

## **IIT M DIPLOMA QUIZ2 EXAM QPC1**

### **Notations :**

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

IIT M DIPLOMA QUIZ2 EXAM QPC1 13

### **Question Paper Name :**

Mar 2022

### **Total Marks :**

700

# **Business Analytics**

**Number of Questions :** 7

**Section Marks :** 50

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

**Correct Marks : 0**

Question Label : Multiple Choice Question

**THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: BUSINESS ANALYTICS"**

**ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?**

**CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.**

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

**Options :**

A. YES

B. NO

**Question Number : 2 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Latent demand in a demand-response curve is the area obtained when?

**Options :**

A. Price is reduced below the identified optimal price

B. Price is increased beyond the identified optimal price

C. The optimal price is increased beyond the maximum available price

- D. ❌ Quantity is reduced below the identified optimal quantity
- E. ❌ Quantity is increased beyond the identified maximum quantity

**Question Type : COMPREHENSION**

**Question Numbers : (3 to 12)**

Question Label : Comprehension

The price and demand for a product are provided in Table-1 below. The linear regression model is fit for this data in excel, and the output is as given in Table-2. Given this information, answer the given subquestions

Price	Demand
10	9703
15	4701
20	2284
25	2137
30	1036
35	503
40	144
45	111
50	54

Table-1: Price Demand Data

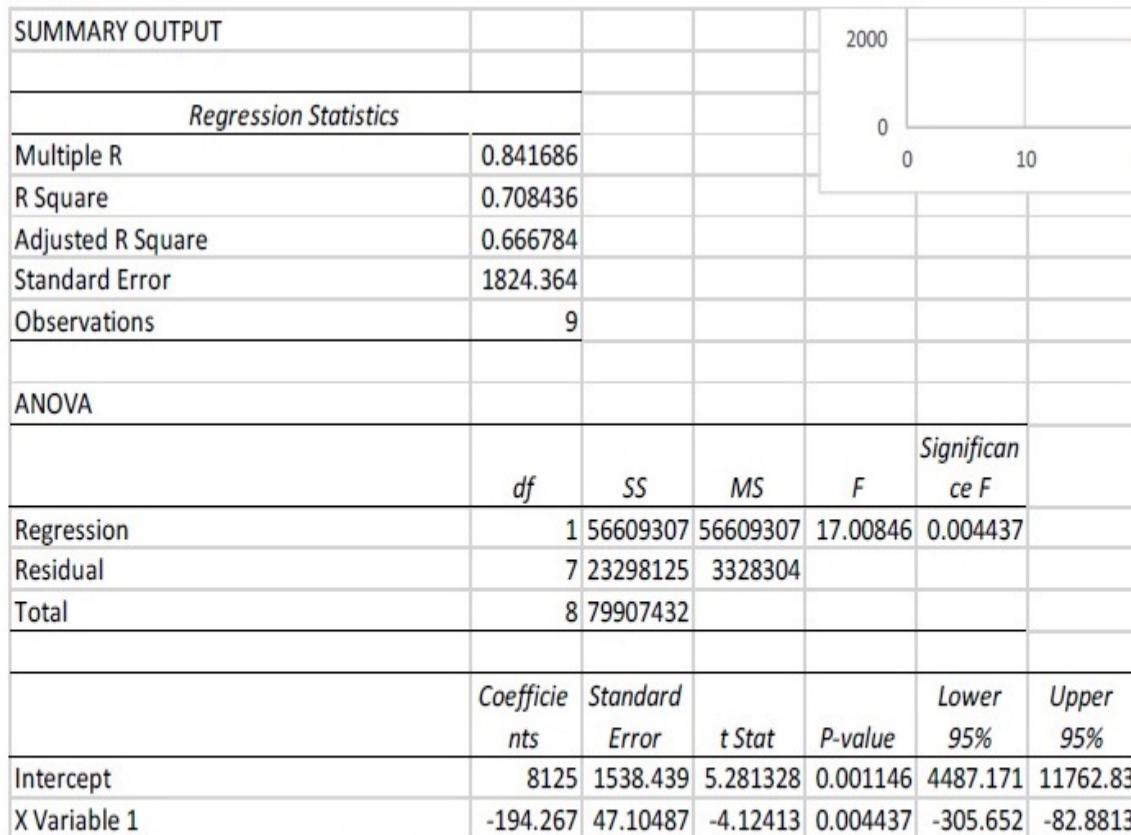


Table-2: Excel Simple Linear Regression Output

## Sub questions

**Question Number : 3 Question Type : SA**

**Correct Marks : 2.5**

Question Label : Short Answer Question

What is the total market size?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

8125

**Question Number : 4 Question Type : SA**

**Correct Marks : 2.5**

Question Label : Short Answer Question

What is the satiating price for the price-demand data based on the fitted model (round your answer to one decimal place)?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

41.79 to 41.82

**Question Number : 5 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

What is the elasticity of demand, when the price is Rs.22 (round to two decimal places)?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.34 to 0.35

**Question Number : 6 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

At the price of Rs. 22, based on the elasticity \_\_

**Options :**

- A. ✗ Demand is elastic
- B. ✓ Demand is inelastic
- C. ✗ Demand indicates luxury item
- D. ✗ Demand indicates inferior item

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

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

As the price moves to the satiating price, then elasticity \_\_?

