0.0.1:5000`, What will be the output on the terminal for the command:

```
curl http://127.0.0.1:5000/api/courses/DBMS?val=JAVA -d
"{"val": "PDSA"}" -X POST -H "Content-Type: application/json"
```

**Options :**

```
{
    "Course_1": "JAVA",
    "Course_2": "PDSA",
    "Course_3": "DBMS"
}
```

6406532731025. \*

6406532731026. \*

```
{  
    "Course_1": "DBMS",  
    "Course_2": "JAVA",  
    "Course_3": "PDSA"  
}
```

```
{  
    "Course_1": "PDSA",  
    "Course_2": "JAVA",  
    "Course_3": "DBMS"  
}
```

6406532731027. ✓

```
{  
    "Course_1": "PDSA",  
    "Course_2": "DBMS",  
    "Course_3": "JAVA"  
}
```

6406532731028. ✘

**Question Number : 177 Question Id : 640653815129 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

What will be the output of the following Python code?

```
from jinja2 import Template  
my_statement = Template("The special series is:{% for n in  
range(1,15)%} {{n/3}}" "% endfor %}")  
out = my_statement.render()  
print(out)
```

**Options :**

6406532731045. ✘ The special series is: 1 0 1 0 1 0 1 0 1 0 1 0

6406532731046. ✳ The special series is: 1 2 0 1 2 0 1 2 0 1 2 0 1 2

6406532731047. ✳ The special series is: 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0

6406532731048. ✓ The special series is: 0.33 0.67 1.0 1.33 1.67 2.0 2.33 2.67 3.0 3.33 3.67 4.0 4.33  
4.67

**Question Number : 178 Question Id : 640653815130 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 that there are two HTML files.

- i) index.html - Home page of the application
- ii) login.html - Login page of the application

Which of the following code will navigate the user between **index.html** and **login.html**, and vice versa?

**Options :**

```
<!-- index.html contains-->
<a src="index.html">Signin</a>
```

```
<!-- login.html contains -->
<a src="login.html">Home</a>
```

6406532731049. ✳

```
<!-- index.html contains -->
<a href="index.html">Signin</a>
```

```
<!-- login.html contains -->
<a href="login.html">Home</a>
```

6406532731050. ✳

6406532731051. ✓

```
<!-- index.html contains -->
<a href="login.html">Signin</a>
```

```
<!-- Login.html contains -->
<a href="index.html">Home</a>
```

```
<!-- index.html contains -->
<a src="login.html">Signin</a>
```

```
<!-- Login.html contains -->
<a src="index.html">Home</a>
```

6406532731052. ✘

**Question Number : 179 Question Id : 640653815135 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 below two data models **Author** and **Book** using SQLite database.

```
class Author(db.Model):
    id = db.Column(db.Integer, primary_key=True)
    name = db.Column(db.String)
    dob = db.Column(db.String)

class Book(db.Model):
    id = db.Column(db.Integer(), primary_key=True)
    title = db.Column(db.String())
    publisher = db.Column(db.String())
    written_by = db.Column(db.Integer(), db.foreign_key("author.id"))
```

What kind of relationship exists between **Author** and **Book** classes?

**Options :**

6406532731069. ✘ One Book to one Author relationship

6406532731070. ✓ One Author to many Books relationship

6406532731071. \* Many Authors to one Book relationship

6406532731072. \* Many Books to many Author relationship

<b>Sub-Section Number :</b>	5
<b>Sub-Section Id :</b>	640653118687
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 180 Question Id : 640653815118 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4.5**

**Question Label : Multiple Choice Question**

Consider a function func, and a set of test cases given below.

Filename: test\_file.py

```
import pytest
def func(x,y):
    out = x**2+y**2
    return out

class Test_class0():
    def test_case1(self):
        assert func(1,2) == 5

    def case_test2(self):
        assert func(2,3) == 13

    def test_case3(self):
        assert func(6,2) == 38

class Test_class1():
    def test_case1(self):
        assert func(5,2) == 29

    def case_test2(self):
        assert func(1,1) == 2
```

What will be the output on the terminal for the command below?

pytest test\_file.py -k Test\_class

**Options :**

== 1 failed, 4 passed in 0.17s ===

6406532731001. ✘

== 1 failed, 2 passed, 2 deselected in 0.17s ===

6406532731002. ✘

== 2 failed, 1 deselected in 0.17s ===

6406532731003. ✘

== 1 failed, 2 passed in 0.14s ===

6406532731004. ✓

**Question Number : 181 Question Id : 640653815119 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the following python code snippet app.py, the HTML files, base.html and home.html residing in "templates" folder.

app.py

```
from flask import Flask, render_template
app = Flask(__name__)
@app.route('/')
def home():
    return render_template('home.html')
app.run(debug=True)
```

home.html

```
{% extends "base.html" %}
{% block content %}
<p>MAD I</p>
<span>MAD II</span>
<span>DBMS</span>
{% endblock %}
```

base.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>IITM</title>
</head>
<body>
    <h2 style="color: violet;"> Diploma Courses </h2>
    {% block content %}
    {% endblock %}
</body>
</html>
```

What will be the rendered output for base URL if flask app is running locally on <http://localhost:5000> ?

**Options :**

MAD I

MAD II

DBMS

6406532731005. \*

6406532731006. \*

## Diploma Courses

MAD I

MAD II

DBMS

## Diploma Courses

MAD I

MAD II DBMS

6406532731007. ✓

MAD I

6406532731008. ✘ MAD II DBMS

**Question Number : 182 Question Id : 640653815126 Question Type : MCQ Is Question**

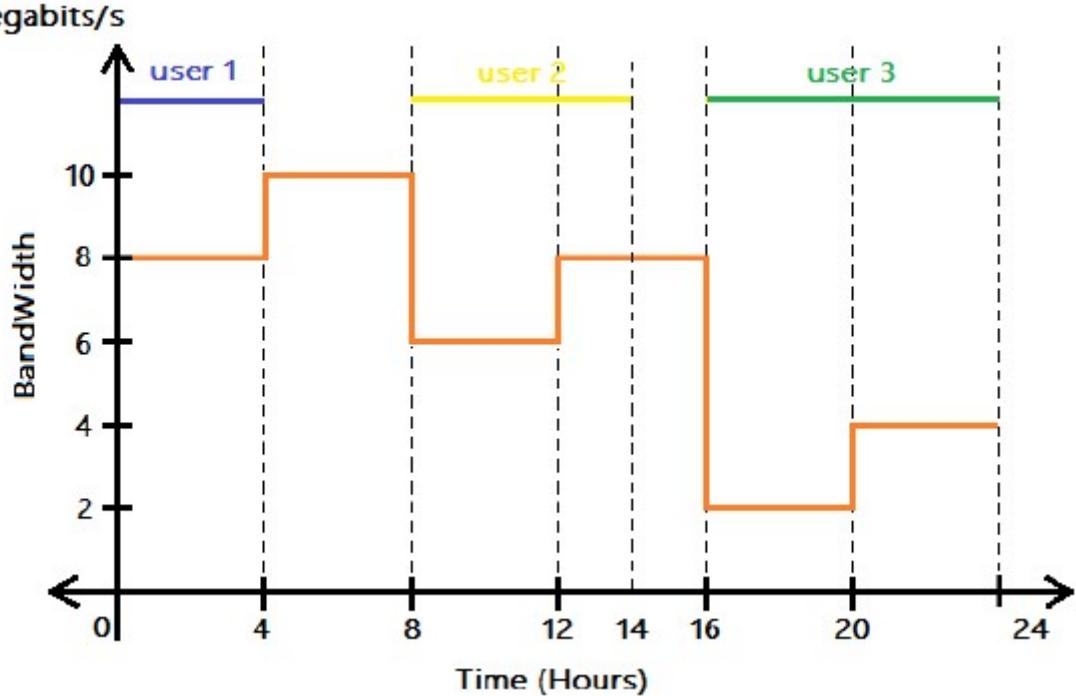
**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the following graph that represents the variation in bandwidth of a network for an entire day (24 hours). Three users were connected to the network at three different times of the day.

What is the total data consumed in GigaBytes by all the users in 24 hrs?



**Options :**

6406532731033. ❌ 547.2 GB

6406532731034. ❌ 12 GB

6406532731035. ✓ 43.2 GB

6406532731036. ❌ 345.6 GB

**Question Number : 183 Question Id : 640653815127 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4.5**

**Question Label : Multiple Choice Question**

Consider the following restful implementation using flask.

```
from flask import Flask, request
from flask_restful import Resource, Api

app = Flask(__name__)
api = Api(app)

student_info = {"name": "Ramesh", "Roll_No": "user123",
"Email": "ramesh.user@kmail.com"}

class Student(Resource):
    def delete(self):
        data = request.json
        student_info.update(data)
        return student_info

    def put(self):
        student_info.popitem()
        return "success", 200

api.add_resource(Student, '/')

app.run()
```

If the above application is running on "<http://127.0.0.1:5000>" then what will be the final output on terminal on executing these two curl commands in the order mentioned?

1:

```
curl -X PUT -H "Content-Type: application/json" -H "Accept-Type:
application/json" -d "{\"Roll_No\": \"user321\", \"Email\":
\"r.user@kmail.com\"}" http://127.0.0.1:5000/
```

2:

```
curl -X DELETE -H "Content-Type: application/json" -H "Accept-Type:
application/json" -d "{\"Roll_No\": \"user321\", \"Email\":
\"r.user@kmail.com\"}" http://127.0.0.1:5000/
```

**Options :**

```
{
    "name": "Ramesh",
    "Roll_No": "user321",
    "Email": "r.user@kmail.com"
}
```

6406532731037. ✓

```
{  
    "name": "Ramesh",  
    "Roll No": "user321"  
}
```

6406532731038. \*

```
{  
    "Roll No": "user321",  
    "Email": "r.user@kmail.com"  
}
```

6406532731039. \*

```
{  
    "name": "Ramesh",  
    "Roll_No": "user123",  
    "Email": "r.user@kmail.com"  
}
```

6406532731040. \*

**Question Number : 184 Question Id : 640653815128 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

An HTML code and CSS code is given below. Which of the following correctly represents its rendered output?

CSS Code:

```
#one{color: blue;}  
.two{color: red !important;}  
#two{color: green}  
#three{color: green;}
```

HTML Code:

```
<!DOCTYPE html>  
<html>  
<head>  
    <title>Document</title>  
    <link href="style.css" rel="stylesheet">  
    <style>  
        body{font-weight: bold;}  
        p{color: violet !important ;}  
    </style>  
</head>  
<body>  
    <span id="one">Content 1</span>  
    <span class="two" id="two" >Content 2</span>  
    <p id="three">Content 3</p>  
</body>  
</html>
```

Options :

**Content 1 Content 2**

6406532731041. ✘ **Content 3**

**Content 1**

**Content 2**

6406532731042. ✘ **Content 3**

**Content 1 Content 2**

6406532731043. ✓ **Content 3**

**Content 1 Content 2**

**Content 3**

6406532731044. \*

**Question Number : 185 Question Id : 640653815132 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the below two python files code snippets *app.py* and *test\_app\_route.py*.

*app.py*

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

@app.route("/greet<string:name>")
def home(name):
    return "Hello, " + name

if __name__ == "__main__":
    app.run()
```

*test\_app\_route.py*:

```
import pytest, requests

@pytest.fixture
def get_response():
    resp = requests.get("http://127.0.0.1:5000/greet/IITM")
    return resp

def test_response(get_response):
    assert get_response.text == "Hello, IITM"
```

Assume that *app.py* and *test\_app\_route.py* are running on two different terminals and all required modules are installed, then which of the following is the correct option for the statements given below?

i) Executing the command `pytest test_app_route.py` on the terminal returns

`===== 1 passed =====`

ii) Executing the command `pytest test_app_route.py` on the terminal returns

`===== 1 failed =====`

iii) Executing the command `pytest test_app_route.py` on the terminal returns

`===== 1 selected, 1 passed =====`

iv) Executing the command `pytest test_app_route.py` on the terminal returns

`===== 1 deselected =====`

**Options :**

6406532731057. ❌ Statements i and iii are correct

6406532731058. ❌ Statements ii and iv are correct

6406532731059. ✓ Only statement i is correct

6406532731060. ❌ Only statement ii is correct

<b>Sub-Section Number :</b>	6
<b>Sub-Section Id :</b>	640653118688
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

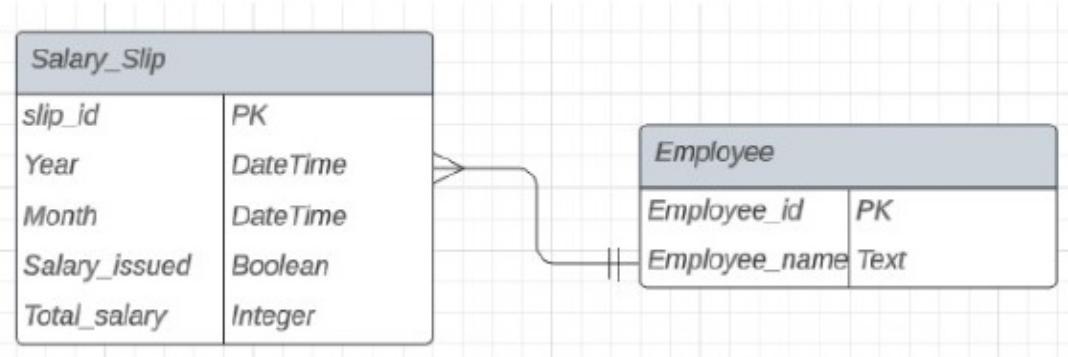
**Question Number : 186 Question Id : 640653815112 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

What can be inferred from the Entity-Relationship Diagram below:



**Options :**

6406532730981. ✓ An employee can exist without having any salary slips

6406532730982. ✓ An employee can have more than one salary slip

6406532730983. ✗ An employee needs to have at least one salary slip

6406532730984. ✓ A salary slip must belong to one and only one employee

<b>Sub-Section Number :</b>	7
<b>Sub-Section Id :</b>	640653118689
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 187 Question Id : 640653815123 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following python code snippet.

```
from string import Template

statement = "The $animal jumped over the $obstacle."

temp = Template(statement)

print(== OUTPUT ==)
```

Which of the following statements, when substituted in place of == OUTPUT ==, will not throw a KeyError?

**Options :**

6406532731021. ✘ temp.substitute({"animal": "cat"})

6406532731022. ✓ temp.safe\_substitute({"animal": "dog", "obstacle": "fence"})

6406532731023. ✓ temp.safe\_substitute({"animal": "rabbit"})

6406532731024. ✓ temp.substitute({"animal": "horse", "obstacle": "wall"})

**Question Number : 188 Question Id : 640653815131 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the below is/are true about the Web Server?

**Options :**

6406532731053. ❌ Always web server response in HTML format

6406532731054. ✓ Web servers process the business logic and return different types of responses

6406532731055. ✓ Web servers can host multiple web applications

6406532731056. ✓ The web server sends the requested web page using HTTP

**Question Number : 189 Question Id : 640653815134 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider a client 'C' and a server 'S', separated by distance 'D' are connected by a fictitious medium in which the speed of light is 'v' m/sec. If 'N' is the number of consecutive requests that can be made in a second by the client 'C' (i.e A new request can be made only after receiving the response from the previous request.), Which of the following changes would halve the number 'N'?

**Options :**

6406532731065. ❌ A change of medium where the speed of light is  $2v$  m/sec.

6406532731066. ❌ Reduce the distance between C and S from D to  $D/2$ .

6406532731067. ✓ A change of medium where the speed of light is  $v/2$  m/sec.

6406532731068. ✓ Increase the distance between C and S from D to  $2D$ .

**Sub-Section Number :** 8

**Sub-Section Id :** 640653118690

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 190 Question Id : 640653815107 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

Time : 0

Correct Marks : 4.5 Max. Selectable Options : 0

Question Label : Multiple Select Question

Consider the following flask app. Given that `test_request_context()` allows text to be printed on the terminal, which of the following statements is/are correct?

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

@app.route('/library')
def home():
    return 'Select your course!'

@app.route('/student/<username>/<roll>')
def dashboard(username):
    return f'{username}\'s dashboard'

with app.test_request_context():
    #== print statement ==#
```

Options :

If #== print statement ==# is replaced by:  
print(url\_for('home', user = "mad1\_cs2003")),  
the output on the terminal will be;  
6406532730961. ✘ /library/mad1\_cs2003.

If #== print statement ==# is replaced by:  
print(url\_for('home', user = "mad1\_cs2003")),  
the output on the terminal will be;  
6406532730962. ✓ /library?user=mad1\_cs2003.

If #== print statement ==# is replaced by:  
print(url\_for('dashboard', username = "mad1", roll = "cs2003", term = "jan2024")),  
the output on the terminal will be;  
6406532730963. ✓ /student/mad1/cs2003?term=jan2024.

If `#= print statement ==#` is replaced by:  
`print(url_for('dashboard', username = "mad1", roll = "cs2003", term = "jan2024"))`,  
the output on the terminal will be;  
`/student/mad1/cs2003/jan2024.`

6406532730964. \*

**Question Number : 191 Question Id : 640653815125 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4.5 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following function to be tested and test functions given in the Python code snippet below.

test\_file.py

```
import pytest

def square(x):
    sum = 0
    for counter in range(x):
        sum += x
    return sum

@pytest.mark.marker1
def testcase_1():
    assert square(10) == 100

@pytest.mark.marker2
def testcase_2():
    assert square(4) == 4

@pytest.mark.marker3
def testcase_3():
    assert square(5) == 25

@pytest.mark.marker4
def testcase_4():
    assert square(6) == 6
```

On running this file on the terminal using pytest, the summary of the output is;

```
===== 1 failed, 3 deselected, 4 warnings in 0.17s =====
```

What command will result into the outcome given above?

**Options :**

```
pytest test_file.py -m marker4
```

6406532731029. ✘

```
pytest test_file.py -m marker1
```

6406532731030. ✓

```
pytest test_file.py -m marker2
```

6406532731031. ✘

```
pytest test_file.py -m marker3
```

6406532731032. ✓

**Sub-Section Number :** 9

**Sub-Section Id :** 640653118691

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653815113 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (192 to 193)**

Question Label : Comprehension

Consider the following Python code snippet.

file.py