**Options :**

- A. ✗ Decreases
- B. ✓ Increases
- C. ✗ Remains same
- D. ✗ Increases then decreases
- E. ✗ Decreases then increases

**Question Number : 8 Question Type : SA**

**Correct Marks : 2.5**

Question Label : Short Answer Question

What is the magnitude of correlation (along with direction) that exists between the price and demand (round your answer to two decimal places)?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

-0.85 to -0.84

**Question Number : 9 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

The fitted regression model

**Options :**

- A. ✓ Is significant at a 95% confidence level
- B. ✗ Is not significant at a 95% confidence level
- C. ✗ Has an accuracy of ~70.84%
- D. ✗ Has an accuracy of ~66.67%

**Question Number : 10 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

A data scientist is interested to see if the demand for the product is exponential in nature. Accordingly, the expected demand at various prices is calculated and presented in the table below. Given this information, what is the value of the chi-square goodness of fit test statistic that will be computed? (round to two decimal places)

$$\{ \text{Hint: Chi-square} = \sum_k \frac{(observed_k - Expected_k)^2}{Expected_k}. \}$$

Price	Expected Demand
10	9820
15	5232
20	2213
25	2045
30	1162
35	620
40	267
45	123
50	34

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

167.00 to 167.06

**Question Number : 11 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

If the p-value for the computed test statistic is 0.0524, then at which of the following significance levels, will you reject the null (select all that is applicable)?

**Options :**

- A. ✘ 1%
- B. ✘ 5%
- C. ✓ 10%
- D. ✓ 15%
- E. ✓ 20%

**Question Number : 12 Question Type : MCQ****Correct Marks : 2.5**

Question Label : Multiple Choice Question

If the tabulated Chi-Squared value provided is 157, then what will be the conclusion of the test?

**Options :**

- A. ✗ This sample is distributed exponentially
- B. ✗ This sample is not distributed exponentially
- C. ✗ The population distribution of demand is exponential
- D. ✓ The population distribution of demand is not exponential

**Question Type : COMPREHENSION****Question Numbers : (13 to 14)**

Question Label : Comprehension

You are given the following contingency table based on sample data where different cities and their brand preferences are provided. You perform a chi-squared test of independence to make inferences about the population from this sample. Using your computations, answer the given subquestions.

*Note: Round off to two decimal values at all the intermediate iterations and the final step.*

	Brand A	Brand B	Total
Chennai	288	124	412
Mumbai	622	204	826
Total	910	328	1238

**Sub questions****Question Number : 13 Question Type : SA****Correct Marks : 2.5**

**Question Label :** Short Answer Question

From the given contingency table, find the expected frequency of Chennai people preferring brand B?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

302 to 304

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

**Correct Marks : 5**

Question Label : Multiple Choice Question

At the significance level 0.01, chi-squared tabular value is 6.63. What do you conclude?

**Options :**

- A. ✗ Reject the null hypothesis and conclude that the categorical variables are independent
- B. ✓ Fail to reject the null hypothesis and conclude that the categorical variables are independent
- C. ✗ Reject the null hypothesis and conclude that the categorical variables are not independent
- D. ✗ Fail to reject the null hypothesis and conclude that the categorical variables are not independent

**Question Number : 15 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

Suppose a factory manufactures products on two machines A and B. Suppose 65% of total output comes from machine A, 30% of total output comes from machine B and 5% of total output comes

from machine C. From the past data, it is known that 12% of products by machine A are defectives, 12% of products by machine B are defectives and 10% of products by machine C are defectives. What is the probability that the product has come from machine B given that it is defective?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.22 to 0.36

**Question Number : 16 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Which of the following statements are true regarding PP and QQ plots when they are used to compare the model distribution and sample distribution (select all that are applicable)

**Options :**

- A. ✘ PP plot amplifies differences between tails and QQ plot amplifies the difference at the middle portion
- B. ✓ QQ plot amplifies differences between tails and PP plot amplifies the difference at the middle portion
- C. ✘ Both PP and QQ plots amplify both differences (in tails and middle portion)
- D. ✘ Both PP and QQ plots do not amplify any differences (in tails and middle portion)
- E. ✘ PP and QQ plots are both 45degree straight lines when the model distribution and sample distribution are not correctly fitted
- F. ✓ PP and QQ plots are both 45degree straight lines when the model distribution and sample distribution are correctly fitted

**Question Number : 17 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Which of the following are **not required** to build an empirical distribution?

**Options :**

- A. ✘ PDF or PMF
- B. ✘ Sample data
- C. ✘ Summary Statistics
- D. ✓ None of these

## **BDM**

**Number of Questions :** 17

**Section Marks :** 50

**Question Number : 18 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

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

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**Options :**

- A. ✓ YES

B. ✘ NO

### Question Number : 19 Question Type : MSQ

**Correct Marks : 2.5**

Question Label : Multiple Select Question

The market-clearing price

**Options :**

- A. ✓ Must be above equilibrium point for "Surplus" quantities to exist
- B. ✘ Must be below equilibrium Point for "Surplus" quantities to exist
- C. ✘ Must be equal to equilibrium point for "Surplus" quantities to exist
- D. ✓ Must be below equilibrium point for "Shortage" quantities to exist
- E. ✘ Must be above equilibrium point for "Shortage" quantities to exist
- F. ✘ Must be equal to equilibrium point for "Shortage" quantities to exist
- G. ✘ "Surplus" and "Shortage" do not depend on the position of the equilibrium point

### Question Number : 20 Question Type : MSQ

**Correct Marks : 2.5**

Question Label : Multiple Select Question

According to this course, which of the statements correctly defines a "Large" industry?

**Options :**

- A. ✘ An industry that has high capital investment from the Government
- B. ✓ An industry that employees a large number of employees
- C. ✘ An industry that is run by the Government
- D. ✘ An industry that is a "Public-Private Partnership" venture

### Question Number : 21 Question Type : MSQ

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Which of the following firm characteristics are used during competition analysis?

**Options :**

- A. ✓ Pricing power
- B. ✗ Supplier deliveries
- C. ✓ Product characteristics
- D. ✗ None of these

**Question Number : 22 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Given the following data on price (in Rs./ unit) and demand (# of units/day) for ice creams in a store. Then which of the following statements can be concluded based on the elasticity between Rs.6 and Rs.7 per unit?

Price	Demand
8	200
7	400
6	600
5	800

**Options :**

- A. ✓ Demand is elastic
- B. ✗ Demand is in-elastic
- C. ✗ Elasticity indicates that ice creams are luxuries
- D. ✗ Elasticity indicates that ice creams are necessities

**Question Number : 23 Question Type : MSQ**

**Correct Marks : 5**

Question Label : Multiple Select Question

The Board of Directors of Company-X have met and a discussion on acquiring another company-Y

is underway. A competitor firm wants to stop this merger due to fears that the market will become monopolistic. So, the competitor has approached the justice department. Then which of the following statements will **not assist** the competitor's claim?

**Options :**

- A. ❌ As the acquisition will cause the Herfindahl Index of the industry to change from 2000 to 8000 it should not be done
- B. ✓ As the acquisition will cause the Herfindahl Index of the industry to change from 8000 to 2000 it should not be done
- C. ❌ The 4-firm concentration ratio will change from 52% to 84%
- D. ✓ The concentration ratio is increasing by 10% because of the meagre
- E. ✓ The 4-firm concentration ratio will change from 84% to 52%

**Question Number : 24 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Movement along a demand curve occurs when \_\_\_\_\_

**Options :**

- A. ✓ Price of the product varies
- B. ❌ Tastes change
- C. ❌ The number of buyers increase
- D. ❌ Income decreases

**Question Number : 25 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

If a product is said to have a price inelastic demand curve, what does this mean?

**Options :**

- A. ❌ If a person's income increases, then the product sales will increase.
- B. ✓ If the price is changed, sales volume will change very little.

- C. ✘ To sell more products, the price should rise.
- D. ✘ To make more sales revenue, the price should be lowered.

**Question Number : 26 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

Which of the following is not one of the five key indicators in Purchasing Manager's Index (PMI)?

**Options :**

- A. ✘ New orders
- B. ✘ Employment environment
- C. ✘ Supplier Deliveries
- D. ✓ Competitor Analysis

**Question Number : 27 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

When a good has no substitutes, then ideally, the demand curve for the good should be

---

**Options :**

- A. ✓ Vertical
- B. ✘ Horizontal
- C. ✘ Inclined at 45 degrees
- D. ✘ Inclined at 135 degrees

**Question Number : 28 Question Type : MCQ**

**Correct Marks : 2.5**

Question Label : Multiple Choice Question

A business is operating using the pricing strategy of “Contribution Pricing”, then which of the following statements are true?

**Options :**

- A. ❌ The price will be higher than the average total cost
- B. ✓ The price will be higher than the average variable cost
- C. ❌ The price will be higher than the average fixed cost
- D. ❌ None of these, cannot say without the cost information

**Question Number : 29 Question Type : MCQ**

**Correct Marks : 1.25**

Question Label : Multiple Choice Question

In a competitive pricing strategy, the final price of a product is arrived at after evaluating/analysing the prices of competitors?

**Options :**

- A. ✓ TRUE
- B. ❌ FALSE

**Question Number : 30 Question Type : MCQ**

**Correct Marks : 1.25**

Question Label : Multiple Choice Question

What does the word “Market Share” mean?