```
import sys
courses = {
    1: "App Dev I",
    2: "App Dev II",
    3: "App Dev III",
    4: "DevOps"
}
if courses[int(sys.argv[2])] in "App Dev III":
    i = 1
    while i <= int(sys.argv[2]):
        print("course found",courses[i])
        i+=1
else:
    print("No course found!")
```

Based on the above data, answer the given subquestions.

## Sub questions

**Question Number : 192 Question Id : 640653815114 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

What will be output on the terminal for the command python file.py course 2?

**Options :**

6406532730985. ❌

course found App Dev II

6406532730986. ❌

course found App Dev III

6406532730987. ❌

No course found!

6406532730988. ✓

course found App Dev I

course found App Dev II

**Question Number : 193 Question Id : 640653815115 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

What will be output on the terminal for the command python file.py course 3?

**Options :**

6406532730989. ❌

course found App Dev III

course found App Dev I  
course found App Dev II

6406532730990. ✘

course found App Dev I  
course found App Dev II  
course found App Dev III

6406532730991. ✓

IndexError: list index out of range

6406532730992. ✘

## MLF

<b>Section Id :</b>	64065356659
<b>Section Number :</b>	9
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	12
<b>Number of Questions to be attempted :</b>	12
<b>Section Marks :</b>	40
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0

Sub-Section Number :	1
Sub-Section Id :	640653118692
Question Shuffling Allowed :	No
Is Section Default? :	null

**Question Number : 194 Question Id : 640653815138 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 : MACHINE LEARNING FOUNDATIONS (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 :**

6406532731081. ✓ YES

6406532731082. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	640653118693
Question Shuffling Allowed :	No
Is Section Default? :	null

**Question Id : 640653815139 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (195 to 197)**

Question Label : Comprehension

A person went to the market to buy hens. Old hens can be bought for ₹ 200.00 each but young hens can be bought for ₹ 500.00 each. The old hens lay 3 eggs per week and the young hens lay 5 eggs per week. Each egg costs Rs. 11. A hen costs ₹ 50.00 per week to feed. If the financial constraint is ₹ 8000 per week to buy hens and the capacity constraint is that the total number of hens bought cannot exceed 20 per week. The objective is to earn more profit. Let  $x$  represent the number of old hens and  $y$  represent the number of young hens.

Use the above information to answer the given subquestions

### Sub questions

**Question Number : 195 Question Id : 640653815140 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Choose the correct **Primal** optimization problem from the following.

**Options :**

Maximize:  $5y - 17x$   
6406532731083. ✓ Subject to:  $x + y \leq 20, 200x + 500y \leq 8000, x \geq 0, y \geq 0$

Maximize:  $-5y + 17x$   
6406532731084. ✗ Subject to:  $x + y \leq 20, 200x + 500y \leq 8000, x \geq 0, y \geq 0$

Maximize:  $33y + 55x$   
6406532731085. ✗ Subject to:  $x + y \leq 20, 200x + 500y \leq 8000, x \geq 0, y \geq 0$

Maximize:  $55y - 17x$   
6406532731086. ✗ Subject to:  $x + y \leq 20, 200x + 500y \leq 8000, x \geq 0, y \geq 0$

**Question Number : 196 Question Id : 640653815141 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

Time : 0

Correct Marks : 2 Max. Selectable Options : 0

Question Label : Multiple Select Question

If  $(x^*, y^*)$  is the optimal solution of the primal,  $u_1$  and  $u_2$  are Lagrange multipliers then which of the following options is/are true?

Options :

Complimentary Slackness Condition is

$$u_1 + 200u_2 = -17$$

6406532731087. ✘  $u_1 + 500u_2 = 5$

Stationary condition is

$$u_1 + 200u_2 = -17$$

6406532731088. ✘  $u_1 + 500u_2 = -5$

Complimentary Slackness Condition is

$$u_1(x^* + y^* - 20) = 0$$

6406532731089. ✓  $u_2(200x^* + 500y^* - 8000) = 0$

Complimentary Slackness Condition is

$$u_1(x^* + y^* - 20) = 0$$

6406532731090. ✘  $u_2(200x^* + 500y^* + 8000) = 0$

Stationary condition is

$$u_1(x^* + y^* - 20) = 0$$

6406532731091. ✘  $u_2(200x^* + 500y^* - 8000) = 0$

Question Number : 197 Question Id : 640653815142 Question Type : MSQ Is Question

Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following options is/are true?

**Options :**

6406532731092. ❌ The Given LPP is infeasible.

6406532731093. ✓ The Given LPP is feasible.

6406532731094. ✓ The optimum value is  $x = 0$  and  $y = 16$

6406532731095. ❌ The optimum value is  $x = 20$  and  $y = 0$

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118694

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 198 Question Id : 640653815143 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

Find the maximum value of the function  $f(x, y) = xy$ , subject to constraints  $\frac{x^2}{8} + \frac{y^2}{2} = 2$ .

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

4

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118695

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 199 Question Id : 640653815144 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider two functions  $f(x, y) = 2x^2 + 3y^2$  and  $g(x) = -(x + 1)^2$ . Which of the following options is/are true?

**Options :**

6406532731097. ✓  $f(x, y)$  is a convex function.

6406532731098. ✗  $g(x)$  is a convex function.

6406532731099. ✓  $g \circ f$  is not a convex function.

6406532731100. ✓ The local minimum value of the function  $f(x, y)$  is the global minimum of the function.

**Question Number : 200 Question Id : 640653815145 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following following set is/are convex sets in  $\mathbb{R}^2$ ?

**Options :**

6406532731101. ✗  $\{(x, y) \mid x^2 + y^2 = 1\}$

6406532731102. ✓  $\{(x, y) \mid x^2 + y^2 \leq 1\}$

6406532731103. ✗  $\{(x, y) \mid x^2 + y^2 > 1\}$

6406532731104. ✓  $\{(x, y) \mid \frac{x^2}{4} + \frac{y^2}{9} < 1\}$

<b>Sub-Section Number :</b>	5
<b>Sub-Section Id :</b>	640653118696
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Id : 640653815146 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (201 to 202)**

Question Label : Comprehension

Consider a function

$$f(x) = \begin{cases} 2x^2 & \text{if } x < 2 \\ (x - 2)^3 & \text{if } 2 \leq x < 4 \\ 4 & \text{if } 4 \leq x \end{cases}$$

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 201 Question Id : 640653815147 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3**

Question Label : Short Answer Question

Find the number of discontinuous points.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas : PlainText**

**Possible Answers :**

2

**Question Number : 202 Question Id : 640653815148 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

Find the number of points where the function is not differentiable.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

2

**Sub-Section Number : 6**

**Sub-Section Id : 640653118697**

**Question Shuffling Allowed : Yes**

**Is Section Default? : null**

**Question Number : 203 Question Id : 640653815149 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Let  $A$  be a real symmetric positive definite matrix. Which of the following options is/are true?

**Options :**

6406532731107. ✓ The eigenvectors of  $A$  may or may not be orthogonal.

6406532731108. ✓ If  $A$  is similar to a diagonal matrix  $B$ , then  $B$  is also positive definite.

6406532731109. ✗  $A^T A$  is not positive definite.

6406532731110. ✗  $A^T A$  is not similar to a diagonal matrix.

**Question Number : 204 Question Id : 640653815150 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider a data set  $\{x_1, x_2, \dots, x_n\}$ , where  $x_i \in \mathbb{R}^d, i = 1, 2, \dots, n$  and  $d \gg n$ .

Let  $A = \begin{bmatrix} (x_1 - \bar{x})^T \\ (x_2 - \bar{x})^T \\ \vdots \\ (x_n - \bar{x})^T \end{bmatrix}$  and  $C = \frac{1}{n}A^T A$ , where  $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$ . Which of the following options is/are true?

**Options :**

6406532731111. ✗  $\text{Rank}(C) \geq n$

6406532731112. ✓  $\text{Rank}((x_i - \bar{x})(x_i - \bar{x})^T) = 1$  for all  $i = 1, 2, \dots, n$

For this problem, it is efficient to perform PCA using eigenvalues/eigenvectors

of  $\frac{1}{n}AA^T$ .

6406532731113. ✓

For this problem, it is efficient to perform PCA using eigenvalues/eigenvectors

6406532731114. ✗ of  $C$ .

**Sub-Section Number :**

7

**Sub-Section Id :**

640653118698

**Question Shuffling Allowed :**

Yes

**Is Section Default? :**

null

**Question Number : 205 Question Id : 640653815151 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  $X_1$  and  $X_2$  be independent exponential random variables with parameters  $\lambda_1$  and  $\lambda_2$ . Let the joint probability density function of  $X_1$  and  $X_2$  be  $f_{X_1X_2}$ . Define  $Y_1 = X_1 + X_2$  and  $Y_2 = X_1 - X_2$ . Which of the following represents the joint density function of  $Y_1$  and  $Y_2$  in terms of  $f_{X_1X_2}$ ?

**Note:** The probability density function of an exponential random variable ( $X$ ) with parameter  $\lambda$  is given by,  $\lambda e^{-\lambda x}$ .

**Options :**

$$f_{Y_1Y_2}(y_1, y_2) = \begin{cases} \frac{\lambda_1\lambda_2}{2} e^{\{-\lambda_1(\frac{y_1+y_2}{2})-\lambda_2(\frac{y_1-y_2}{2})\}} & y_1 + y_2 \geq 0, y_1 - y_2 \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

6406532731115. ✓

$$f_{Y_1Y_2}(y_1, y_2) = \begin{cases} \frac{\lambda_1\lambda_2}{2} e^{\{-\lambda_1(\frac{x_1+x_2}{2})-\lambda_2(\frac{x_1-x_2}{2})\}} & y_1 + y_2 \geq 0, y_1 - y_2 \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

6406532731116. ✗

$$f_{Y_1Y_2}(y_1, y_2) = \begin{cases} \frac{\lambda_1\lambda_2}{2} e^{\{-\lambda_1(\frac{y_1-y_2}{2})-\lambda_2(\frac{y_1+y_2}{2})\}} & y_1 + y_2 \geq 0, y_1 - y_2 \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

6406532731117. ✗

$$f_{Y_1Y_2}(y_1, y_2) = \begin{cases} \frac{\lambda_1\lambda_2}{2} e^{\{-\lambda_1(\frac{y_1+y_2}{2})-\lambda_2(\frac{y_1-y_2}{2})\}} & y_1 \geq 0, y_2 \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

6406532731118. ✗

**Sub-Section Number :** 8

**Sub-Section Id :** 640653118699

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 206 Question Id : 640653815152 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

The joint probability density function of  $X$  and  $Y$  is given by,

$$f(x, y) = \begin{cases} e^{-(x+y)} & 0 < x < \infty, 0 < y < \infty \\ 0 & \text{otherwise} \end{cases}$$

Find the expected value of  $X$  i.e.  $E[X]$ .

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

1

**Question Number : 207 Question Id : 640653815153 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

In a large town, it is estimated that 20% of students own a laptop. A random sample of 400 students is selected from the town. What is the variance of the number of students with the laptops in a given sample?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

**Question Number : 208 Question Id : 640653815154 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

A quality control manager at a factory measures the thickness of glass sheets produced. Five randomly selected sheets have the thicknesses(in mm) 10, 8, 11, 9, 12 respectively. Assuming the thickness follows a normal distribution and the variance is known, what is the maximum likelihood estimator (MLE) of the mean thickness, ( $\mu$ ), in mm of the glass sheets?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

10

## Java

<b>Section Id :</b>	64065356660
<b>Section Number :</b>	10
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	24
<b>Number of Questions to be attempted :</b>	24
<b>Section Marks :</b>	100
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No

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

**Maximum Instruction Time :** 0

**Sub-Section Number :** 1

**Sub-Section Id :** 640653118700

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Number : 209 Question Id : 640653815155 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 CONCEPTS USING JAVA (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 :**

6406532731122. ✓ YES

6406532731123. ✗ NO

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118701

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 210 Question Id : 640653815156 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
1 class ClassOne{
2     public void methodOne(){
3         // ...
4     }
5     public void methodTwo(){
6         // ...
7         methodOne();
8         // ...
9     }
10 }
11 class ClassTwo{
12     public static void methodThree(){
13         // ...
14         ClassOne c = new ClassOne();
15         c.methodTwo();
16         // ...
17     }
18     public static void main(String[] args) {
19         // ...
20         methodThree();
21     }
22 }
```

During execution of Line 8 in the above code, the activation record of which method is at the top of the stack of activation records?

**Options :**

6406532731124. ✘ main

6406532731125. ✘ methodOne

6406532731126. ✓ methodTwo

6406532731127. ✘ methodThree

**Question Number : 211 Question Id : 640653815157 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
class Product {  
    private String productName;  
    public Product(String pn) {  
        productName = pn;  
    }  
    public Product(Product p) {  
        this.productName = p.productName;  
    }  
    public void setProductName(String pn) {  
        productName = pn;  
    }  
    public String getProductName() {  
        return productName;  
    }  
}  
public class InventoryTest {  
    public static void main(String[] args) {  
        Product p1 = new Product("Laptop");  
        Product p2 = new Product(p1);  
        Product p3 = p1;  
        p1.setProductName("Smartphone");  
        System.out.println(p1.getProductName());  
        System.out.println(p2.getProductName());  
        System.out.println(p3.getProductName());  
    }  
}
```

What will the output be?

**Options :**

Smartphone

Laptop

6406532731128. ✘ Laptop

6406532731129. ✓

Smartphone

Laptop

Smartphone

Smartphone

Smartphone

Smartphone

6406532731130. \*

Smartphone

Smartphone

Laptop

6406532731131. \*

**Question Number : 212 Question Id : 640653815158 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
class Shape {  
    public void draw() {  
        System.out.println("Drawing a generic shape.");  
    }  
    public void area() {  
        System.out.println("Calculating area of the shape.");  
    }  
}  
class Circle extends Shape {  
    public void draw() {  
        System.out.println("Drawing a circle.");  
    }  
}  
class Square extends Shape {  
    public void draw() {  
        System.out.println("Drawing a square.");  
    }  
}  
public class ShapeApp {  
    static void describe(Shape sh) {  
        sh.draw();  
        sh.area();  
    }  
    public static void main(String[] args) {  
        Shape circle = new Circle();  
        Shape square = new Square();  
        describe(circle);  
        describe(square);  
    }  
}
```

Choose the correct option.

**Options :**

It generates the output as:

Drawing a generic shape.

Calculating area of the shape.

Drawing a generic shape.

6406532731132. ✘ Calculating area of the shape.

6406532731133. ✘ Compilation fails because Circle and Square cannot be converted to Shape

Compilation fails because area() method has not been defined in classes  
6406532731134. ✘ Circle and Square

It generates the output as:

Drawing a circle.

Calculating area of the shape.

Drawing a square.

Calculating area of the shape.

6406532731135. ✓

**Question Number : 213 Question Id : 640653815159 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the code given below that checks whether two cars have the same manufacturer. Method `equals` is overridden to compare two `Car` objects as follows. If two cars have same manufacturer then they are said to be the same. Based on the given information, answer the question that follows.

```
class Car {  
    private String model;  
    private String manufacturer;  
  
    // Constructor to initialize instance variables  
  
    public String toString() {  
        return model;  
    }  
    public boolean equals(Object obj) {  
        // CODE BLOCK  
    }  
}  
  
public class CarEqualsTest {  
    public static void main(String[] args) {  
        Car car1 = new Car("Sedan", "Toyota");  
        Car car2 = new Car("SUV", "Honda");  
        Car car3 = new Car("Hatchback", "Toyota");  
        if (car1.equals(car3)) {  
            System.out.println(car1 + " and " + car3 + " belong to the same brand");  
        }  
        if (car2.equals(car3)) {  
            System.out.println(car2 + " and " + car3 + " belong to the same brand");  
        }  
    }  
}
```

Choose the correct option to fill in place of CODE BLOCK so that the output is:

Sedan and Hatchback belong to the same brand

**Options :**

6406532731136. ~~return false;~~  
if(obj instanceof Car) {  
 if(this.manufacturer.equals(obj.manufacturer))  
 return true;  
}

6406532731136. ~~return false;~~

if(this.manufacturer.equals(obj.manufacturer))  
 return true;

6406532731137. ~~return false;~~

```
if(obj instanceof Car) {  
    Car c = (Car) obj;  
    if(this.manufacturer.equals(c.manufacturer))  
        return true;  
}  
6406532731138. ✓ return false;
```

```
if(obj instanceof Car) {  
    Car c = obj;  
    if(this.manufacturer.equals(c.manufacturer))  
        return true;  
}  
6406532731139. ✗ return false;
```

**Question Number : 214 Question Id : 640653815160 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the code given below.

```
interface MessageService {  
    void sendMessage();  
}  
class MessagingApp {  
    public TextMessaging getTextMessaging() {  
        return new TextMessaging();  
    }  
    public VoiceMessaging getVoiceMessaging() {  
        return new VoiceMessaging();  
    }  
    private class TextMessaging implements MessageService {  
        public void sendMessage() {  
            System.out.println("Sending text message");  
        }  
    }  
    private class VoiceMessaging implements MessageService {  
        public void sendMessage() {  
            System.out.println("Sending voice message");  
        }  
    }  
}  
public class Test {  
    public static void main(String[] args) {  
        MessagingApp m = new MessagingApp();  
        //CODE BLOCK  
        obj1.sendMessage();  
        obj2.sendMessage();  
    }  
}
```

Choose the correct option to fill in place of CODE BLOCK so that the output is:

Sending text message  
Sending voice message

**Options :**

TextMessaging obj1 = new TextMessaging();  
**6406532731140. \*** VoiceMessaging obj2 = new VoiceMessaging();

MessageService obj1 = m.getTextMessaging();  
**6406532731141. ✓** MessageService obj2 = m.getVoiceMessaging();

```
TextMessaging obj1 = m.getTextMessaging();  
6406532731142. ✘ VoiceMessaging obj2 = m.getVoiceMessaging();
```

```
MessageService obj1 = new TextMessaging();  
6406532731143. ✘ MessageService obj2 = new VoiceMessaging();
```

**Question Number : 215 Question Id : 640653815161 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the code given below.

```
interface WashingMachine {  
    default void getCapacity() {  
        System.out.println("Capacity : 8kg");  
    }  
    default void startWash() {  
        System.out.println("Started washing");  
    }  
}  
class LGWasher implements WashingMachine { //LINE 1  
    public void startWash() {  
        System.out.println("Started LGwasher");  
    }  
}  
class SamsungWasher implements WashingMachine { // Line 2  
    public void getCapacity() {  
        System.out.println("Capacity : 9kg");  
    }  
}  
public class Test {  
    public static void main(String[] args) {  
        WashingMachine w[] = new WashingMachine[2];  
        w[0] = new LGWasher();  
        w[1] = new SamsungWasher();  
        for (int i = 0; i < w.length; i++) {  
            w[i].getCapacity();  
            w[i].startWash();  
        }  
    }  
}
```

Choose the correct option.

**Options :**

Compilation error at LINE 1 because method `getCapacity()` is not overridden  
**6406532731144. ❌** in class `LGWasher`

Compilation error at LINE 2 because method `startWash()` is not overridden  
**6406532731145. ❌** in class `SamsungWasher`

This program generates the output:  
Started LGwasher  
**6406532731146. ❌** Capacity : 9kg

This program generates the output:

Capacity : 8kg

Started LGwasher

Capacity : 9kg

6406532731147. ✓ Started washing

**Question Number : 216 Question Id : 640653815162 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the code given below.

```
abstract class Fruit {  
    abstract void peel();  
    void eat() { // LINE 1  
        System.out.println("Eating fruit");  
    }  
}  
class Banana extends Fruit {  
    void peel() {  
        System.out.println("Peeling banana");  
    }  
    void eat() {  
        System.out.println("Eating banana");  
    }  
}  
class Apple extends Fruit {  
    void peel() {  
        System.out.println("Peeling apple");  
    }  
    void eat() {  
        System.out.println("Eating apple");  
    }  
}  
public class TestAbstract {  
    public static void main(String[] args) {  
        Fruit f1 = new Banana(); //LINE 2  
        Fruit f2 = new Apple(); //LINE 3  
        f1.eat();  
        f1.peel();  
        f2.eat();  
        f2.peel();  
    }  
}
```

Choose the correct option regarding the above code.

**Options :**

LINE 1 generates compilation error because abstract class must contain only  
**6406532731148. \*** abstract methods.

LINE 2 and LINE 3 generate compilation errors because reference variable of  
**6406532731149. \*** type Fruit cannot store the objects of type Banana and Apple.

This program generates the output:

Eating banana  
Peeling banana  
Eating apple  
Peeling apple

6406532731150. ✓

This program generates the output:

Eating fruit  
Peeling banana  
Eating fruit  
Peeling apple

6406532731151. ✗

**Question Number : 217 Question Id : 640653815163 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
interface Iterator{
    public boolean has_next();
    public Object get_next();
}

abstract class Printable{
    public abstract void print();
}

class ClientList{
    private final int limit = 3;
    private Client[] list = { new Client("Joseph", "C1001"),
        new Client("Mili", "C1002"),
        new Client("Byju", "C1003")
    };
    private class Client extends Printable{
        private String name, invoiceNo;
        public Client(String n, String i) {
            //initialize name and invoiceNo
        }
        public void print() {
            System.out.println(invoiceNo + ", " + name);
        }
    }
    private class ClntIter implements Iterator{
        private int idx;
        public ClntIter() {
            //constructor
        }
        public boolean has_next() {
            //if next element available in list return true;
            //else false
        }
        public Object get_next() {
            //return next element from list
        }
    }
    public Iterator getIterator() {
        return new ClntIter();
    }
}

public class IterTest{
    public static void main(String[] args) {
        ClientList cList = new ClientList();
        Iterator iter = cList.getIterator();
        while(iter.has_next()) {
            -----; //LINE 1
        }
    }
}
```

Identify the appropriate statement to fill in the blank at LINE 1, such that the output is:

C1001, Joseph  
C1002, Mili  
C1003, Byju

**Options :**

6406532731152. ✓ ((Printable)iter.get\_next()).print()

6406532731153. ✘ ((Client)iter.get\_next()).print()

6406532731154. ✘ ((ClientList)iter.get\_next()).print()

6406532731155. ✘ iter.get\_next().print();

**Question Number : 218 Question Id : 640653815165 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
import java.util.*;
public class Football {
    public static void main(String[] args) {
        var wc = new LinkedHashMap<String, Integer>();
        var ac = new LinkedHashMap<String, Integer>();

        var brazil = new LinkedHashMap<String, Integer>();
        brazil.put("BRA WC", 5);
        ac.put("BRA AC", brazil.getOrDefault("BRA AC", 0));
        wc.put("BRA WC", brazil.getOrDefault("BRA WC", 0));

        var germany = new LinkedHashMap<String, Integer>();
        germany.put("GER AC", 4);
        wc.put("GER WC", germany.getOrDefault("GER WC", 0));
        ac.put("GER AC", germany.getOrDefault("GER AC", 0));

        for (Map.Entry<String, Integer> obj1 : wc.entrySet())
            System.out.println(obj1.getKey() + " " + obj1.getValue());

        for (Map.Entry<String, Integer> obj2 : ac.entrySet())
            System.out.println(obj2.getKey() + " " + obj2.getValue());
    }
}
```

Choose the correct option.

**Options :**

This program generates the output:

BRA WC 5  
GER AC 4  
GER WC 0

6406532731160. ✘ BRA AC 0

This program generates the output:

BRA WC 5  
GER WC 0  
BRA AC 0

6406532731161. ✓ GER AC 4

6406532731162. ✘

This program generates the output:

BRA WC 5  
GER WC 4  
BRA AC 5  
GER AC 4

This program generates the output:

BRA WC 0  
GER WC 0  
BRA AC 0

6406532731163. \* GER AC 0

**Question Number : 219 Question Id : 640653815166 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
import java.util.*;  
public class TaskQueue {  
    public static void main(String[] args) {  
        ArrayDeque<String> taskDeque = new ArrayDeque<String>();  
        taskDeque.add("Write Report");  
        taskDeque.add("Review Code");  
        taskDeque.add("Attend Meeting");  
        taskDeque.add("Test Application");  
        taskDeque.add("Submit Proposal");  
  
        PriorityQueue<String> priorityQueue =  
            new PriorityQueue<String>(taskDeque);  
        while (priorityQueue.size() > 0) {  
            System.out.println(priorityQueue.poll());  
        }  
    }  
}
```

Choose the correct option.

**Options :**

This program generates the output:

Write Report  
Review Code  
Attend Meeting  
Test Application  
Submit Proposal

6406532731164. ❌

This program generates the output:

Submit Proposal  
Test Application  
Attend Meeting  
Review Code

6406532731165. ❌ Write Report

6406532731166. ❌ Compilation error as taskDeque cannot be passed as argument to PriorityQueue

This program generates the output:

Attend Meeting  
Review Code  
Submit Proposal  
Test Application  
Write Report

6406532731167. ✓

**Question Number : 220 Question Id : 640653815167 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the code given below.

```
import java.util.*;
class EvenNumberException extends Exception {
    public String toString() {
        return "Even number encountered";
    }
}
class Test {
    public static void main(String[] args) {
        int[] values = {5, 15, 10, 8, 20};
        try {
            for (int i = 0; i < values.length; i++) {
                if (values[i] % 2 == 0) {
                    throw new EvenNumberException();
                }
                values[i] = values[i] * 2;
            }
        } catch (EvenNumberException e) {
            System.out.println(e);
        }
        for (int value : values) {
            System.out.print(value + " ");
        }
    }
}
```

What will the output be?

**Options :**

6406532731168. ✘ Even number encountered

6406532731169. ✘ 10 30 10 8 20

Even number encountered

6406532731170. ✘ 10 30

Even number encountered

6406532731171. ✓ 10 30 10 8 20

**Question Number : 221 Question Id : 640653815168 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

**Question Label : Multiple Choice Question**

Consider the Java code given below.

```
class Habitat implements Cloneable {  
    private String environment;  
    public Habitat(String env) {  
        environment = env;  
    }  
    public void updateEnvironment(String env) {  
        environment = env;  
    }  
    public Habitat clone() throws CloneNotSupportedException {  
        return (Habitat) super.clone();  
    }  
    public String toString() {  
        return environment;  
    }  
}  
  
class Animal implements Cloneable {  
    private String name;  
    private Habitat habitat;  
    public Animal(String n, String env) {  
        name = n;  
        habitat = new Habitat(env);  
    }  
    public void updateAnimal(String n, String env) {  
        name = n;  
        habitat.updateEnvironment(env);  
    }  
    public Animal clone() throws CloneNotSupportedException {  
        return (Animal) super.clone();  
    }  
    public String toString() {  
        return name + " : " + habitat;  
    }  
}  
  
public class Zoo {  
    public static void main(String[] args) throws CloneNotSupportedException {  
        Animal lion = new Animal("Leo", "Savannah");  
        Animal tiger = lion.clone();  
        tiger.updateAnimal("Tina", "Jungle");  
        System.out.println(lion + ", " + tiger);  
    }  
}
```

What will the output be?

**Options :**

6406532731172. ✘ Tina : Jungle, Tina : Jungle

6406532731173. ✓ Leo : Jungle, Tina : Jungle

6406532731174. ✘ Leo : Savannah, Tina : Jungle

6406532731175. ✘ Leo : Savannah, Tina : Savannah

**Question Number : 222 Question Id : 640653815169 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below:

```
import java.util.stream.*;
public class StreamTest {
    public static void main(String[] args) {
        Integer[] a = {12, 8, 9};
        Stream.of(a)
            .map((i) -> i - 20)
            .filter((i) -> i % 4 == 0)
            .forEach((x) -> System.out.println(x));
    }
}
```

What will the output be?

**Options :**

12

8

4

6406532731176. ✘ 4

-11

-17

6406532731177. ✘ -17

-8  
-12  
-11  
-16

6406532731178. ❌ -17

-8  
-12  
-16

6406532731179. ✓ -16

**Question Number : 223 Question Id : 640653815170 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Method `Optional.ofNullable(T value)` returns an `Optional` that describes the specific value, if non-null; otherwise returns an empty `Optional`.

Based on this description, consider the code given below, and answer the question that follows.

```
import java.util.*;
class Course {
    HashMap<String, String> instructors = new HashMap<>();
    public Course() {
        instructors.put("Math", "Devan");
        instructors.put("Java", "Divya");
    }
    public String getInstructor(String subject) {
        return instructors.get(subject);
    }
}
public class Test {
    public static void main(String[] args) {
        Optional<String> i1 = Optional.ofNullable(new Course().getInstructor("Math"));
        Optional<String> i2 = Optional.ofNullable(new Course().getInstructor("Python"));
        i1.ifPresent(n -> System.out.println(n.toUpperCase()));
        i2.ifPresent(n -> System.out.println(n.toUpperCase()));
    }
}
```

Choose the correct option.

#### Options :

This program generates the output:

6406532731180. ✓ DEVAN

This program terminates due to `NullPointerException` after printing the message:

6406532731181. ✗ DEVAN

This program generates the output:

DEVAN

6406532731182. ✗ null

6406532731183. ✗

This program generates the output:

MATH  
DEVAN

**Question Number : 224 Question Id : 640653815171 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
import java.io.*;  
class MembershipCard implements Serializable {  
    private String memberId = "*****";  
    private transient int accessCode = 1000;  
    private String issueDate = "00/00";  
    public MembershipCard(String m, int a, String i) {  
        this.memberId = m;  
        this.accessCode = a;  
        this.issueDate = i;  
    }  
    public String toString() {  
        return memberId + ", " + accessCode + ", " + issueDate;  
    }  
}  
public class Test {  
    public static void main(String[] args) throws Exception {  
        var fos = new FileOutputStream("membershipcard.txt");  
        var os = new ObjectOutputStream(fos);  
        os.writeObject(new MembershipCard("M987654", 1234, "01/25"));  
        var fis = new FileInputStream("membershipcard.txt");  
        var ois = new ObjectInputStream(fis);  
        MembershipCard m = (MembershipCard) ois.readObject();  
        System.out.println(m);  
    }  
}
```

What will the output be?

**Options :**

6406532731184. **\* null, 0, null**

6406532731185. ✓ M987654, 0, 01/25

6406532731186. ✖ M987654, 1000, 01/25

6406532731187. ✖ M987654, 1234, 01/25

6406532731188. ✖ \*\*\*\*\*, 1000, 00/00

**Question Number : 225 Question Id : 640653815172 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the Java code given below.

```
import java.util.*;
import java.util.stream.*;
class Game {
    private String name;
    int participantsNeeded;
    //Constructor to initialize instance variables
    public String toString() {
        return name;
    }
}
public class Test {
    public static void main(String[] args) {
        var gamesList = new ArrayList<Game>();
        gamesList.add(new Game("Chess", 2));
        gamesList.add(new Game("Football", 22));
        gamesList.add(new Game("TableTennis", 4));
        gamesList.add(new Game("Poker", 5));
        Map<Boolean, List<Game>> gamesMap;
        gamesMap = gamesList.stream()
            .collect(Collectors.partitioningBy
                (g -> g.participantsNeeded >= 5));
        System.out.println(gamesMap.get(false));
    }
}
```

Choose the correct option.

**Options :**

6406532731189. ✘ This program generates the output: [Football, Poker]

6406532731190. ✘ This program generates the output: [Football]

6406532731191. ✓ This program generates the output: [Chess, TableTennis]

6406532731192. ✘ This program generates the output: [Chess, TableTennis, Poker]

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 4**

**Question Label : Multiple Choice Question**

Consider the Java code given below. Assume that the file garden.txt contains the following lines of text in it.

A garden is a place of nature.

Garden blooms with vibrant flowers.

Garden offers a peaceful retreat.

```
import java.io.*;
import java.util.Scanner;
public class Test {
    public static void main(String[] args) {
        try {
            var in = new FileInputStream("garden.txt");
            var scanner = new Scanner(in); //LINE 1
            System.out.println("Data from file:");
            System.out.println(scanner.nextLine());
            System.out.println(scanner.next());
            System.out.println(scanner.nextLine());
        }
        catch (FileNotFoundException e) {
            System.out.println("File does not exist.");
        }
        catch (IOException e) {
            System.out.println("Error in writing a file.");
        }
    }
}
```

Choose the correct option.

**Options :**

6406532731193. ✘ LINE 1 generates IOException.

This program generates the output:

Data from file:

A garden is a place of nature.

Garden blooms with vibrant flowers.

6406532731194. ✘ Garden offers a peaceful retreat.

6406532731195.

This program generates the output:

Data from file:

A garden is a place of nature.

Garden

✓ blooms with vibrant flowers.

This program generates the output:

Data from file:

A garden is a place of nature.

A

6406532731196. ✖ Garden offers a peaceful retreat.

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118702

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 227 Question Id : 640653815164 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider the Java code given below that prints the highest turnover amount among a set of given Turnover objects. From among the options, identify the appropriate function header for the function printHighestTurnover that takes as input an array of Turnover objects and prints the highest turnover.

```
import java.util.*;
interface Turnover {
    public abstract double getTurnoverAmount();
}
public class GroceryStore implements Turnover {
    private double amount;
    // Constructor
    // method getTurnoverAmount() that returns amount
}
public class ClothingStore implements Turnover {
    private double amount;
    // Constructor
    // method getTurnoverAmount() that returns amount
}
public class Test {
    // LINE 1: FUNCTION HEADER
    {
        // invokes method getTurnoverAmount()
        // to print the value of highest turnover
    }
    public static void main(String[] args) {
        Turnover[] t = {new GroceryStore(85000.0), new ClothingStore(98000.0),
                        new GroceryStore(180000.0)};
        printHighestTurnover(t);
    }
}
```

Choose the correct option(s).

**Options :**

6406532731156. ❌ public static <T extends GroceryStore> void printHighestTurnover(T[] items)

6406532731157. ✓ public static <T extends Turnover> void printHighestTurnover(T[] items)

6406532731158. ❌ public static <T extends ClothingStore> void printHighestTurnover(T[] items)

6406532731159. ✓ public static void printHighestTurnover(Turnover[] items)

**Question Number : 228 Question Id : 640653815174 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the Java code given below.

```
class Pattern implements Runnable {  
    boolean stopRequested = false;  
    String[] pattern = {"Sa", "Ri", "Ga", "Ma", "Pa"};  
    int index = 0;  
    public void run() {  
        while (!stopRequested) {  
            System.out.print(pattern[index] + " ");  
            index = (index + 1) % pattern.length;  
        }  
    }  
    public void setStop(boolean stop) {  
        stopRequested = stop;  
    }  
}  
  
public class Test {  
    public static void main(String[] args) throws InterruptedException {  
        Pattern p = new Pattern();  
        Thread t1 = new Thread(p);  
        t1.start();  
        p.setStop(true);  
    }  
}
```

Choose the correct option(s).

**Options :**

6406532731197. ✘ The program will always generate the output: Sa Ri Ga Ma Pa

6406532731198. ✘ The program will always generate the output: Sa

6406532731199.

✓ The output can be Sa or Sa Ri or Sa Ri Ga or Sa Ri Ga Ma or Sa Ri Ga Ma Pa

6406532731200. ✓ The program may not generate any output.

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118703

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 229 Question Id : 640653815175 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Consider the Java code given below.

```
class ConcertVenue {  
    int available = 1;  
    public synchronized void bookTicket(int n, String name) {  
        if (available >= n) {  
            available = available - n;  
            System.out.println(name + " booked " + n + " ticket");  
        } else {  
            System.out.println(name + " cannot book " + n + " ticket");  
        }  
    }  
}  
class TicketBooking implements Runnable {  
    private ConcertVenue c;  
    private String name;  
    private int n_tickets;  
    public TicketBooking(ConcertVenue c, String n, int t) {  
        this.c = c;  
        this.name = n;  
        this.n_tickets = t;  
    }  
    public void run() {  
        c.bookTicket(n_tickets, name);  
    }  
}  
public class ThreadTest {  
    public static void main(String[] args) {  
        ConcertVenue obj = new ConcertVenue();  
        TicketBooking tb1 = new TicketBooking(obj, "Aman", 1);  
        TicketBooking tb2 = new TicketBooking(obj, "Leela", 1);  
        Thread t1 = new Thread(tb1);  
        Thread t2 = new Thread(tb2);  
        t1.start();  
        t2.start();  
    }  
}
```

Which of the following options is/are possible result/s of the above code?

**Options :**

Leela booked 1 ticket  
6406532731201. ✓ Aman cannot book 1 ticket

Leela booked 1 ticket  
6406532731202. ✗ Aman booked 1 ticket

Aman booked 1 ticket

6406532731203. ✓ Leela cannot book 1 ticket

Aman cannot book 1 ticket

Leela cannot book 1 ticket

6406532731204. ✗

**Question Number : 230 Question Id : 640653815178 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the Java program given below.

```
import javax.swing.*;
import java.awt.event.*;
public class ButtonEvents extends JFrame implements ActionListener {
    private JButton btn1, btn2;
    private JLabel label;
    private JPanel panel;
    public ButtonEvents() {
        btn1 = new JButton("Button 1");
        btn2 = new JButton("Button 2");
        panel = new JPanel();
        panel.add(btn1);
        panel.add(btn2);
        add(panel, "North");
        label = new JLabel("No button clicked yet.");
        add(label, "South");
        btn1.setActionCommand("btn1");
        btn2.setActionCommand("btn2");
        btn1.addActionListener(this);
        btn2.addActionListener(this);
        setSize(300, 200);
        setVisible(true);
    }
    public void actionPerformed(ActionEvent e) {
        //CODE SEGMENT
    }
    public static void main(String[] args) {
        new ButtonEvents();
    }
}
```



Choose the correct code segment(s) to be filled inside method `actionPerformed()` such that on clicking the Button 1, the label text changes to `Button 1 clicked` and on clicking the Button 2, the label text changes to `Button 2 clicked`.

#### Options :

```
if (e.getActionCommand().equals("btn1"))
    label.setText("Button 1 clicked");
else if (e.getActionCommand().equals("btn2"))
    label.setText("Button 2 clicked");
6406532731213. ✓
```

6406532731214. ✓

```
if (e.getSource().equals(btn1))
    label.setText("Button 1 clicked");
else if (e.getSource().equals(btn2))
    label.setText("Button 2 clicked");
```

```
if (e.getActionCommand().equals("Button 1"))
    label.setText("Button 1 clicked");
else if (e.getActionCommand().equals("Button 2"))
    label.setText("Button 2 clicked");
```

6406532731215. \*

```
if (e.getSource().equals("btn1"))
    label.setText("Button 1 clicked");
else if (e.getSource().equals("btn2"))
    label.setText("Button 2 clicked");
```

6406532731216. \*

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118704

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 231 Question Id : 640653815176 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 5**

**Question Label : Multiple Choice Question**

Consider the Java code given below.

```
import java.util.*;
import java.util.concurrent.*;
class Example extends Thread {
    Map cuMap;
    Example(Map m) {
        this.cuMap = m;
    }
    public void run() {
        cuMap.put("D", "Dog");
    }
}
public class Test {
    public static void main (String[] args) {
        Map<String, String> cuMap = new ConcurrentHashMap();
        String[] str = {"A", "B", "C"};
        String[] arr = {"Apple", "Bat", "Cat"};
        for(int i = 0; i < str.length; i++) {
            cuMap.put(str[i],arr[i]);
        }
        Example t = new Example(cuMap);
        t.start();
        Set s = cuMap.entrySet();
        Iterator itr = s.iterator();
        while(itr.hasNext()) {
            Map.Entry m = (Map.Entry)itr.next();
            System.out.println(m.getKey() + " => " + m.getValue());
        }
    }
}
```

Which of the following is NOT true about the given code.