**Options :**

- A. ❌ Share a company's profits with shareholders
- B. ✓ Share of company's sales in total market sales
- C. ❌ Share the company market research activities with researchers
- D. ❌ None of these

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

**Correct Marks : 2.5**

Question Label : Short Answer Question

The cost of a motorbike has changed from Rs. 20,000 to Rs. 40,000. At the same time, the number of cycles purchased has changed from 1200 to 1500. Then, the cross-price elasticity of these two goods is (round to two decimal places)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.25

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

**Correct Marks : 2.5**

Question Label : Short Answer Question

The table below provides the total utility of X, for each cup of milk he buys. If a packet of milk sells for Rs.24, how many packets will X buy?

packets of Milk	1	2	3	4	5	6	7	8	9
Total Utility (in Rs)	28	30	34	40	38	36	32	28	24

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Type : COMPREHENSION****Question Numbers : (33 to 35)**

Question Label : Comprehension

[Data for the question is hypothetical] Say, the sales data on December-2021 for different automobile companies are given in the table below. Using this data, answer the given subquestions

Company	Sales in December-2021 (No. of units)
Maruti Suzuki	1,04,057
Hyundai	38,736
Tata Motors	30,941
Mahindra	23644
Toyota	23000
Kia, MG, Ford, Nissan and Others	24,289
Total	2,44,667

**Sub questions****Question Number : 33 Question Type : SA****Correct Marks : 2.5**

Question Label : Short Answer Question

What is the market share of "Kia, MG, Ford, Nissan and Others"? (in %) (round to two decimal places)

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

9.80 to 10.00

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

**Correct Marks : 2.5**

Question Label : Short Answer Question

What is the 4-firm concentration ratio for this industry? (in %) (round to one decimal place)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

80.5 to 81.0

**Question Number : 35 Question Type : MSQ**

**Correct Marks : 2.5**

Question Label : Multiple Select Question

Which of the following statements are true for this market based on the 4-firm concentration ratio?

**Options :**

- A. ✘ It is a perfectly competitive market
- B. ✘ It is a monopolistic market
- C. ✓ It is an oligopoly market
- D. ✘ None of these

**Question Type : COMPREHENSION**

**Question Numbers : (36 to 37)**

Question Label : Comprehension

[Answer the questions considering only the data given] Mr M is an entrepreneur who wants to start a new car-wash business. Mr M can vary the output (number of cars washed per day) by varying the number of employees hired. Mr M pays a fixed salary for all employees. The total output for the different number of employees that can be hired by Mr M is estimated as given in the table below. With this information, answer the given subquestions.

Number of Employees	Total Output
2	1
4	4
6	9
8	15
10	20
12	24
14	26
16	27
18	28

**Sub questions****Question Number : 36 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

Each employee hired is to be paid Rs. 30/hour and Mr M is planning to charge Rs. 320 per car wash. Additionally, Mr M plans to rent a space at a fixed cost of Rs. 1000 per day, and to keep it open from 8 AM – 8 PM for washing. Then how many employees should Mr M hire? (assume that the available output is completely utilized/demanded)

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

12

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

**Correct Marks : 2.5**

Question Label : Short Answer Question

What is the average fixed cost per car washed that is incurred when Mr M operates the business by hiring the number of employees identified in previous question (round your answer to one decimal place)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

41.00 to 42.00

## DBMS

**Number of Questions :** 17

**Section Marks :** 50

**Question Number : 38 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

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**Options :**

A. ✓ Yes

B. ✗ No

**Question Number : 39 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following statements.

1. If a relation R is in 3NF and for each non-trivial functional dependency, the RHS is a super key, then R is in BCNF as well.
2. If a relation R is in BCNF and does not consist of any multivalued dependency, then R is in 4NF as well.
3. If a relation R is in 2NF and does not contain any transitive dependencies, then R is in BCNF as well.

Choose the correct option.

**Options :**

A. ✗ Statements 1 & 3 are correct.

B. ✓ Only Statement 2 is correct.

C. ✗ Statements 2 & 3 are correct.

D. ✗ All the statements are correct.

**Question Number : 40 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following code for creating a table STUDENTS in a PostgreSQL database using Python.

```
import psycopg2
def createTable():
    conn = None
    try:
        conn = psycopg2.connect(database = "mydb", user = "myuser",
                               password = "mypass", host = "127.0.0.1", port = "5432")
        cur = conn.cursor()
        -----A-----(''CREATE TABLE STUDENTS
                     (roll_no INT PRIMARY KEY      NOT NULL,
                      student_name VARCHAR(40)    NOT NULL,
                      department VARCHAR(40)     NOT NULL)'')
        conn.commit()
        print ("Table created successfully")
        -----B-----
    except (Exception, psycopg2.DatabaseError) as error:
        print(error)
    finally:
        if conn is not None:
            conn.close()
createTable()
```

Choose the correct option to fill in the blanks A and B, such that the STUDENTS table is created in mydb database.

**Options :**

- A. ❌ A: cur.conn.sql, B : cur.execute()
- B. ✓ A: cur.execute, B : cur.close()
- C. ❌ A: cur.open, B : cur.execute()
- D. ❌ A: cur.execute, B : cur.conn.close()

**Question Number : 41 Question Type : MCQ**

**Correct Marks : 3**

### Question Label : Multiple Choice Question

Consider an NPTEL database having the following tables:

**students**(*roll\_no, sname, age, university*)

**course**(*course\_id, cname, grade, roll\_no*)

Assume that the number of tuples in both the tables is quite large.

Suppose the following two queries are executed on these tables.

1. SELECT s.sname, c.grade FROM students s NATURAL JOIN course c WHERE university = 'Mumbai'
  
2. SELECT sname FROM students WHERE roll\_no = 'ME003'

Which of the following statements is true?

### Options :

- A. Query 1 will execute more efficiently when multitable clustering file organization scheme is used.
- B. Both queries will execute more efficiently when sequential clustering file organization scheme is used.
- C. Query 1 will execute more efficiently when sequential clustering file organization scheme is used.
- D. None of these

### Question Number : 42 Question Type : MCQ

### Correct Marks : 2

#### Question Label : Multiple Choice Question

Consider the following statements.

1. Array, stack, tree, graph, queue are some types of linear data structure.
2. In non-linear data structure, data elements can be traversed in multiple ways.

Choose the correct option.

### Options :

- A. Only statement 1 is correct.

- B. ✓ Only statement 2 is correct.
- C. ✗ Both the statements are correct.
- D. ✗ Both the statements are incorrect.

### Question Number : 43 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

Consider the following statements about a **data dictionary**:

1. It is a collection of names, definitions, and attributes about data elements that are being used or captured in a database
2. DDL commands are capable of updating data dictionary.
3. The data dictionary cannot be updated once a database is created.

#### Options :

- A. ✗ All the statements are correct.
- B. ✗ Statements 1 & 3 are correct.
- C. ✗ Only statement 1 is correct.
- D. ✓ Statements 1 & 2 are correct.

### Question Number : 44 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following methods are used to read the result of a query using Python psycopg2 module?

1. fetch()
2. fetchone()
3. fetchmany()
4. fetchall()

**Options :**

- A. ✘ 1,2,3
- B. ✓ 2,3,4
- C. ✘ 1,3,4
- D. ✘ All of these

**Question Number : 45 Question Type : MCQ****Correct Marks : 2**

Question Label : Multiple Choice Question

Given relation  $R(J, K, L, M)$  and a set of functional dependencies

$$\mathcal{F} = \{K \rightarrow M, M \rightarrow J, KL \rightarrow J\}$$

Which of the following is the correct canonical cover for the given set of functional dependencies?

**Options :**

A. ✘  $\mathcal{F} = \{K \rightarrow M, M \rightarrow J, L \rightarrow J\}$

B. ✘  $\mathcal{F} = \{M \rightarrow J, K \rightarrow J\}$

C. ✓  $\mathcal{F} = \{K \rightarrow M, M \rightarrow J\}$

D. ✘  $\mathcal{F} = \{K \rightarrow M, KL \rightarrow J\}$

**Question Number : 46 Question Type : MCQ****Correct Marks : 4**

Question Label : Multiple Choice Question

Consider the relation Term1 shown in Figure 1.

Student	Course	Instructor	Credit
MSD	Python	Kumar	_____
MSD	DBMS	Patel	_____
MSD	Python	Patel	_____
MSD	DBMS	Kumar	_____

Figure 1: Relation Term1

Choose the correct values in *Credit* column (in the same order) such that the following MVDs are true:

$Student \rightarrow\rightarrow Course$

$Student \rightarrow\rightarrow (Instructor, Credit)$

**Options :**

Credit
7
8
9
6

A. ✘

Credit
9
7
9
7

B. ✘

Credit
9
7
7
9

C. ✓

D. ✘

Credit
7
7
9
9

### Question Number : 47 Question Type : MCQ

**Correct Marks : 4**

Question Label : Multiple Choice Question

Consider a magnetic disk with the following specifications. The magnetic disk consists of 16 platters, and has information recorded on both the surfaces of each platter. Each platter's surface is logically divided into 128 tracks, each of which is subdivided into 256 sectors. Find the storage capacity of a track. (Given, sector size is 512 bytes.)

**Options :**

- A. ❌ 64 KB
- B. ✓ 128 KB
- C. ❌ 256 KB
- D. ❌ 512 KB

### Question Number : 48 Question Type : MSQ

**Correct Marks : 3**

Question Label : Multiple Select Question

Consider a relation **cars**(*name, model, price*). If all cars have the same price, then which of the following functional dependency/dependencies hold(s) in **cars**?

**Options :**

- A. ✓ *name* → *price*
- B. ❌ *price* → *model*
- C. ✓ *model* → *price*

D. ❌ *price* → name

### Question Number : 49 Question Type : MSQ

#### Correct Marks : 3

Question Label : Multiple Select Question

Choose the SQL statement(s) that can result in an SQL Injection that retrieves all information from the customers table.

#### Options :

A. ❌ `SELECT * FROM customers WHERE cus_id = 'M002' and 'X' = 'Y'`

B. ❌ `SELECT * FROM customers WHERE cus_id = 'M002' or '8' <= '5'`

C. ❌ `SELECT * FROM customers WHERE cus_id = 'M002' and '8' <= '5'`

D. ✓ `SELECT * FROM customers WHERE cus_id = 'M002' or 'Y' = 'Y'`

### Question Number : 50 Question Type : MSQ

#### Correct Marks : 3

Question Label : Multiple Select Question

Consider a relation  $R(A, B, C, D, E)$  with the following functional dependencies:

$$\mathcal{F} = \{A \rightarrow B, C \rightarrow DE, D \rightarrow E\}$$

Which among the following is/are lossless decomposition(s)?