**Options :**

6406532731205. ✓ This program may generate **ConcurrentModificationException**.

The program may generate the output:

A => Apple  
B => Bat  
C => Cat

6406532731206. ✗ D => Dog

6406532731207. ✗

The program may generate the output:

D => Dog  
A => Apple  
B => Bat  
C => Cat

The program may generate the output:

A => Apple  
B => Bat  
C => Cat

6406532731208. ✳ C => Cat

**Question Number : 232 Question Id : 640653815177 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 5**

Question Label : Multiple Choice Question

The Java code given below produces a toggle button. With the first click, the color of panel pnlColor should become red, with the next click it should become blue, and on the next click, it should turn to red again, and so on. Based on the requirement, answer the question that follows the code.

```
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;
public class FClass extends JFrame implements ActionListener{
    JButton btnToggle;
    JPanel pnlColor, pnlBtn;
    public FClass1(){
        setSize(200, 200);
        btnToggle = new JButton("Toggle");
        btnToggle.addActionListener(this);
        btnToggle.setActionCommand("red");
        pnlColor = new JPanel();
        pnlBtn = new JPanel();
        pnlBtn.add(btnToggle);
        add(pnlBtn, "South");
        add(pnlColor, "Center");
        setVisible(true);
    }
    public void actionPerformed(ActionEvent e) {
        //CODE BLOCK
    }
    public static void main(String[] args){
        new FClass();
    }
}
```

Choose the correct code segment inside method `actionPerformed()` such that the given behaviour can be implemented correctly.

#### Options :

```
if(e.getActionCommand().equals("red")){
    btnToggle.setActionCommand("blue");
    pnlColor.setBackground(Color.red);
}
else if(e.getActionCommand().equals("blue")){
    btnToggle.setActionCommand("red");
    pnlColor.setBackground(Color.blue);
}
```

6406532731209. ✓ }

6406532731210. ❌

```
if (btnToggle.isSelected())
    pnlColor.setBackground(Color.red);
else
    pnlColor.setBackground(Color.blue);

        if(e.getActionCommand().equals("red"))
            btnToggle.setActionCommand("blue");
        else if(e.getActionCommand().equals("blue"))
6406532731211. ✘      btnToggle.setActionCommand("red");
```

```
if(e.getSource().equals("red")){
    btnToggle.setActionCommand("blue");
    pnlColor.setBackground(Color.red);
}
else if(e.getSource().equals("blue")){
    btnToggle.setActionCommand("red");
    pnlColor.setBackground(Color.blue);
}
6406532731212. ✘
```

## MLT

<b>Section Id :</b>	64065356661
<b>Section Number :</b>	11
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	17
<b>Number of Questions to be attempted :</b>	17
<b>Section Marks :</b>	50
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes

<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118705
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 233 Question Id : 640653815179 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 : MACHINE LEARNING TECHNIQUES (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 :**

6406532731217. ✓ YES

6406532731218. ✗ NO

<b>Sub-Section Number :</b>	2
<b>Sub-Section Id :</b>	640653118706
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 234 Question Id : 640653815180 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3**

**Question Label :** Short Answer Question

Consider a dataset  $X$  in  $\mathbb{R}^3$ . The dataset  $X$  consists of 4 samples with 3 features each. The covariance matrix  $C$  of this dataset has three non-zero eigenvalues which follow the given linear equations:

$$2\lambda_1 + 3\lambda_2 - \lambda_3 = 4$$

$$\lambda_1 - \lambda_2 + \lambda_3 = 3$$

$$\lambda_1 + \lambda_2 + 3\lambda_3 = 15$$

Determine the variance of the given dataset.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

7

**Question Number :** 235 **Question Id :** 640653815183 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 3

**Question Label :** Short Answer Question

Consider a dataset of  $n$  observations  $\{x_1, x_2, \dots, x_n\}$ , where each  $x_i$  follows a Bernoulli distribution with parameter  $p$ , i.e.,  $x_i \sim \text{Bernoulli}(p)$  for  $i = 1, 2, \dots, n$ . However, you have reason to believe that the parameter  $p$  might differ for two distinct groups within the dataset. You suspect that there are two groups in the dataset, each with its own parameter ( $p_1$  and  $p_2$ ). Now, develop an algorithm to estimate the parameters  $p_1$  and  $p_2$  using maximum likelihood estimation. Then, apply your algorithm to a dataset with the following observations and corresponding group labels:  $\{0, 1, 1, 0, 1\}$  and  $\{1, 0, 1, 1, 1\}$  for group 1 and group 2 respectively.

Calculate the maximum likelihood estimates of  $p_2$  and rounded to two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.80

**Question Number :** 236 **Question Id :** 640653815186 **Question Type :** SA **Calculator :** None

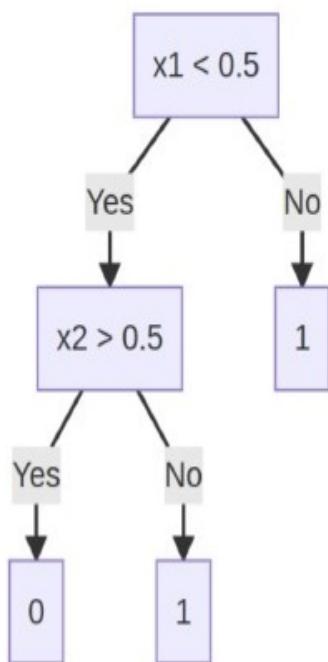
**Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Correct Marks :** 3

**Question Label :** Short Answer Question

Consider the following decision tree for a classification problem in which all the data-points are constrained to lie in the unit square in the first quadrant. That is  $0 \leq x_1, x_2 \leq 1$ . If a point is picked uniformly at random from the unit square, what is the probability that the decision tree predicts this point as belonging to class 0?

Enter your answer correct to two decimal place.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.25

**Question Number : 237 Question Id : 640653815187 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

Consider the following dataset with 6 samples along with the corresponding labels. Each sample has three binary features  $f_1, f_2$  and  $f_3$ .

sample	$f_1$	$f_2$	$f_3$	$y$
$x_1$	1	1	0	1
$x_2$	0	1	0	1
$x_3$	1	1	1	0
$x_4$	0	1	1	0
$x_5$	1	0	1	0
$x_6$	1	1	1	1

Assume that the features are conditionally independent given the label  $y$ . Suppose the test sample is  $x_{test} = [0, 1, 0]^T$ .

What is the estimated probability that the test point belongs to class 0 (that is,  $p(y = 0 | x_{test})$ )?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

0

**Question Number : 238 Question Id : 640653815189 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

Consider a linearly separable binary classification data set with 1000 data points and 100 features. Assume that there exists a  $w$  such that  $\|w\| = 1$ ,  $y_i(w^T x_i) \geq 0.2 \forall i$ . Also assume that  $\|x\|_2 \leq 1 \forall i$ . What is the maximum number of mistakes that the Perceptron algorithm can make in this data set?

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

**25**

**Question Number : 239 Question Id : 640653815195 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

Consider a simple neural network with one hidden layer. The network has the following architecture:

Input layer with 3 neurons. Hidden layer with 2 neurons, using the sigmoid activation function. Output layer with 1 neuron, using the linear activation function.

The weights and biases for the network are as follows:

Hidden Layer:

Neuron 1: Weights: [0.5, -0.2, 0.8]

Bias: 0.1

Neuron 2: Weights: [0.4, 0, 0.6]

Bias: -0.4

Output Layer:

Neuron 1: Weights: [0.2, 0.4]

Bias: -0.3

Assume that the input values are [0.6, 0.3, 0.8].

Calculate output of Neuron 1 in hidden layer

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

**0.70 to 0.80**

<b>Sub-Section Number :</b>	3
<b>Sub-Section Id :</b>	640653118707
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 240 Question Id : 640653815182 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 dataset with two features (Feature 1 and Feature 2) exhibiting a perfect positive correlation (1). If you apply k-means clustering with k = 3, what is the most likely arrangement of cluster centers that minimizes the within-cluster sum of squares (WCSS)?

**Options :**

6406532731224. ❌ An equilateral triangle centered around the mean of the data.

6406532731225. ✓ Cluster centers positioned along a straight line.

6406532731226. ❌ A triangle with two acute angles, positioned strategically within the data distribution.

6406532731227. ❌ A right-angled triangle with one center at the origin.

**Question Number : 241 Question Id : 640653815185 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 two models fitted on a one-dimensional dataset:

Model 1:  $\hat{y} = w_0 + w_1x$

Model 2:  $\hat{y} = w_1x^2 + w_2x + w_3$

If both models are trained on the same one-dimensional dataset and evaluated on the same test dataset, which model is more likely to have lower bias and higher variance?

**Options :**

6406532731233. ✘ Model 1

6406532731234. ✓ Model 2

6406532731235. ✘ Both models are equally sensitive to outliers

6406532731236. ✘ Insufficient data

**Question Number : 242 Question Id : 640653815188 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 dataset of 100 points  $x_1, x_2, \dots, x_{100}$ .

First 50 points are  $x_1, x_2, \dots, x_{50} = \begin{bmatrix} a \\ a \end{bmatrix}$  and next 50 points are  $x_{51}, x_{52}, \dots, x_{100} = \begin{bmatrix} -a \\ -a \end{bmatrix}$ , where  $a > 0$ . The first 50 data points belong to positive class (denoted as 1) and the next 50 datapoints belong to negative class (denoted by -1). Suppose that the perceptron learning algorithm is used to find the decision boundary that separates these data points with the following rule,

$$f(x) = \begin{cases} 1 & \text{if } w^T x \geq 0 \\ -1 & \text{if } w^T x < 0 \end{cases}$$

The algorithm checks the data points in the order. How many times the weights get updated until convergence (That is, the algorithm classifies both the points correctly)? The weights do not include bias.

**Options :**

6406532731239. ✓ 1

6406532731240. ✘ 2

6406532731241. ✘ 4

6406532731242. ✘ It oscillates and never converges

**Question Number : 243 Question Id : 640653815193 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**

What is the output of the following expression for  $x' = [3 \ 4]^T$ ? Here,  $L(x', \lambda)$  is the Lagrangian function for this optimization problem evaluated at  $x'$ .

$$\max_{\lambda \geq 0} L(x', \lambda)$$

**Options :**

6406532731259. ✘  $(x'_1)^2 - 3(x'_2)$

6406532731260. ✓  $\infty$

6406532731261. ✘  $-\infty$

6406532731262. ✘ 0

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118708

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 244 Question Id : 640653815181 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

**Question Label : Multiple Select Question**

Which of the following are true about the kernel function? Assume that the dataset  $X$  is mean centered.

**Options :**

6406532731220. ✓ The standard PCA is equivalent to kernel PCA if the kernel function is  $k(x_i, x_j) = x_i^T x_j$ .

6406532731221. ✗ The standard PCA is equivalent kernel PCA if the kernel function is  $k(x_i, x_j) = (x_i^T x_j + 1)^2$ .

6406532731222. ✓ The dimension of the transformed dataset  $\phi(X)$ , whose inner products the kernel function computes, can be infinite.

6406532731223. ✗ The dimension of the transformed dataset  $\phi(X)$ , whose inner products the kernel function computes, can never be smaller than the original dimension.

**Question Number : 245 Question Id : 640653815184 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Let  $X$  be a data matrix of the shape  $(d, n)$  and  $y$  be the associated label vector of shape  $(n, 1)$ . Assume that a linear regression model with loss as the sum of squared error is trained on the data  $\{X, y\}$ . In which of the following cases, the loss on the training data will necessarily be zero? Assume that the solution of the model is obtained by the normal equation that is  $w^* = (XX^T)^{-1}Xy$ .

**Options :**

6406532731229. ✗ If  $y$  lies in the space spanned of column vectors of  $X$ .

6406532731230. ✓ If  $y$  lies in the space spanned of column vectors of  $X^T$ .

6406532731231. ✓ If all the data points satisfy the equality  $x_1 + x_2 + \dots + x_d = 0$ , where  $x_i$  is the  $i$ th feature and  $y = 0$  for all the data points.

If all the data points satisfy the equality  $x_1^3 + x_2^3 + \dots + x_d^3 = 0$ , where  $x_i$  is the  $i$ th feature and  $y = 0$  for all the data points.

**Question Number : 246 Question Id : 640653815192 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Given a two-dimensional data set where points from class 1 are:

$\{(-2, 3), (-1, 1), (-1, 2), (-1, 4)\}$

And points from class 0 are:

$\{(1, 3), (1, 4), (2, 4), (2, 2)\}$

Which of the following statements are true?

**Options :**

The given data points from classes 1 and 0 can be linearly separated using a Hard-margin SVM.

A perceptron model and a hard margin SVM can give different decision boundary for this dataset.

A Soft-margin SVM would be a more robust choice than a Hard-margin SVM for this dataset as the dataset is not linearly separable.

The width of the separation between the two supporting hyperplanes is 4. (Hint: Calculate width using formulae  $\frac{2}{\|w\|}$ )

6406532731258. ❌

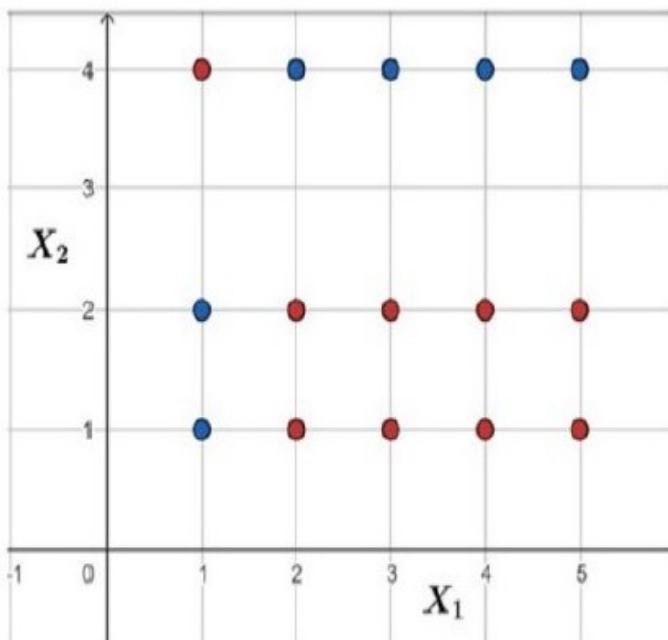
**Question Number : 247 Question Id : 640653815194 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following two-dimensional dataset with two classes: +1 for blue points and -1 for red points. An AdaBoost algorithm was run on this dataset using decision stumps as weak learners.



When training the new weak learner  $h_t(x)$  (decision stump at  $t^{th}$  iteration), we choose the split that minimizes the weighted miss-classification error with respect to current weights  $D_t$  i.e. choose  $h_t$  that minimizes  $\sum_{i=1}^n D_t(i) \mathbb{1}(h_t(x_i) \neq y_i)$ .

Based on the above data, answer the below given question.

To train the second decision stump, which pair of points will be assigned equal weights to create the training data-set?

**Options :**

6406532731263. ✓  $[2, 2]^T, [4, 2]^T$

6406532731264. ✗  $[2, 2]^T, [1, 4]^T$

6406532731265. ✓  $[1, 1]^T, [1, 4]^T$

6406532731266. ✗  $[3, 1]^T, [1, 4]^T$

**Sub-Section Number :**

5

<b>Sub-Section Id :</b>	640653118709
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 248 Question Id : 640653815190 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider a soft-margin Support Vector Machine (SVM) for a binary classification problem with a dataset in a two-dimensional space. The optimization problem for the soft-margin SVM is formulated as:

$$\text{Minimize } \frac{1}{2} \|\mathbf{w}\|^2 + C \sum_{i=1}^N \xi_i$$

subject to the constraints:

$$y_i(\mathbf{w} \cdot \mathbf{x}_i + b) \geq 1 - \xi_i \text{ and } \xi_i \geq 0 \text{ for all } i$$

Where  $C$  is a positive constant.

Let  $w^*$ ,  $\xi^*$  be the optimal solutions, and  $\alpha^*$ ,  $\beta^*$  be the optimal dual solutions of the soft margin SVM problem.

Which of the following statements about the soft-margin SVM is correct?

**Options :**

6406532731244. ✓ If the  $i^{th}$  data point pays a nonzero bribe, then  $\alpha_i^* = C$ .

6406532731245. ✓ If  $i^{th}$  data point lies on the correct supporting hyperplane, it does not pay any bribes.

6406532731246. ✗ A smaller value of  $C$  allows for a larger margin, potentially leading to less misclassifications on the training data.

6406532731247. ✓ For a dataset with  $n$  data-points, there are  $2n$  constraints for soft-margin SVM.

6406532731248. ✓ As  $C$  approaches  $\infty$  the soft margin SVM is equal to the hard margin SVM.

6406532731249. ✗  $C$  can be negative, as long as the bribe( $\xi$ ) each data point pays is non-negative.

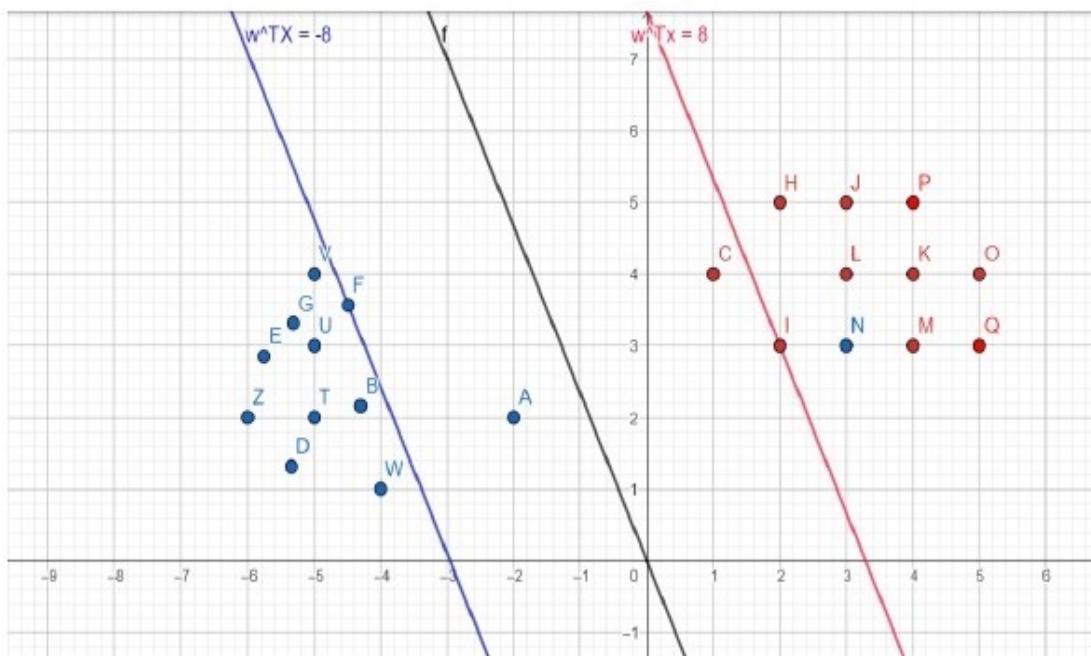
**Question Number : 249 Question Id : 640653815191 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following dataset on which the soft margin SVM is applied.



Which of the following statements is/are true about this dataset?

**Options :**

6406532731250. ✗ Points {F, I} are the only support vectors.

6406532731251. ✓ Points {A, N} are a subset of support vectors.

6406532731252. ✗ Points {F, A, C, I} are the only support vectors.

6406532731253. ✓ Points except {F, A, C, I, N} do not play any role in determining optimal weight vector.

6406532731254. \* Points except {F, A, C, I} do not play any role in determining optimal weight vector.

## MLP

<b>Section Id :</b>	64065356662
<b>Section Number :</b>	12
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	37
<b>Number of Questions to be attempted :</b>	37
<b>Section Marks :</b>	100
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118710
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 250 Question Id : 640653815196 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 : MACHINE LEARNING PRACTICES (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 :**

6406532731268. ✓ YES

6406532731269. ✗ NO

**Question Number : 251 Question Id : 640653815197 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

Instruction:

**Note:** For numerical answer type questions enter your answer correct upto 2 decimal places without rounding off, unless stated otherwise.

**Options :**

6406532731270. ✓ Instruction has been mentioned above.

6406532731271. ✗ This Instruction is just for a reference & not for an evaluation.

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118711

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 252 Question Id : 640653815204 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Select multilabel multiclass classification problems:

**Options :**

6406532731285. ✓ There is a collection of photographs. Each photograph can have multiple animals, e.g., cats, dogs and birds. Your model should indicate all the animals which are present.

6406532731286. ✗ From appropriate weather data, your model must predict, average temperature and average humidity for next seven days.

6406532731287. ✗ Predicting expected price of a second hand car with appropriate features.

6406532731288. ✗ None of these.

**Question Number : 253 Question Id : 640653815211 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following options is the correct method to shuffle training data after each epoch in SGDRegressor?

**Options :**

6406532731307. ✓ 

```
from sklearn.linear_model import SGDRegressor  
linear_regressor = SGDRegressor(shuffle=True)
```

6406532731308. ✗ 

```
from sklearn.preprocessing import SGDRegressor  
linear_regressor = SGDRegressor(shuffle_per_epoch=True)
```

6406532731309. ✗ 

```
from sklearn.SGDRegressor import linear_model  
linear_regressor = SGDRegressor(learning_rate='constant',  
                                eta0=1e-2)
```

6406532731310. ✗ None of these

**Question Number : 254 Question Id : 640653815212 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following can be used (with appropriate supporting code) to compute training error after each iteration?

**Options :**

SGDRegressor(max\_iter=1,  
                  warm\_start=True,  
                  fit\_intercept=True,  
                  random\_state=0,  
                  learning\_rate='optimal')

6406532731311. ✓

SGDRegressor(max\_iter=2,  
                  warm\_start=True,  
                  fit\_intercept=True,  
                  random\_state=42,  
                  learning\_rate='optimal')

6406532731312. ✗

SGDRegressor(max\_iter=1,  
                  warm\_start=False,  
                  fit\_intercept=True,  
                  random\_state=0,  
                  learning\_rate='optimal')

6406532731313. ✗

SGDRegressor(max\_iter=1,  
                  warm\_start=False,  
                  fit\_intercept=True,  
                  random\_state=0,  
                  learning\_rate='invscaling')

6406532731314. ✗

6406532731315. ✗ None of these

**Question Number : 255 Question Id : 640653815213 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

For the given code below in which you use how many models will get trained or what will be the length of scores variable ?

```
from sklearn.model_selection import cross_val_score
from sklearn.model_selection import LeaveOneOut
from sklearn.linear_model import LogisticRegression
from sklearn.datasets import make_classification
X, y = make_classification(n_samples=1024, n_features=82, n_classes=2,
                           random_state=42)
estimator = LogisticRegression()
loocv = LeaveOneOut()
scores = cross_val_score(estimator, X, y, cv=loocv)
```

**Options :**

6406532731316. ✘ 1106

6406532731317. ✘ 82

6406532731318. ✓ 1024

6406532731319. ✘ 5

6406532731320. ✘ None of these

**Question Number : 256 Question Id : 640653815214 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

What is the purpose of k-fold cross-validation ?

**Options :**

6406532731321. ✘ To split data into training and testing sets.

6406532731322. ✘ To tune hyperparameters.

6406532731323. ✓ To evaluate model performance on multiple subsets.

6406532731324. ✘ To preprocess data.

**Question Number : 257 Question Id : 640653815215 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider below statements and choose the correct option

Statement 1 :  fit method in scikit-learn helps in learning the parameters of any Classifier or Regressor.

Statement 2 : The  transform method in scikit-learn is utilized to apply a transforming function and convert the feature matrix after fitting the Classifier or Regressor.

**Options :**

6406532731325. ✓ Statement 1 is True and Statement 2 is False

6406532731326. ✘ Statement 2 is True and Statement 1 is False

6406532731327. ✘ Both the statements are True

6406532731328. ✘ Both the statements are False

**Question Number : 258 Question Id : 640653815219 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which assumption does Naive Bayes make about the features?

**Options :**

6406532731332. ✓ They are independent of each other.

6406532731333. ✗ They are always a numerical representation of the text data.

6406532731334. ✗ They are linearly related.

6406532731335. ✗ They are categorical.

6406532731336. ✗ None of these.

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118712

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 259 Question Id : 640653815207 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

Given the following code snippet that preprocesses a dataset with both continuous and categorical features using `sklearn.preprocessing` tools, what will be the first row of the `X_transformed` array after preprocessing?

```
import numpy as np
from sklearn.preprocessing import OneHotEncoder
from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.compose import ColumnTransformer

X = np.array([[4.0, 'avocado'],
              [3.0, 'dragon fruit'],
              [2.0, 'sapodilla'],
              [7.0, 'papaya']])

preprocessor = ColumnTransformer(
    transformers=[('num1', MinMaxScaler(), [0]),
                  ('cat', OneHotEncoder(), [1]),
                  ('num2', StandardScaler(), [0]),])

X_transformed = preprocessor.fit_transform(X)
print(X_transformed[0])
```

**Options :**

6406532731295. ✓ [0.4, 1, 0, 0, 0, 0]

6406532731296. ✗ [0.5, 0, 1, 0, 0, 1.66]

6406532731297. ✗ [0.25, 0, 1, 0, -1.66]

6406532731298. ✗ [0.4, 0, 0, 0, 1, 0.66]

6406532731299. ✗ None of these

**Question Number : 260 Question Id : 640653815231 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

You're working on a dataset containing customer purchase data, and you want to segment the customers into distinct groups based on their purchasing behavior. Each data point represents a customer and includes features like "Total Amount Spent" and "Number of Items Purchased."

Which algorithm is suitable for this scenario?

**Options :**

6406532731376. ✘ Linear Regression

6406532731377. ✘ Decision Tree

6406532731378. ✓ K-means Clustering

6406532731379. ✘ Support Vector Machine

6406532731380. ✘ None of these

**Question Number : 261 Question Id : 640653815232 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

You're building an `MLPClassifier` for a dataset with a large number of features. The goal is to predict whether an online user will purchase a product based on their browsing behavior. You're trying to decide the appropriate number of neurons in the hidden layers of the neural network. Which statement about adjusting the `hidden_layer_sizes` parameter is correct?

**Options :**

6406532731381. ✘ Increasing the number of neurons in hidden layers will always lead to better model performance.

6406532731382. ✘ Decreasing the number of neurons in hidden layers reduces the model's capacity to capture complex patterns.

6406532731383. ✘ The number of neurons in hidden layers does not significantly affect the

model's performance.

6406532731384. ✓ Finding the optimal number of neurons is a trial-and-error process and may require experimentation.

**Question Number : 262 Question Id : 640653815234 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

How does agglomerative clustering handle outliers?

**Options :**

6406532731389. ✗ It ignores outliers during the clustering process.

6406532731390. ✓ It assigns outliers to the nearest cluster.

6406532731391. ✗ It creates separate clusters for outliers.

6406532731392. ✗ It removes outliers from the dataset before clustering.

**Question Number : 263 Question Id : 640653815235 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

What is agglomerative clustering?

**Options :**

6406532731393. ✓ A hierarchical clustering technique that starts with each data point as its cluster and merges the closest clusters iteratively.

6406532731394. ✗ A method for partitioning data into a predefined number of clusters.

6406532731395. ✗ A clustering algorithm that uses centroids to iteratively assign data points to clusters.

6406532731396. ❌ A dimensionality reduction technique that projects data onto a lower-dimensional space.

**Question Number : 264 Question Id : 640653815236 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

What initialization method is best in KMeans to select initial cluster centroids?

**Options :**

6406532731397. ❌ Random initialization

6406532731398. ✓ K-means++ initialization

6406532731399. ❌ Hierarchical agglomerative initialization

6406532731400. ❌ Weighted initialization

**Question Number : 265 Question Id : 640653815237 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

In K-Means clustering, what does the `inertia_` attribute represent?

**Options :**

6406532731401. ❌ The distance between cluster centroids

6406532731402. ❌ The number of clusters formed

6406532731403. ✓ Sum of squared distances of samples to their closest cluster center.

6406532731404. ❌ The silhouette coefficient

<b>Sub-Section Id :</b>	640653118713
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 266 Question Id : 640653815226 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

You're using a `DecisionTreeClassifier` from `sklearn.tree` to build a classification model. Which of the following statements is MOST accurate regarding the parameters and attributes of this classifier?

**Options :**

The depth of the tree always must be less than equal to the `max_depth` parameter value, while the `tree_.max_depth` attribute retrieves the depth of the  
6406532731355. ✓ actual tree that was built.

Setting `min_samples_split` to a value greater than 2 can prevent the tree from splitting on features that have very minimal influence, but this guarantees that  
6406532731356. ✗ all leaf nodes will contain fewer samples than this value.

The `criterion='entropy'` parameter means that the decision tree will split nodes to maximize information gain, while the `tree_.impurity` attribute retrieves the impurity of the root node.  
6406532731357. ✗

If the `class_weight` parameter is set to 'balanced', the decision tree will always have balanced classes in its leaf nodes.  
6406532731358. ✗

**Question Number : 267 Question Id : 640653815228 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

You're aiming to optimize an `AdaBoostClassifier` that uses a `DecisionTreeClassifier` as its base estimator. You decide to use `GridSearchCV` from `sklearn.model_selection` to search for the best hyperparameters. In the given parameter grids for `GridSearchCV`, parameters `n_estimators` and `learning_rate` are meant for the '`AdaBoostClassifier`', while the others are for the '`DecisionTreeClassifier`'. Which of the following sets of parameters is the MOST comprehensive in testing the capabilities of both the '`AdaBoostClassifier`' and its base estimator?

**Options :**

6406532731363. ❌ `{'AdaBoostClassifier_n_estimators': [50, 100, 150], 'AdaBoostClassifier_learning_rate': [0.01, 0.1, 1]}`

6406532731364. ❌ `{'max_depth': [1, 2, 3], 'n_estimators': [50, 100], 'learning_rate': [0.01, 0.1, 1]}`

6406532731365. ❌ `{'DecisionTreeClassifier_criterion': ['gini', 'entropy'], 'DecisionTreeClassifier_splitter': ['best', 'random'], 'n_estimators': [50, 100], 'learning_rate': [0.1, 1]}`

6406532731366. ✓ `{'estimator__max_depth': [1, 2, 3], 'estimator__criterion': ['gini', 'entropy'], 'n_estimators': [30, 50], 'learning_rate': [0.05, 0.1, 0.5]}`

**Question Number : 268 Question Id : 640653815229 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

Question Label : Multiple Choice Question

Given the following code using BaggingClassifier with KNeighborsClassifier as the base estimator:

```
from sklearn.ensemble import BaggingClassifier  
from sklearn.neighbors import KNeighborsClassifier  
  
base_knn = KNeighborsClassifier(n_neighbors=5)  
  
bag_clf = BaggingClassifier(base_knn, n_estimators=50, max_samples=0.5,  
    bootstrap=True, n_jobs=-1)
```

Which of the following statements is correct?

**Options :**

6406532731367. ✘ Bag\_clf will throw an error as it only accepts decision tree classifiers as base classifiers.

6406532731368. ✘ Each base KNN classifier will be trained on the entire dataset.

6406532731369. ✓ The max\_samples=0.5 parameter means each base estimator in the ensemble is trained on 50% of the training samples,

6406532731370. ✘ The ensemble will use sequential computation due to n\_jobs=-1.

6406532731371. ✘ None of these

**Question Number : 269 Question Id : 640653815230 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4**

**Question Label : Multiple Choice Question**

You're using a RandomForestClassifier from sklearn for a multi-class classification problem. You want to ensure diversity among the trees to avoid overfitting and increase robustness. Which combination of parameter settings would contribute MOST to achieving this objective?

**Options :**

6406532731372. ✘ Setting `n_estimators` to 10, `max_depth` to 3, and using `criterion='entropy'`.

6406532731373. ✘ Increasing the value of `n_estimators`, setting `max_features` to a value less than the total number of features, and setting `bootstrap` to False.

6406532731374. ✓ Setting `n_estimators` to a high value, using `criterion='gini'`, and setting `max_samples` to a value less than the total number of samples.

6406532731375. ✘ Setting `max_depth` to None, `min_samples_split` to 2, and `min_samples_leaf` to 1.

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118714

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 270 Question Id : 640653815205 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

What is the solution for overfitting?

**Options :**

6406532731289. ✘ To have less constraints/regularization

6406532731290. ✓ To have more constraints/regularization

6406532731291. ✘ Delete a significant portion of data

6406532731292. ✓ Increase the dataset size.

6406532731293.

\* None of these.

**Question Number : 271 Question Id : 640653815210 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Select all the correct options:

**Options :**

6406532731302. ✓ The more the SGD iterations, the lesser the fluctuations in training error.

6406532731303. ✓ More iterations require more computation time.

6406532731304. ✓ The tol (error tolerance) parameter restricts the number of iterations performed.

6406532731305. ✓ Training error might not consistently decrease while performing SGD iterations.

6406532731306. \* None of these

**Question Number : 272 Question Id : 640653815222 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Fill in the missing parameter value in the following estimator that can be used to classify the data

```
from sklearn.svm import SVC  
clf = SVC(kernel = _____)  
clf.fit(X, y)
```

**Options :**

6406532731339. \* 'lasso'

6406532731340. ✓ 'linear',

6406532731341. ✓ 'rbf',

6406532731342. ✗ 'scale'

**Question Number : 273 Question Id : 640653815223 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following statements are true?

**Options :**

KNeighborsClassifier with low values of n\_neighbors produces complex decision boundaries.

6406532731344. ✗ KNeighborsClassifier with low values of n\_neighbors produces smooth decision boundaries.

6406532731345. ✓ In KNeighborsClassifier the scale of the features (columns) can impact the decision boundaries.

6406532731346. ✗ None of these.

**Question Number : 274 Question Id : 640653815224 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following options are correct regarding regularization?

**Options :**

6406532731347. ❌ It is a technique used to minimize the adjusted loss function and avoid underfitting.

6406532731348. ✓ It helps in increasing the bias of the training model.

6406532731349. ❌ It determines the rows to be selected as a training dataset.

6406532731350. ✓ Elastic net regularization is a combination of L1 and L2 regularization both.

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118715

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 275 Question Id : 640653815227 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following techniques are used in decision trees to make decisions or to measure the quality of a split while training the model?

**Options :**

6406532731359. ✓ Entropy

6406532731360. ❌ RoC Curve

6406532731361. ❌ Cross Entropy

6406532731362. ✓ Gini Impurity

**Question Number : 276 Question Id : 640653815233 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 3 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following approaches is(are) helpful to find a good value for  $k$  in  $k$ -means clustering algorithm?

**Options :**

6406532731385. ✓ Plotting an Elbow curve.

6406532731386. ✗ Using classifiers before making clusters.

6406532731387. ✓ Plotting Silhouette coefficient for various values of  $k$ .

6406532731388. ✗ Using k-fold cross validation

**Sub-Section Number :** 7

**Sub-Section Id :** 640653118716

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 277 Question Id : 640653815225 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 4 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following block of code:

```
from sklearn.datasets import load_breast_cancer
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
X,y = load_breast_cancer(as_frame = True,
                         return_X_y = True)
X_train,X_test,y_train,y_test = train_test_split(X,y,
                                                test_size = 0.2,
                                                random_state = 1)
clf = DecisionTreeClassifier(min_samples_split = 5,
                             min_samples_leaf = 3,
                             random_state = 5)
clf.fit(X_train, y_train)
print(clf.score(X_test, y_test))
```

In which of the following scenarios, the split will NOT be made at node N?

**Options :**

6406532731351. ✓ 10 number of samples at node N. If it is split, it can split such that 2 samples in the left child and 8 samples in the right child.

6406532731352. ✗ 6 number of samples at node N. If it is split, it can split such that 3 samples in the left child and 3 samples in the right child.

6406532731353. ✗ 12 number of samples at node N. If it is split, it can split such that 5 samples in the left child and 7 samples in the right child.

6406532731354. ✓ 4 number of samples at node N. If it is split, it can split such that 3 samples in the left child and 1 samples in the right child.