#### Options :

A. ✓ R1(A,B,C) and R2(C,D,E)

B. ✓ R1(A,B,C) and R2(A,C,D,E)

C. ✘ R1(A,B) and R2(B,D,E)

D. ✘ R1(A,B,C) and R2(D,E)

### Question Number : 51 Question Type : MSQ

#### Correct Marks : 4

Question Label : Multiple Select Question

Consider a relation `hotel_information(c_name, c_id, mobile, room_type, room_no)` with the following functional dependencies:

$$\mathcal{F} = \{c\_id \rightarrow (c\_name, mobile), \\ (c\_name, mobile) \rightarrow room\_no, \\ room\_no \rightarrow room\_type\}$$

#### Options :

- A. ✓ The above relation can be decomposed into smaller relations, each of which is in BCNF, such that the decomposition is dependency preserving.
- B. ✘ The above relation can be decomposed into smaller relations, each of which is in BCNF, such that the decomposition is not dependency preserving.
- C. ✘ The above relation can be decomposed into smaller relations, each of which is in 3NF, such that the decomposition is not dependency preserving.
- D. ✓ The above relation can be decomposed into smaller relations, each of which is in 3NF, such that the decomposition is dependency preserving.

### Question Number : 52 Question Type : SA

#### Correct Marks : 3

Question Label : Short Answer Question

The following numbers are inserted into an empty binary search tree in the given order: 61,34,23,45,1,2,3,4,5. What is the height of the resulting binary search tree?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

7

**Question Number : 53 Question Type : SA**

**Correct Marks : 4**

Question Label : Short Answer Question

Let  $R(U, V, W, X, Y, Z)$  be a given relation with the following functional dependencies:  
 $\mathcal{F} = \{V \rightarrow UW, W \rightarrow V, U \rightarrow Z, X \rightarrow Y\}$

Find the total number of super keys of  $R$ .

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

24

**Question Type : COMPREHENSION**

**Question Numbers : (54 to 55)**

Question Label : Comprehension

Consider a relation **Employee**(*eid*, *ename*, *eaddress*, *pid*, *pname*, *mid*, *mname*).

Each employee is assigned a unique *eid*, an *ename* and an *eaddress*. Each project is assigned a unique *pid* and a *pname*. Each manager is assigned a unique *mid* and *mname*. An employee can work on more than one project and a project can have multiple employees. Each employee can work under only one manager. However, a manager can have multiple employees. A manager is not concerned with the project that the employees are working on. Different employees can have the same name and different employees can be living at the same address.

Considering the above scenario, answer the given subquestions.

### **Sub questions**

#### **Question Number : 54 Question Type : MSQ**

##### **Correct Marks : 3**

Question Label : Multiple Select Question

Identify the candidate key(s) for the **Employee** relation.

##### **Options :**

- A. ✘ *eid*
- B. ✘ {*eid*, *mid*}
- C. ✓ {*eid*, *pid*}
- D. ✘ {*mid*, *pid*}

#### **Question Number : 55 Question Type : MCQ**

##### **Correct Marks : 2**

Question Label : Multiple Choice Question

Identify the highest normal form of the relation **Employee**.

##### **Options :**

- A. ✘ 2NF
- B. ✘ 3NF

C. ✖ BCNF

D. ✓ None of these

## MLF

**Number of Questions :** 18

**Section Marks :** 50

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

**Correct Marks : 0**

Question Label : Multiple Choice Question

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

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

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

**Options :**

A. ✓ Yes

B. ✖ No

**Question Number : 57 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider a matrix  $A$  of size  $n \times n$ . Let  $a_{jk}$  denotes an element at  $j^{th}$  row and  $k^{th}$  column. The elements  $a_{jj}$  of the matrix are all of complex number  $i$ . The elements at  $a_{jk} = \overline{a_{kj}}$ , for  $j \neq k$ . Then, the matrix  $iA$  is

**Options :**

- A. ✘ Hermitian
- B. ✘ Symmetric
- C. ✘ Hermitian and Symmetric
- D. ✘ Hermitian but not Symmetric
- E. ✓ Neither Hermitian nor Symmetric

**Question Number : 58 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

It is known that the operation  $z \cdot z$ , where  $z \in \mathbb{C}^n$ , always outputs a real number. Then the resultant scalar for the operation  $z \cdot Az$ , where  $A$  is a Hermitian matrix of size  $n \times n$ , is

**Options :**

- A. ✘ Always a complex number
- B. ✓ Always a real number
- C. ✘ Always an imaginary number
- D. ✘ Real or complex based on the elements of the matrix  $A$

**Question Number : 59 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

The Schur's decomposition for the matrix  $A = \begin{bmatrix} 1 & i & 2i \\ -i & 2 & -i \\ -2i & i & 1 \end{bmatrix}$  is  $QTQ^*$ . Let