**Sub-Section Number :** 8

**Sub-Section Id :** 640653118717

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 278 Question Id : 640653815206 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

**Question Label : Short Answer Question**

What will be the output of the following code:

```
from sklearn.preprocessing import MaxAbsScaler
a = [[-3.5],[ 0],[-2.8],[ 2.0],[-1],[-4]]
mas = MaxAbsScaler()
scaled_a = mas.fit_transform(a)
print(scaled_a.max())
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.5

**Question Number : 279 Question Id : 640653815216 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

Consider following data points:

```
import numpy as np
X = np.array([[1,1],[10,11],[5,5],[25,18],[-1,-1]])
y = np.array([0,1,0,1,1]).reshape(-1,1)
```

What will be the highest accuracy a perceptron model can achieve on this dataset without any feature engineering?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.8

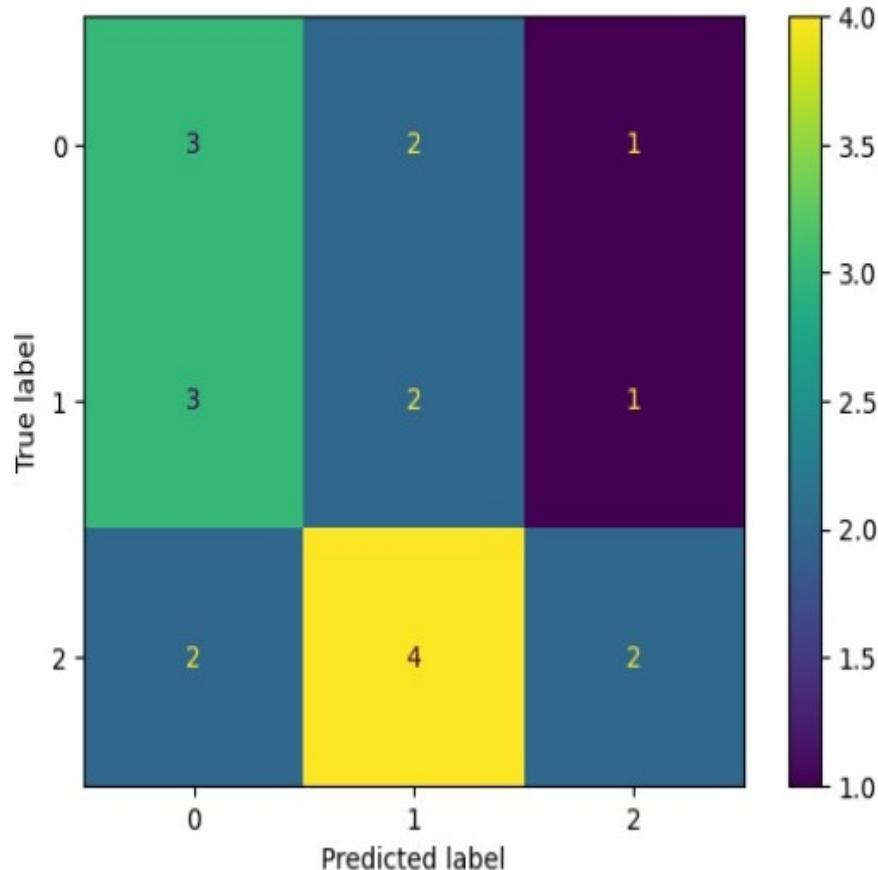
**Question Number : 280 Question Id : 640653815217 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

**Question Label : Short Answer Question**

Using the confusion matrix given below. What is the precision score for the label (class) 0 ?



**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

**0.37 to 0.38**

**Question Number : 281 Question Id : 640653815220 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

**Question Label : Short Answer Question**

Consider the following Python code snippet and the given dataset that has been stored in the data variable that demonstrates the use of GaussianNB from scikit-learn:

	Outlook	Temperature	Humidity	Windy	Play Golf
0	Rainy	Hot	High	False	No
1	Overcast	Hot	High	False	Yes
2	Sunny	Cool	Normal	False	Yes
3	Sunny	Cool	Normal	True	No
4	Overcast	Cool	Normal	True	Yes
5	Rainy	Cool	Normal	False	Yes
6	Rainy	Hot	High	True	No
7	Overcast	Hot	High	False	Yes
8	Sunny	Cool	Normal	True	No
9	Overcast	Cool	Normal	True	Yes
10	Rainy	Cool	Normal	False	Yes
11	Overcast	Hot	Normal	False	Yes

```
from sklearn.preprocessing import OneHotEncoder, LabelEncoder
from sklearn.naive_bayes import GaussianNB

X = data.drop("Play Golf", axis=1)
y = data["Play Golf"]

X = OneHotEncoder(sparse_output=False).fit_transform(X)
y = LabelEncoder().fit_transform(y)

estimator = GaussianNB()

estimator.fit(X,y)

print(estimator.class_prior_) # gives the priori of labels(y)
```

What is the prior probability of the label being “No”? i.e.  $p(y = \text{“No”})$

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.32 to 0.35

**Question Number : 282 Question Id : 640653815221 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the output of the following code?

```
from sklearn.neighbors import KNeighborsClassifier
X = [[2,3], [5,6], [10, 11], [15,16], [20,21]]
y = [0, 1, 1, 1, 2]
knn = KNeighborsClassifier(n_neighbors=3,
                           metric='euclidean',
                           weights='uniform')
knn.fit (X, y)
print (knn.predict([[8,9]]))
```

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

1

**Sub-Section Number :** 9

**Sub-Section Id :** 640653118718

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 283 Question Id : 640653815208 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

Question Label : Short Answer Question

Consider the following code snippet:

```
from sklearn.datasets import fetch_california_housing, load_iris
from sklearn.decomposition import PCA
from sklearn.preprocessing import StandardScaler, PolynomialFeatures
from sklearn.pipeline import Pipeline, FeatureUnion

X,y = load_iris(return_X_y= True)

polynomial_transform = PolynomialFeatures(degree=3,
                                         interaction_only=False,
                                         include_bias=False)

combined_features = FeatureUnion([('poly', polynomial_transform),
                                   ('pca', PCA(n_components=2))])

pipeline = Pipeline([('features', combined_features),
                     ('scaler', MinMaxScaler())])

X_transformed = pipeline.fit_transform(X)

print(X_transformed.shape)
```

If the shape of X is (150,4), what will be the number of features in X\_transformed?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

36

**Question Number : 284 Question Id : 640653815209 Question Type : SA Calculator : None**

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

**Correct Marks : 3**

**Question Label : Short Answer Question**

What will be the output of the following code snippet? Assume necessary imports.

```
X = np.array([[1,6],  
             [-2,0],  
             [-0.25, 3.5]])  
  
pca_transform = PCA(n_components=2)  
  
X_transformed = pca_transform.fit_transform(X)  
  
print(pca_transform.explained_variance_ratio_[0])
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1.00

**Question Number :** 285 **Question Id :** 640653815218 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 3

**Question Label :** Short Answer Question

What will be the output of the following code snippet?

```
from sklearn.linear_model import Perceptron  
# Sample data  
X = [[0, 0], [0, 1], [1, 0], [1, 1]]  
y = [0, 0, 0, 1]  
  
clf = Perceptron(tol=None, shuffle=False)  
clf.fit(X, y)  
  
print(clf.predict([[2, 2]]))
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Sub-Section Number :** 10

**Sub-Section Id :** 640653118719

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653815198 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (286 to 290)**

Question Label : Comprehension

Consider following code snippet, assume necessary imports:

```
df=pd.DataFrame(data={"Name": ['Akash',
                               'Brajesh',
                               'Charu',
                               'Deepak'],
                      "Maths": [34,43,56,77],
                      "English": [23,45,67,82],
                      "Hindi": [53,35,np.nan,"hi"],},
                      index = range(11,15))
```

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 286 Question Id : 640653815199 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Consider the following code snippet:

```
selection = df.loc[13:15, 'Maths':'English']
```

Which of the following will be equivalent to the given code snippet?

**Options :**

6406532731272. ✓ selection = df.iloc[[2,3], [1,2]]

6406532731273. ✗ selection = df.iloc[[1,3], [1,2]]

6406532731274. ✓ selection = df.iloc[2:4, 1:3]

6406532731275. ✗ selection = df.iloc[1:3, 1:2]

6406532731276. ✗ None of these

**Question Number : 287 Question Id : 640653815200 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the output of the following code snippet:

```
df.loc[13, 'English'] + df.iloc[0,3]
```

Enter -1, if you think the given statement will generate an error.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

120

**Question Number : 288 Question Id : 640653815201 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the output of the following code snippet:

```
print(df.Hindi.apply(type).nunique())
```

Enter -1, if you think the given statement will generate an error.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

3

**Question Number : 289 Question Id : 640653815202 Question Type : SA Calculator : None**

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

**Correct Marks : 2**

Question Label : Short Answer Question

What is the output of the following code snippet:

```
def getPassing(aRow):
    if aRow['Maths']>=35 and aRow['English']>=35:
        return True
    return False

df.apply(getPassing).sum()
```

Enter -1, if you think the given statement will generate an error.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

-1

**Question Number : 290 Question Id : 640653815203 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2**

Question Label : Multiple Choice Question

What is the output of the following code snippet:

```
df=df.dropna()
```

Choose correct options from following:

**Options :**

6406532731280. ✓ The number of rows will decrease in the dataset.

6406532731281. ✗ The number of columns will decrease in the dataset.

6406532731282. ✗ The number of columns and number of rows, both, will decrease in the

dataset.

6406532731283. ✖ There will be no change.

6406532731284. ✖ Insufficient information.

## System Commands

<b>Section Id :</b>	64065356663
<b>Section Number :</b>	13
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	16
<b>Number of Questions to be attempted :</b>	16
<b>Section Marks :</b>	100
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118720
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 291 Question Id : 640653815238 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 : SYSTEM COMMANDS  
(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 :**

6406532731405. ✓ YES

6406532731406. ✗ NO

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118721

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 292 Question Id : 640653815239 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 6**

**Question Label : Multiple Choice Question**

Select the script to find and kill the process which is consuming more than 90% of the CPU.

Hint:

```
$ ps -eo pid,%cpu --sort=-%cpu
      PID %CPU
243099 88.2
  9640  7.0
  9814  3.1
  2824  2.8
242251  2.4
  9822  1.2
  3140  0.7
  2654  0.7
  9902  0.6
```

- `xargs` is used to pass the stdout of one command as arguments to another command.

### Options :

6406532731407. ✓ `ps -eo pid,%cpu --sort=-%cpu | awk '$2 > 90 {print $1}' | xargs kill`

6406532731408. ✗ `ps -eo pid,%cpu --sort=-%cpu | awk '$2 < 90 {print $1}' | xargs kill`

6406532731409. ✗ `ps -eo pid,%cpu --sort=-%cpu | awk '$0 > 90 {print $1}' | xargs kill`

6406532731410. ✗ `ps -eo pid,%cpu --sort=-%cpu | awk '$0 < 90 {print $1}' | xargs kill`

**Question Number : 293 Question Id : 640653815240 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

What does the below script do?

```
while read -r line; do
    [ "$line" = EOF ] && break
    echo $line
done <file1 >file2
```

**Options :**

6406532731411. ✘ Copies the contents of file1 to file2 .

Copies the contents of file1 to file2 until the line EOF is encountered and the line EOF is not copied.

6406532731412. ✓ Copies the contents of file1 to file2 until the line EOF is encountered, the line EOF is copied.

Copies the contents of file1 to file2 until the last occurrence of the line EOF is encountered and the line EOF is not copied.

6406532731414. ✘

**Question Number : 294 Question Id : 640653815243 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

What does the following script do?

```
#!/bin/bash

x=0
for number in {10..20}; do
    # The ends of the range are inclusive
    if ((number % 2 == 0)); then
        x=$((x + 1))
    fi
done
echo $x
```

**Options :**

6406532731417. ✓ Prints the count of even numbers between 10 and 20.

6406532731418. ✗ Prints the count of odd numbers between 10 and 20.

6406532731419. ✗ Prints the sum of even numbers between 10 and 20.

6406532731420. ✗ Prints the sum of odd numbers between 10 and 20.

**Question Number : 295 Question Id : 640653815244 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

The PATH environment variable:

- Stores a list of directories separated by colons (":").
- The shell searches for executable commands in these directories, one by one, in the order they appear in the PATH.

Select the command that does the following:

Here, the script `my-script` is taken as an **example**. If the command `my-script` is run:

1. Check for `my-script` in `~/.local/bin`:
  - If an executable file named `my-script` exists in the `~/.local/bin` directory, run that specific file.
2. Check for `my-script` in `/opt/extr/bin` (if not found in step 1):
  - If the executable file `my-script` doesn't exist in `~/.local/bin` but exists in `/opt/extr/bin`, run the one from `/opt/extr/bin`.
3. The same flow should be followed if the command is run from a script.

**Options :**

6406532731421. ✗

```
export PATH=/opt/extr/bin:~/.local/bin:$PATH
```

6406532731422. ✓

```
export PATH=~/local/bin:/opt/extr/bin:$PATH
```

6406532731423. ✗

PATH=/opt/extra/bin:~/local/bin:\$PATH

6406532731424. \*

PATH=~/local/bin:/opt/extra/bin:\$PATH

**Question Number : 296 Question Id : 640653815245 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

Consider the following shell script:

```
# myscript.sh
for file in *.txt; do
    echo "Processing $file"
    mv "$file" "backup_$file"
done
```

What does this script do?

**Options :**

6406532731425. ✓ Renames all .txt files by adding the prefix “backup\_” to their names.

6406532731426. \* Deletes all .txt files.

6406532731427. \* Creates backup copies of all .txt files.

6406532731428. \* Moves all .txt files to a backup directory.

**Question Number : 297 Question Id : 640653815246 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

What environment variable stores the path to the user's home directory?

**Options :**

6406532731429. ✓ \$HOME

6406532731430. ✗ \$PATH

6406532731431. ✗ \$USER

6406532731432. ✗ \$PWD

**Question Number : 298 Question Id : 640653815247 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 6**

Question Label : Multiple Choice Question

You have a file with multiple lines, each containing a word. How would you use `sed` to print only the lines containing words starting with the letter "a"?

**Options :**

6406532731433. ✓ sed -n '/^a/p' filename

6406532731434. ✗ sed -n '/^a\$/p' filename

6406532731435. ✗ sed '/^a/p' filename

6406532731436. ✗ sed '/^a\$/ filename

<b>Sub-Section Number :</b>	3
<b>Sub-Section Id :</b>	640653118722
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 299 Question Id : 640653815251 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 8**

Question Label : Multiple Choice Question

Arrange the following steps in the correct order to create a bash script that takes a directory as input and recursively searches for all files with a .log extension, compressing them into a single .tar.gz archive:

1. Use the find command to recursively locate all files with a .log extension within the specified directory.
2. Check if the specified directory exists and is accessible.
3. Prompt the user to enter the directory path.
4. Handle errors gracefully, such as displaying an error message for invalid directories.
5. Check if any .log files were found.
6. Pipe the output of find to tar -czf to create the archive.
7. Provide feedback to the user indicating the successful completion of the task.

**Options :**

6406532731450. ✖ 2 -> 1 -> 3 -> 6 -> 5 -> 7 -> 4

6406532731451. ✖ 1 -> 2 -> 3 -> 5 -> 6 -> 7 -> 4

6406532731452. ✓ 3 -> 2 -> 1 -> 5 -> 6 -> 7 -> 4

6406532731453. ✖ 1 -> 3 -> 2 -> 5 -> 6 -> 7 -> 4

6406532731454. ✘ 2 -> 1 -> 3 -> 5 -> 6 -> 7 -> 4

**Question Number : 300 Question Id : 640653815252 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 8**

Question Label : Multiple Choice Question

Which AWK script from the options can count the frequency of each word if executed on a text file?

Note: The text file contains only words separated by spaces.

**Options :**

```
{  
    for (i=1; i<NF; i++) {  
        word_count[$i]++;  
    }  
}  
END {  
    for (word in word_count) {  
        print word, word_count[word];  
    }  
}
```

6406532731455. ✘

```
{  
    for (i=1; i<=NF; i++) {  
        word_count[$i]++;  
    }  
}  
END {  
    for (word in word_count) {  
        print word, word_count[word];  
    }  
}
```

6406532731456. ✓ }

6406532731457. ✘

```
{  
    for (i=1; i<=NR; i++) {  
        word_count[$i]++;  
    }  
}  
END {  
    for (word in word_count) {  
        print word, word_count[word];  
    }  
}
```

```
{  
    for (i=1; i<NR; i++) {  
        word_count[$i]++;  
    }  
}  
END {  
    for (word in word_count) {  
        print word, word_count[word];  
    }  
}
```

6406532731458. \*

**Sub-Section Number :** 4

**Sub-Section Id :** 640653118723

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 301 Question Id : 640653815241 Question Type : SA Calculator : None**

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

**Correct Marks : 7**

**Question Label : Short Answer Question**

How long will the following script run upon execution?

**Hint:**

- `$!` expands to the PID of the most recently executed **background command**.
- Provide the answer in integer format.

```
for i in {1..5}; do
    sleep 3 &
    sleep 1 && kill $!
done
```

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

5

**Question Number :** 302 **Question Id :** 640653815242 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 7

**Question Label :** Short Answer Question

What will be the output of the last command?

Note: The answer is case-sensitive, so provide it without leading or trailing spaces.

```
$ cat data.txt
Hello World
$ cat data.txt | while read -r line; do
    echo "${line#* }"
done
```

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive : Yes**

**Text Areas : PlainText**

**Possible Answers :**

World

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118724

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 303 Question Id : 640653815249 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6 Max. Selectable Options : 0**

Question Label : Multiple Select Question

You want to find lines in a text file where the third field is a numeric value between 10 and 20 inclusive. Which command(s) would you use?

**Options :**

6406532731441. ✓ awk '\$3 >= 10 && \$3 <= 20 {print}' filename

6406532731442. ✗ awk '\$3 ~ /^[10-20]+\$/ {print}' filename

6406532731443. ✗ awk '\$3 ~ /^[0-9]{2}\$/ {print}' filename

6406532731444. ✓ awk '\$3 >= 10 && \$3 <= 20 {print \$0}' filename

6406532731445. ✓ awk '\$3 ~ /[:digit:]]+&& \$3 >= 10 && \$3 <= 20 {print}' filename

**Question Number : 304 Question Id : 640653815250 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 6 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Select the correct option(s) to validate whether a string variable contains only digits in a bash script.

**Options :**

6406532731446. ✓ [[ \$variable =~ ^[0-9]+\\$ ]]

6406532731447. ✗ [[ \$variable =~ ^[0-9]\*\\$ ]]

6406532731448. ✓ [[ \$variable =~ ^[:digit:]+\\$ ]]

6406532731449. ✗ [[ \$variable =~ ^[:digit:]\*\\$ ]]

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118725

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 305 Question Id : 640653815248 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 8 Max. Selectable Options : 0**

Question Label : Multiple Select Question

You're tasked with extracting phone numbers from a text document in the format of either (123) 456-7890 or 123-456-7890. Which regular expression (ERE) would you use to match both formats?

**Options :**

6406532731437. ✗ ([0-9]{3}) [0-9]{3}-[0-9]{4}|[0-9]{3}-[0-9]{3}-[0-9]{4}

6406532731438. ✘ ([0-9]{3}-)?(\([0-9]{3}\)\ )?[0-9]{3}-[0-9]{4}|[0-9]{3}-[0-9]{3}-[0-9]{4}

6406532731439. ✓ [0-9]{3}-[0-9]{3}-[0-9]{4}|\([0-9]{3}\)\ [0-9]{3}-[0-9]{4}

6406532731440. ✓ \([0-9]{3}\)\ [0-9]{3}-[0-9]{4}|[0-9]{3}-[0-9]{3}-[0-9]{4}

**Question Number : 306 Question Id : 640653815253 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 8 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Complete the script to print the name in the order of the "given name" and "family name" from the file `name_country.csv`. In some countries, people keep their "family name" as their first name and their "given name" as their last name.

Note: `name_country.csv` is a comma-separated file with the "first name", "last name" and "country" as field values. The file `family_name_first_countries.txt` has the "country name" where the "family name" is used as the "first name".