$B = kA$  for some  $k \in \mathbb{R}$ . Then Schur's decomposition of  $B$  is

**Options :**

- A. ✘  $QTQ^*$
- B. ✓ The matrix  $T$  will be multiplied by  $k$

C. ❌ The matrix  $Q$  will be multiplied by  $k$

D. ❌ The matrix  $Q^*$  will be multiplied by  $k$

**Question Number : 60 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

The function  $f(x, y) = 2x^2 + 2xy + 2y^2 - 18x$  has a stationary point at

**Options :**

A. ❌ (6, 3)

B. ❌ (-3, 6)

C. ❌ (-6, -3)

D. ✓ (6, -3)

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

**Correct Marks : 2**

Question Label : Multiple Choice Question

The matrix  $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$  is

**Options :**

A. ✓ positive definite

B. ❌ positive semi-definite

C. ❌ negative definite

D. ❌ negative semi-definite

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

**Correct Marks : 2**

Question Label : Multiple Choice Question

The correct representation of  $x^2 + y^2 - z^2 - xy - zy + zx$  in the matrix form is**Options :**

A. ❌  $[x \ y \ z] \begin{bmatrix} 1 & -1 & 0 \\ 0 & -1 & 0 \\ 1 & 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

B. ❌  $[x \ y \ z] \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

C. ✓  $[x \ y \ z] \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \\ 1 & -1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

D. ❌  $[x \ y \ z] \begin{bmatrix} 1 & 1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

**Question Number : 63 Question Type : MCQ****Correct Marks : 2**

Question Label : Multiple Choice Question

What is the value of  $k$ , if the function  $f : \mathbb{R} \rightarrow \mathbb{R}, f(x, y) = kx^2 + 8y^2$  is a convex function?**Options :**

A. ❌  $k \geq \frac{1}{2}$

B. ❌  $k < 1$

C. ✓  $k > 0$

D. ✗ None of these

### Question Number : 64 Question Type : MCQ

**Correct Marks : 2**

Question Label : Multiple Choice Question

Compute the Hessian matrix at the point  $(0,1,\pi)$  of the following 3 variable function:  $f(x,y,z) = e^{-x} \cdot \sin(yz)$

**Options :**

A. ✗ 
$$\begin{bmatrix} 0 & \pi & 1 \\ \pi & 0 & -1 \\ 1 & 0 & 1 \end{bmatrix}$$

B. ✗ 
$$\begin{bmatrix} 1 & \pi & 1 \\ \pi & 0 & -1 \\ 1 & -1 & 0 \end{bmatrix}$$

C. ✓ 
$$\begin{bmatrix} 0 & \pi & 1 \\ \pi & 0 & -1 \\ 1 & -1 & 0 \end{bmatrix}$$

D. ✗ None of these

### Question Number : 65 Question Type : MSQ

**Correct Marks : 2**

Question Label : Multiple Select Question

Which of the following is/are a convex function?

**Options :**

- A. ❌  $f(x) = \frac{1}{x^5}$  over  $\mathbb{R}$
- B. ✓  $f(x) = -\log(x)$  over  $\mathbb{R}$
- C. ✓  $f(x) = 4x^4 + 5x$  over  $\mathbb{R}$
- D. ❌  $-e^x$  given  $x \in \mathbb{R}$

**Question Number : 66 Question Type : MSQ****Correct Marks : 3**

Question Label : Multiple Select Question

Given  $S$  is a convex set and the points  $x_1, x_2, x_3, x_4 \in S$ . Which of the following points must be the part of the convex hull formed by these points:

**Options :**

- A. ✓  $0.1x_1 + 0.2x_2 + 0.3x_3 + 0.4x_4$
- B. ❌  $-0.1x_1 + 0.2x_2 + 0.6x_3 + 0.7x_4$
- C. ❌  $0.1x_1 + 0.1^2x_2 + 0.1^3x_3 + 0.1^3x_4$
- D. ✓  $0.25x_1 + 0.25x_2 + 0.25x_3 + 0.25x_4$

**Question Number : 67 Question Type : SA****Correct Marks : 2**

**Question Label :** Short Answer Question

Consider the vector  $w = \begin{bmatrix} 2 \\ 0 \\ 1+i \\ 1-i \end{bmatrix}$  and  $z = \begin{bmatrix} 2+2i \\ 2+2i \\ -2-2i \\ 2+2i \end{bmatrix}$ .  $z = u + v$  for some

$u, v$  from  $\mathbb{C}^4$ . If  $v.w$  is  $-4 - 8i$ ,  $u.w = a + ib$ , then what is the value of  $a + b$ ?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

4

**Question Number : 68 Question Type : SA**

**Correct Marks : 2**

**Question Label :** Short Answer Question

A matrix  $S$  is decomposed using SVD as given below

$$S = \begin{bmatrix} -0.9739 & -0.1146 & 0.1961 \\ -0.1539 & -0.3023 & -0.9407 \\ 0.1671 & -0.9463 & 0.2768 \end{bmatrix} \begin{bmatrix} 7.6574 & 0 & 0 \\ 0 & 3.3214 & 0 \\ 0 & 0 & 2.5164 \end{bmatrix} \begin{bmatrix} -0.2578 & 0.6829 & 0.6835 \\ -0.4651 & -0.7078 & 0.5317 \\ -0.8469 & 0.1808 & -0.5001 \end{bmatrix}$$

Then the absolute value of the determinant of the matrix  $SS^T$  is?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

248 to 264

**Question Number : 69 Question Type : SA**

**Correct Marks : 3**

Question Label : Short Answer Question

Suppose a vector  $u$  of size  $n \times 1$  is formed by the expression  $u(k) = \operatorname{Re} \left( \exp \left( \frac{ik\theta}{2} \right) \right)$ ,  
for  $k = 0, 1, \dots, n-1$ , where  $k$  denotes the  $k^{\text{th}}$  element in the vector  $u$ . Suppose  $A = uu^T$ .