```
#!/bin/bash

awk '
BEGIN {
    FS=","
}
FILENAME == "family_name_first_countries.txt" {
    family_name_first_countries[$0]++
}
# Fill here
' family_name_first_countries.txt name_country.csv
```

**Options :**

6406532731459. ✘

```
FILENAME == "name_country.csv" && $3 in family_name_first_countries {  
    if ($3 in family_name_first_countries) {  
        print $2, $1  
    } else {  
        print $1, $2  
    }  
}
```

```
FILENAME == "name_country.csv" {  
    if ($3 in family_name_first_countries) {  
        print $2, $1  
    } else {  
        print $1, $2  
    }  
}
```

6406532731460. ✓

```
FILENAME == "name_country.csv" && $3 in family_name_first_countries {  
    print $2, $1  
}  
FILENAME == "name_country.csv" && !($3 in family_name_first_countries) {  
    print $1, $2  
}
```

6406532731461. ✓

```
FILENAME == "name_country.csv" && !($3 in family_name_first_countries) {  
    print $2, $1  
}  
FILENAME == "name_country.csv" && $3 in family_name_first_countries {  
    print $1, $2  
}
```

6406532731462. ✘

## TDS

**Section Id :**

64065356664

**Section Number :**

14

<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	19
<b>Number of Questions to be attempted :</b>	19
<b>Section Marks :</b>	19
<b>Display Number Panel :</b>	Yes
<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118726
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 307 Question Id : 640653815254 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 : TOOLS IN DATA SCIENCE (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 :**

6406532731463. ✓ YES

6406532731464. ✘ NO

<b>Sub-Section Number :</b>	2
<b>Sub-Section Id :</b>	640653118727
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 308 Question Id : 640653815255 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

What happens if you choose the "Delimited" option in "Text to Columns" and don't select any delimiter?

**Options :**

6406532731465. ✘ The text will be split based on spaces

6406532731466. ✓ The text will not be split, and the original content remains unchanged

6406532731467. ✘ An error message will be displayed

6406532731468. ✘ The text will be split into individual characters

**Question Number : 309 Question Id : 640653815257 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

K-Means clustering algorithm is sensitive to the initial choice of centroids. Which parameter in kmeans() function helps the user mitigate this problem?

**Options :**

6406532731475. ✘ algorithm

6406532731476. ✘ max\_iter

6406532731477. ✘ n\_clusters

6406532731478. ✓ n\_init

**Question Number : 310 Question Id : 640653815259 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

We are interested in fitting an ARIMA model to our time series data. Specifically, we are interested in a moving average model of 0, setting a lag value of 4 for autoregression, and a difference order of 1. Which of the following gives you such a model?

**Options :**

6406532731483. ✘ ARIMA(..., trend = (4,1,0))

6406532731484. ✓ ARIMA(..., order = (4,1,0))

6406532731485. ✘ ARIMA(..., order = (0,4,1))

6406532731486. ✘ ARIMA(..., trend = (0,4,1))

**Question Number : 311 Question Id : 640653815262 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

If the p-value in a regression analysis is less than the significance level (e.g., 0.05), what does it generally indicate?

**Options :**

6406532731495. ✘ There is no relationship between variables

6406532731496. ✘ The analysis is inconclusive

6406532731497. ✓ The relationship between variables is statistically significant

6406532731498. ✘ The model is overfitting

**Question Number : 312 Question Id : 640653815263 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

What is OpenRefine used for?

**Options :**

6406532731499. ✓ Data cleaning and transformation

6406532731500. ✘ Data compression and storage

6406532731501. ✘ Real-time data analysis

6406532731502. ✘ Open source refined data

**Question Number : 313 Question Id : 640653815265 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Subjectivity score ranges between -1 to +1.

**Options :**

6406532731506. ✘ TRUE

6406532731507. ✓ FALSE

**Question Number : 314 Question Id : 640653815266 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Which of the following tab in chrome devtools will show API calls on the website?

**Options :**

6406532731508. ❌ Elements

6406532731509. ❌ Console

6406532731510. ❌ Sources

6406532731511. ✓ Network

6406532731512. ❌ APILogs

**Question Number : 315 Question Id : 640653815267 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Chrome devtools can be accessed by which of the following steps?

**Options :**

6406532731513. ❌ Right click, choose View page-source

6406532731514. ✓ Right click, choose Inspect

6406532731515. ❌ Settings, more tools and choose Developer Tools

6406532731516. ❌ Settings, extensions and search for devtools

**Question Number : 316 Question Id : 640653815268 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Nominatim can output the type of place for every latitude longitude.

**Options :**

6406532731517. ✓ TRUE

6406532731518. ✗ FALSE

**Question Number : 317 Question Id : 640653815269 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

What Streamlit command is used to add text to the app interface?

**Options :**

6406532731519. ✗ st.add\_text()

6406532731520. ✓ st.text()

6406532731521. ✗ st.insert\_text()

6406532731522. ✗ st.display\_text()

**Question Number : 318 Question Id : 640653815270 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction**

**Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

What is a "Tableau Workbook" in Tableau terminology?

**Options :**

6406532731523. ✗ A workbook created in Microsoft Excel

6406532731524. ✓ A Tableau file containing sheets, dashboards, and stories

6406532731525. ✗ A spreadsheet in Tableau

6406532731526. ✗ A summary of visualizations

**Question Number : 319 Question Id : 640653815271 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

What is the purpose of the "st.button()" command in a Streamlit app?

**Options :**

6406532731527. ✓ Adds a button to trigger an action

6406532731528. ✗ Displays the current status of the app

6406532731529. ✗ Resets all input fields

6406532731530. ✗ Turns the app into full-screen mode

**Question Number : 320 Question Id : 640653815272 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

How can you change the calculation performed in the "Values" area of a Pivot Table?

**Options :**

6406532731531. ✓ By selecting a function from the "Summarize Values by" in the "Value Field settings"

6406532731532. ✗ By right-clicking the cell and choosing "Change Calculation"

6406532731533. ✗ By dragging a new field into the "Values" area

6406532731534. ❌ By adjusting the cell formatting in the "Values" area

<b>Sub-Section Number :</b>	3
<b>Sub-Section Id :</b>	640653118728
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 321 Question Id : 640653815256 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 2 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Using cross-validation we find that the ideal  $K$  in a  $K$ -Nearest Neighbour procedure is 6. Your friend does not use cross-validation but instead guesses a  $K$  of 2. His predictor would:

**Options :**

6406532731469. ❌ have higher bias

6406532731470. ✓ have higher variance

6406532731471. ✓ have lower bias

6406532731472. ❌ have lower variance

6406532731473. ✓ overfit the data compared to your solution

6406532731474. ❌ underfit the data compared to your solution

<b>Sub-Section Number :</b>	4
<b>Sub-Section Id :</b>	640653118729
<b>Question Shuffling Allowed :</b>	Yes
<b>Is Section Default? :</b>	null

**Question Number : 322 Question Id : 640653815258 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

How do we find (using Python) all the possible values of categories inside a Pandas data-frame column named 'book'? The name of the Pandas data-frame is data\_df.

**Options :**

6406532731479. ✓ data\_df.book.unique()

6406532731480. ✗ data\_df.book.category\_name()

6406532731481. ✗ data\_df['book'].distinct()

6406532731482. ✓ data\_df['book'].unique()

**Question Number : 323 Question Id : 640653815260 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Under which of the following parts of inspect elements can you find cookie information?

**Options :**

6406532731487. ✗ Elements

6406532731488. ✓ network

6406532731489. ✗ Source

6406532731490. ✓ Application

**Question Number : 324 Question Id : 640653815261 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of these are Python libraries specifically useful for Geospatial analysis:

**Options :**

6406532731491. ✓ Geopandas

6406532731492. ✗ QGIS

6406532731493. ✓ Folium

6406532731494. ✗ OpenStreetMap

**Question Number : 325 Question Id : 640653815264 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

The analysis metric slope can be observed through which of the following ways?

**Options :**

6406532731503. ✓ Trend Line in Line Chart

6406532731504. ✓ SLOPE function

6406532731505. ✗ None of these

**AI**

<b>Section Id :</b>	64065356665
<b>Section Number :</b>	15
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	9
<b>Number of Questions to be attempted :</b>	9
<b>Section Marks :</b>	25
<b>Display Number Panel :</b>	Yes

<b>Section Negative Marks :</b>	0
<b>Group All Questions :</b>	No
<b>Enable Mark as Answered Mark for Review and Clear Response :</b>	Yes
<b>Maximum Instruction Time :</b>	0
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	640653118730
<b>Question Shuffling Allowed :</b>	No
<b>Is Section Default? :</b>	null

**Question Number : 326 Question Id : 640653815273 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 "DEGREE LEVEL : AI: SEARCH METHODS FOR PROBLEM SOLVING (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 :**

6406532731535. ✓ YES

6406532731536. ✗ NO

**Question Number : 327 Question Id : 640653815274 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

**ASK FOR PRINTED  
GRAPH SHEETS  
10 PAGES TWO-SIDE PRINT**

**Options :**

6406532731537. ✓ Printed graph sheets were provided to me.

6406532731538. ✗ Printed graph sheets were not provided to me.

6406532731539. ✗ I did not use graph sheets.

**Sub-Section Number :** 2

**Sub-Section Id :** 640653118731

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653815275 Question Type : COMPREHENSION Sub Question Shuffling**

**Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix**

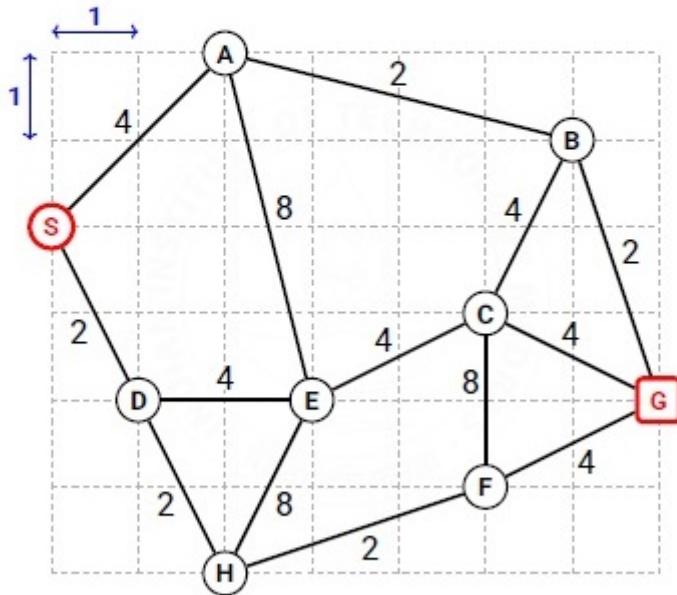
**Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (328 to 332)**

Question Label : Comprehension

**SEARCH**

The figure shows a map on a uniform grid where each tile is 1x1 in size.  
The start node is S and the goal node is G.  
The MoveGen function returns nodes in alphabetical order.  
Use Manhattan Distance as the heuristic function.  
**Tie-breaker:** If several nodes have the same cost, use node labels to break the tie.



Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 328 Question Id : 640653815276 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

What is the path found by the Best First Search algorithm? Enter the path as a comma separated list of node labels.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format: S,X,Y,Z**

**Response Type : Alphanumeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Answers Case Sensitive : No**

**Text Areas : PlainText**

**Possible Answers :**

S,D,E,C,G

**Question Number : 329 Question Id : 640653815277 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

What is the path found by A\* search algorithm? Enter the path as a comma separated list of node labels.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format: S,X,Y,Z**

**Response Type : Alphanumeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Answers Case Sensitive : No**

**Text Areas : PlainText**

**Possible Answers :**

S,D,H,F,G

**Question Number : 330 Question Id : 640653815278 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

What is the path found by Branch-and-Bound search algorithm? Enter the path as a comma separated list of node labels.

Use the Branch-and-Bound variation that avoids cyclic expansions like S,A,S,A,S,A,...

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:**S,X,Y,Z

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

S,A,B,G

**Question Number :** 331 **Question Id :** 640653815279 **Question Type :** MCQ **Is Question**

**Mandatory :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Correct Marks :** 1

Question Label : Multiple Choice Question

For the given map, which algorithm finds the shortest path from S to G?

**Options :**

6406532731543. ❌ Best First Search

6406532731544. ❌ A\* Search Algorithm

6406532731545. ✓ Branch-and-Bound Search Algorithm

6406532731546. ❌ None of these.

**Question Number :** 332 **Question Id :** 640653815280 **Question Type :** MCQ **Is Question**

**Mandatory :** No **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Correct Marks :** 1

Question Label : Multiple Choice Question

What can you say about the heuristic function for the given graph?

**Options :**

6406532731547. ✘ Admissible.

6406532731548. ✓ Inadmissible.

6406532731549. ✘ Partly admissible and partly inadmissible.

6406532731550. ✘ Cannot be determined.

**Sub-Section Number :** 3

**Sub-Section Id :** 640653118732

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653815281 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (333 to 336)**

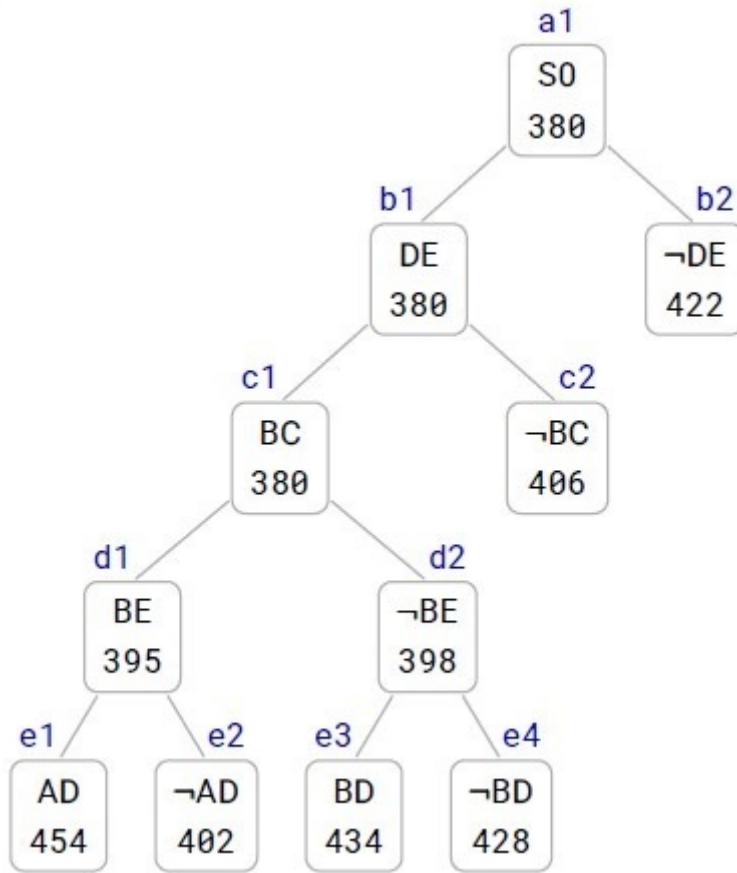
Question Label : Comprehension

**TSP Branch-and-Bound**

The TSP Branch-and-Bound algorithm is solving a TSP instance where the cities are A, B, C, .... and so on. The Branch-and-Bound search tree at the time when **the algorithm has discovered the optimal tour** is shown below.

Each node in the search tree displays an edge (either XY or ~XY), a cost value, and a unique reference number (a1, b1, b2, c1, c2, d1, d2, e1, e2, e3, e4). Use the reference numbers to break ties. When required, enter the reference numbers in short answers.

What information can you glean from the search tree? Answer the sub-questions based on the information gleaned from the search tree.



Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 333 Question Id : 640653815282 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

Let S0 (ref. no. a1) be the first node to be refined, identify the next 4 nodes (2nd to 5th node) that are refined by the TSP Branch-and-Bound algorithm. Enter the nodes (node reference numbers) in the order they are refined.

Enter a comma separated list of node reference numbers.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format: a9,b9,c9,d9**

**Response Type : Alphanumeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

b1,c1,d1,d2

**Question Number :** 334 **Question Id :** 640653815283 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

Which node represents the optimal tour and what is the cost of the optimal tour? Enter the node reference number and the tour cost in the text box, or enter NIL if it is not possible to determine the optimal tour.

Enter a node reference number followed by tour cost, separated by comma.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** a9,42

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

e2,402

**Question Number :** 335 **Question Id :** 640653815284 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

Determine the number of cities in the TSP instance. Enter the number of cities in the text box, or

enter NIL if it is not possible to determine the number of cities.

Enter an integer.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** 42

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

6

**Question Number :** 336 **Question Id :** 640653815285 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

**Question Label :** Short Answer Question

Start from city A, what is the path representation of the optimal tour? Enter the path representation in the text box, or enter NIL if it is not possible to determine the optimal tour.

Enter a comma separated list of cities (city labels).

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** A,B,C

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

A,C,B,E,D,F

A,F,D,E,B,C

Sub-Section Number : 4  
Sub-Section Id : 640653118733  
Question Shuffling Allowed : No  
Is Section Default? : null

**Question Id : 640653815286 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Question Numbers : (337 to 340)**

Question Label : Comprehension

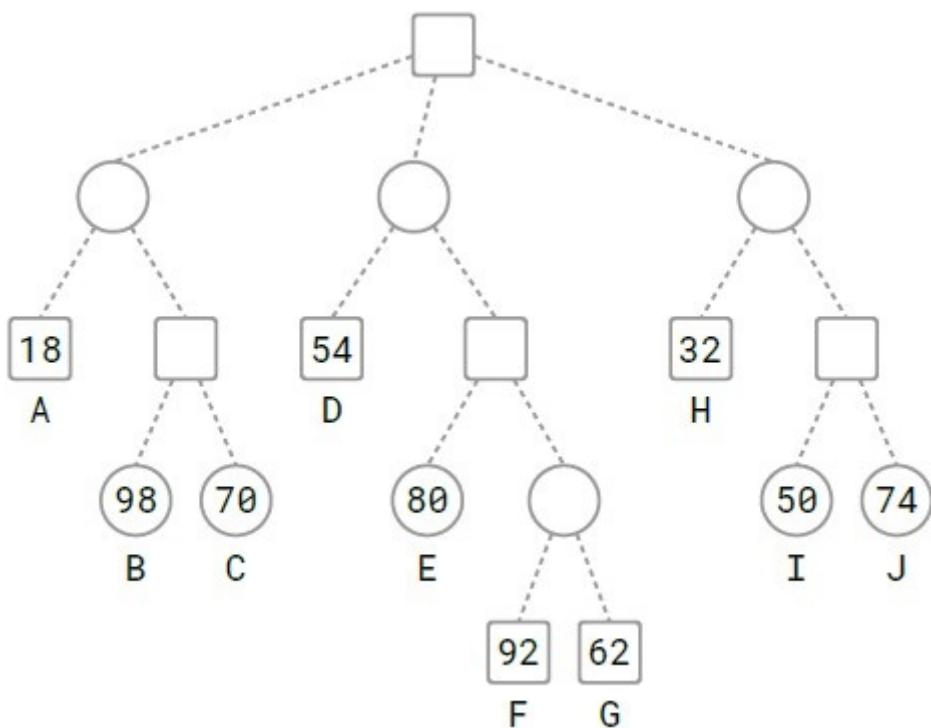
## GAMES

The figure shows a game tree with evaluation function values at the leaf nodes.

The leaf nodes are labeled from A to J.

Use these labels to enter a leaf node or a list of leaf nodes in short answers (textbox).

**Tie-breaker:** when several nodes carry the same best cost then select the deepest node, if tie persists then select the leftmost of the deepest nodes.



Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 337 Question Id : 640653815287 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following is a strategy for the MAX player?

**Options :**

6406532731555. ✓ A,C

6406532731556. ✗ A,D,H

6406532731557. ✓ D,F,G

6406532731558. ✗ E,I,J

**Question Number : 338 Question Id : 640653815288 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

List the leaf nodes in the best strategy for MAX. Enter the node labels in alphabetical order.

Enter a comma separated list of node labels in alphabetical order.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** X,Y,Z

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

D,E

**Question Number :** 339 **Question Id :** 640653815289 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

List the leaf nodes pruned by Alpha-Beta.

Enter a comma separated list of node labels in alphabetical order.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** X,Y,Z

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

C,F,G,I,J

**Question Number :** 340 **Question Id :** 640653815290 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

List the leaf nodes solved (assigned SOLVED status) by SSS\*.

Enter a comma separated list of node labels in alphabetical order.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** X,Y,Z

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

A,D,E,H

A,D,H,E

**Sub-Section Number :** 5

**Sub-Section Id :** 640653118734

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653815291 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix **Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (341 to 343)

Question Label : Comprehension

## PROBLEM DECOMPOSITION

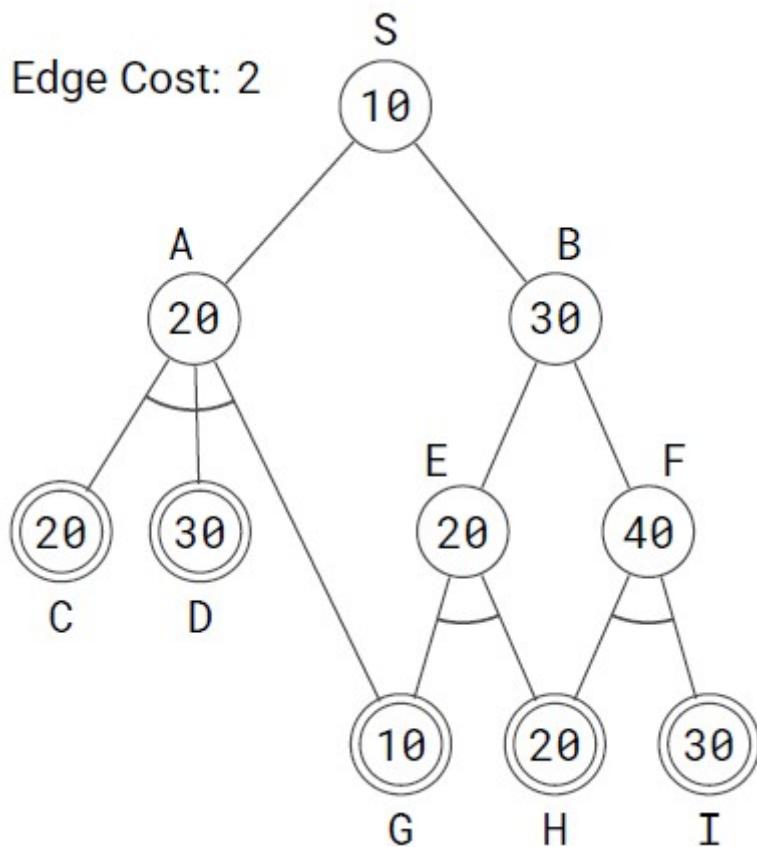
The figure shows an AND-OR graph that depicts how a problem S can be decomposed into one or more smaller problems. Nodes are uniquely identified by labels (S, A, B, ...). The number in each node is the heuristic estimate of the cost of solving that node.

Nodes shown in double lines are primitive nodes and their values are actual costs. Observe that a primitive node is added to the graph by its parent when the parent is expanded, and the primitive node is labeled as SOLVED and it will not be expanded subsequently.

The cost of each edge is 2 units.

**Tie-breaker 1:** If several nodes have the same cost then break the tie using node labels.

**Tie-breaker 2:** For AND nodes, select the unsolved branch with the highest cost.



Use AO\* algorithm to solve S, then answer the sub-questions.

### Sub questions

**Question Number : 341 Question Id : 640653815292 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

List the first three nodes (including S) expanded by AO\* algorithm. List the nodes in the order they are expanded. Observe that primitive nodes are not expanded.

Enter a comma separated list of node labels.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format: X,Y,Z**

**Response Type : Alphanumeric**

**Evaluation Required For SA : Yes**

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

S,A,B

A,B,E

**Question Number :** 342 **Question Id :** 640653815293 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

Question Label : Short Answer Question

Determine the value of the start node S after each node is expanded. What are the values of S after the 1st, 2nd and 3rd nodes are expanded, respectively? Enter the 3 values in the textbox.

Enter a comma separated list of numbers.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** 12,42,17

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

22,32,24

32,24,38

**Question Number :** 343 **Question Id :** 640653815294 **Question Type :** SA **Calculator :** None

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

**Correct Marks :** 1

**Question Label :** Short Answer Question

What is the final value of the start node S?

Enter a number.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** 42

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

38

**Sub-Section Number :** 6

**Sub-Section Id :** 640653118735

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id :** 640653815295 **Question Type :** COMPREHENSION **Sub Question Shuffling Allowed :** No **Group Comprehension Questions :** No **Question Pattern Type :** NonMatrix

**Calculator :** None **Response Time :** N.A **Think Time :** N.A **Minimum Instruction Time :** 0

**Question Numbers :** (344 to 346)

Question Label : Comprehension

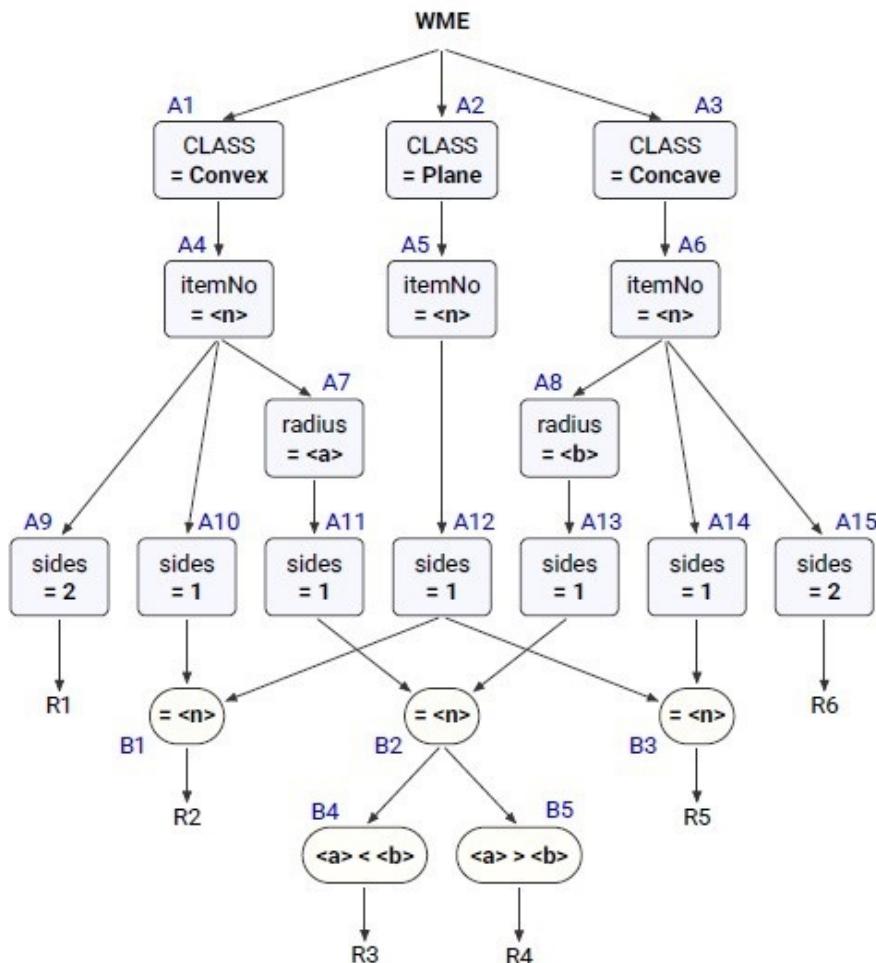
**RULE BASED EXPERT SYSTEMS**

A Rete Net for classifying lenses based on surface properties (convex, concave, planar, radius of curvature, and number of sides) is shown in the figure. Each lens is uniquely identified by "itemNo" attribute, the remaining classes and attributes are self explanatory.

A part of the Rete Net that classifies mushrooms (as edible or poisonous) is shown in the figure. The labels A1, A2, ..., A15, ..., B1, B2, ..., B5, R1, ..., R6 uniquely identify the nodes in the network.

When required, use the above label ordering to **break ties** and to enter short answers.

**Note:** beta nodes B4 and B5 compare the radius of curvature of two surfaces.



Run the Rete algorithm for the Working Memory shown below, the WMEs are in timestamp order. Assume that WMEs reside at appropriate Alpha nodes, and the Beta nodes point to WMEs residing in Alpha nodes.

101. (Concave ^itemNo K3 ^radius 70 ^sides 1)
102. (Concave ^itemNo K7 ^radius 10 ^sides 3)
103. (Convex ^itemNo K2 ^radius 60 ^sides 1)
104. (Convex ^itemNo K3 ^radius 50 ^sides 1)
105. (Convex ^itemNo K4 ^radius 20 ^sides 4)
106. (Plane ^itemNo K2 ^sides 1)
107. (Concave ^itemNo K1 ^radius 80 ^sides 2)

For each WME identify its location (node label) in the Rete Net, and prepare the conflict set for the first cycle, then answer the sub-questions.

### Sub questions

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Which of the following rule-data tuples are in the conflict-set?

**Options :**

6406532731565. ❌ R1,105

6406532731566. ✓ R2,103,106

6406532731567. ❌ R4,102,103

6406532731568. ❌ R5,102

**Question Number : 345 Question Id : 640653815297 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

If the Inference Engine uses **Specificity** as the conflict resolution strategy then which of the following rule-data tuples will qualify?

**Options :**

6406532731569. ❌ R1,105

6406532731570. ✓ R3,101,104

6406532731571. ❌ R4,102,103

6406532731572. ❌ R5,102

**Question Number : 346 Question Id : 640653815298 Question Type : MCQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1**

Question Label : Multiple Choice Question

If the Inference Engine uses **Recency** as the conflict resolution strategy then which of the following rule-data tuples will qualify?.

**Options :**

6406532731573. ✘ R2,103,107

6406532731574. ✘ R3,101,104

6406532731575. ✘ R4,102,103

6406532731576. ✓ R6,107

**Sub-Section Number :** 7

**Sub-Section Id :** 640653118736

**Question Shuffling Allowed :** No

**Is Section Default? :** null

**Question Id : 640653815299 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Question Numbers : (347 to 350)**

Question Label : Comprehension

## AUTOMATED PLANNING

The domain description of a Blocks World with a single one-armed robot is given below. This is the same domain used in the assignments.

## PREDICATES

armEmpty	The arm is not holding any block, it is empty.
holding(X)	The arm is holding X.
onTable(X)	X is on the table.
clear(X)	X has nothing above it, it is clear.
on(X,Y)	X is directly placed on Y.

## OPERATORS

Pickup(X): pick up X from the table.

Preconditions: { armEmpty, clear(X), onTable(X) }  
Add Effects : { holding(X) }  
Del Effects : { armEmpty, onTable(X) }

Putdown(X): place X on the table.

Preconditions: { holding(X) }  
Add Effects : { armEmpty, onTable(X) }  
Del Effects : { holding(X) }

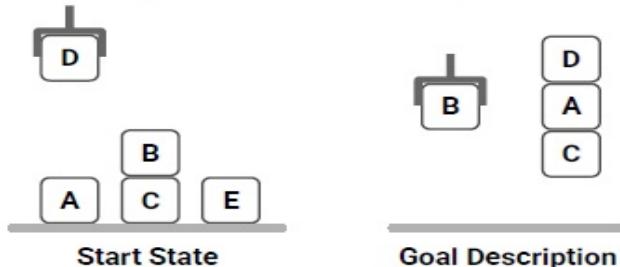
Unstack(X,Y): pick up X that is directly sitting on Y.

Preconditions: { armEmpty, clear(X), on(X,Y) }  
Add Effects : { clear(Y), holding(X) }  
Del Effects : { armEmpty, on(X,Y) }

Stack(X,Y): place X directly on top of Y.

Preconditions: { holding(X), clear(Y) }  
Add Effects : { armEmpty, on(X,Y) }  
Del Effects : { holding(X), clear(Y) }

Consider the planning problem with the following start state and goal description.



{ holding(D), clear(D),  
clear(A), clear(B),  
clear(E), on(B,C),  
onTable(A), onTable(C),  
onTable(E) }

{ holding(B),  
on(D,A),  
on(A,C) }

Based on the above data, answer the given subquestions.

## Sub questions

**Question Number : 347 Question Id : 640653815300 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following are **applicable** actions in the start state?

**Options :**

6406532731577. ✓ Putdown(D)

6406532731578. ✗ Stack(D,C)

6406532731579. ✗ Pickup(B)

6406532731580. ✓ Stack(D,A)

6406532731581. ✗ Stack(A,C)

**Question Number : 348 Question Id : 640653815301 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

Which of the following are **relevant** actions in the goal state?

**Options :**

6406532731582. ✓ Pickup(B)

6406532731583. ✗ Putdown(D)

6406532731584. ✓ Unstack(B,E)

6406532731585. ✗ Stack(D,C)

6406532731586. ✓ Stack(D,A)

**Question Number : 349 Question Id : 640653815302 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

In the planning graph, which of the following are mutex action pairs in Layer 1?

**Options :**

6406532731587. ✗ `Unstack(B,C)`, `Putdown(D)`

6406532731588. ✓ `Stack(D,A)`, `Putdown(D)`

6406532731589. ✗ `Stack(D,A)`, NOP-ACTION for `armEmpty`

6406532731590. ✓ `Stack(D,A)`, `Stack(D,E)`

6406532731591. ✗ `Pickup(A)`, `Putdown(D)`

**Question Number : 350 Question Id : 640653815303 Question Type : MSQ Is Question**

**Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

**Correct Marks : 1 Max. Selectable Options : 0**

Question Label : Multiple Select Question

In the planning graph, which of the following are mutex proposition pairs in Layer 1?

**Options :**

6406532731592. ✗ `on(D,A)`, `armEmpty`

6406532731593. ✓ `on(D,A)`, `onTable(D)`

6406532731594. ✓ `on(D,A)`, `on(D,B)`

6406532731595. ✗ `holding(D)`, `clear(A)`

6406532731596. ✓ on(D,A), clear(A)

**Sub-Section Number :**

8

**Sub-Section Id :**

640653118737

**Question Shuffling Allowed :**

No

**Is Section Default? :**

null

**Question Id : 640653815304 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0**

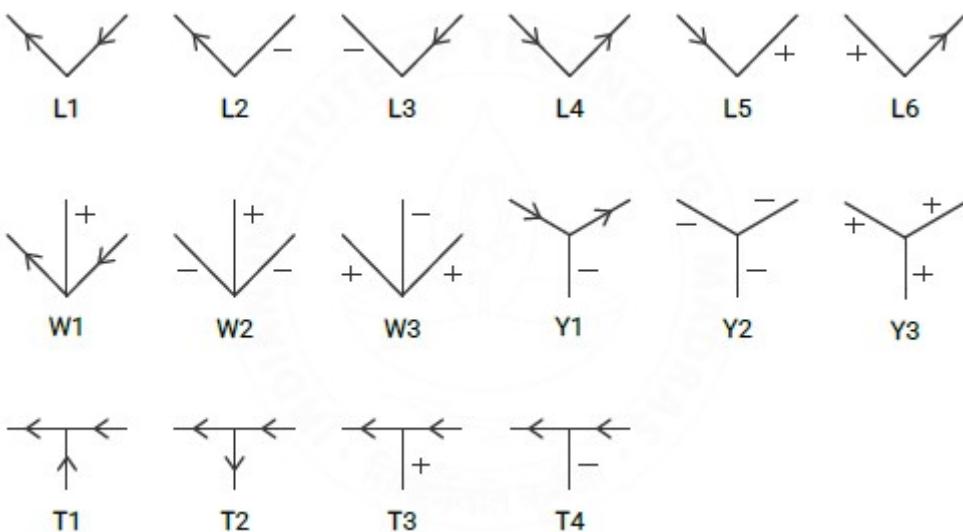
**Question Numbers : (351 to 352)**

Question Label : Comprehension

### **CONSTRAINT SATISFACTION**

The set of junctions (L, W, Y and T type junctions) that occur in a 2D line drawing of trihedral objects is provided below. The in-plane clockwise/counterclockwise rotations of these junctions are valid as well. These junctions provide constraints on the possible edge assignments (convex, concave, arrow) for the edges/lines in 2D line drawings of trihedral objects.

The junctions carry unique labels: L1, L2, L3, L4, L5, L6, T1, T2, T3, T4, W1, W2, W3, Y1, Y2, Y3. When required, use the labels in short answers.



**Note:** A 2D line drawing of trihedral objects is considered to be consistent if all the edges and junctions can be assigned labels that are consistent with each other, otherwise the drawing is considered to be inconsistent and all labels are reset to NIL.

Apply a suitable algorithm to assign consistent labels to edges/junctions in the 2D line drawings in the sub-questions. Choose a suitable edge and junction order for solving the problems.

Based on the above data, answer the given subquestions.

### **Sub questions**

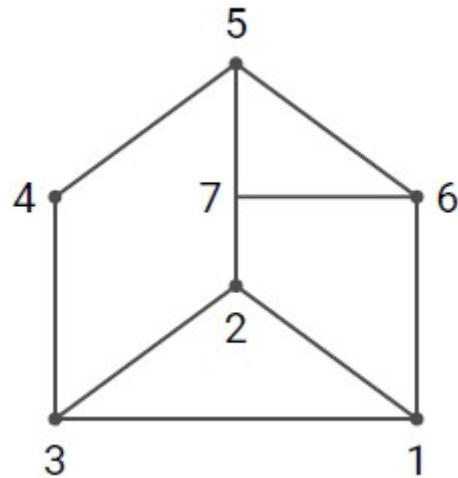
**Question Number : 351 Question Id : 640653815305 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

Assign consistent labels to all the edges and junctions in the 2D line drawing shown below. Enter the labels of the junctions 1, 2, 3, 4 in the text box, in that order. Otherwise enter NIL if the drawing has no consistent label assignment.



Enter a comma separated list of junction labels, or enter NIL.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format: Y9,T9,W9,L9**

**Response Type : Alphanumeric**

**Evaluation Required For SA : Yes**

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

**NIL**

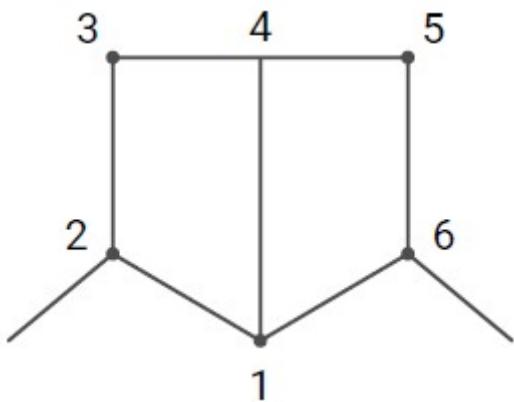
**Question Number : 352 Question Id : 640653815306 Question Type : SA Calculator : None**

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

**Correct Marks : 1**

Question Label : Short Answer Question

Assign consistent labels to all the edges and junctions in the 2D line drawing shown below. Enter the labels of the junctions 1, 2, 3, 4 in the text box, in that order. Otherwise enter NIL if the drawing has no consistent label assignment.



Enter a comma separated list of junction labels, or enter NIL.

NO SPACES, TABS, DOTS, BRACKETS OR EXTRANEous CHARACTERS.

**Answer format:** Y9,T9,W9,L9

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

W3,Y3,L5,T4