The number of non-zero singular values  $\sigma_i$  on the diagonal matrix  $\Sigma$  obtained by applying SVD on the matrix  $A$  is?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number : 70 Question Type : SA**

**Correct Marks : 3**

Question Label : Short Answer Question

The distance of the point on the sphere  $x^2 + y^2 + z^2 = 3$  farthest from the point  $(2,2,2)$  is \_\_\_\_.

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5.00 to 6.00

**Question Number : 71 Question Type : SA**

**Correct Marks : 4**

Question Label : Short Answer Question

If  $f(10) = 2500$ ,  $f'(10) = 1000$  and  $f''(10) = 50$ , then what could be the approximate value of  $f(10.2)$ ?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

2700 to 2702

**Question Type : COMPREHENSION**

**Question Numbers : (72 to 74)**

Question Label : Comprehension

Consider the data points  $x_1, x_2, x_3$  to answer the given subquestions.

$$x_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}, x_2 = \begin{bmatrix} 0 \\ 0 \end{bmatrix}, x_3 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

### Sub questions

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

**Correct Marks : 2**

Question Label : Multiple Choice Question

The mean vector of the data points  $x_1, x_2, x_3$  is

**Options :**

A. ❌  $\begin{bmatrix} 0 \\ 0 \end{bmatrix}$

B. ✓  $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$

C. ❌  $\begin{bmatrix} 0 \\ 1 \end{bmatrix}$

D. ❌  $\begin{bmatrix} 0.5 \\ 0.5 \end{bmatrix}$

**Question Number : 73 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

The covariance matrix

$$C = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})(x_i - \bar{x})^T$$

for the data points  $x_1, x_2, x_3$  is

**Options :**

A. ❌  $\begin{bmatrix} 0.67 & 0.33 \\ -0.33 & 0.67 \end{bmatrix}$

B. ❌  $\begin{bmatrix} 0.67 & -0.33 \\ -0.33 & 0 \end{bmatrix}$

C. ✓  $\begin{bmatrix} 0.67 & 0.33 \\ 0.33 & 0.67 \end{bmatrix}$

D. ❌  $\begin{bmatrix} -0.67 & -0.33 \\ 0.33 & 0.67 \end{bmatrix}$

**Question Number : 74 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

The eigenvalues of the covariance

matrix  $C = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})(x_i - \bar{x})^T$   
are

**Options :**

A. ❌ 0.5, 0.5

B. ❌ 0.33, 0.33

C. ✓ 1, 0.34

D. ❌ 0.67, 0.67

**Question Type : COMPREHENSION**

**Question Numbers : (75 to 76)**

Question Label : Comprehension

Consider the function  $f(x) = 25x^2 + 625 - 250x$ .

Based on the above data, answer the given subquestions.

### **Sub questions**

#### **Question Number : 75 Question Type : SA**

##### **Correct Marks : 4**

Question Label : Short Answer Question

Starting with  $x_0 = 3$ , in how many iterations, will Newton's method be able to achieve the function's minimum value considering an error of 0.1?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

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

##### **Correct Marks : 4**

Question Label : Short Answer Question

Starting with  $x_0 = 3$  and  $\eta = 0.01$ , in how many iterations will gradient descent be able to reach the function's minimum value considering an error of 0.1?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

5

## MLP

**Number of Questions :** 22

**Section Marks :** 50

**Question Number : 77 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

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

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CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

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

**Options :**

A. YES

B. NO

**Question Number : 78 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following will create a confusion matrix plot from  $y$  and  $y_{hat}$ ?

**Options :**

A. ✓ `cm_display = ConfusionMatrixDisplay.from_predictions(y,y_hat_)`  
A. ✓ `plt.show()`

B. ✗ `cm_display = ConfusionMatrixDisplay(y,y_hat_)`  
B. ✗ `plt.show()`

C. ✗ `cm_display = ConfusionMatrix.from_predictions(y,y_hat_)`  
C. ✗ `plt.show()`

D. ✗ `cm_display = ConfusionMatrix(y,y_hat_)`  
D. ✗ `plt.show()`

**Question Number : 79 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

We have a dataset which has only numerical features. We are implementing the following model on this dataset. (Note: X and y are feature matrix and label vector respectively.)

```
from sklearn.naive_bayes import CategoricalNB  
model = CategoricalNB()  
model.fit(X,y)
```

We find that the performance of the model is unsatisfactory. Which of the following models may be useful to use instead of CategoricalNB?

**Options :**

- A. ✗ NumericalNB
- B. ✗ MultinomialNB
- C. ✗ BernoulliNB
- D. ✓ GaussianNB

## Question Number : 80 Question Type : MCQ

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following two models:

Model A:

```
import pandas as pd
from sklearn.datasets import load_wine
from sklearn.linear_model import LogisticRegression
data = load_wine()
X = pd.DataFrame(data.data, columns = data.feature_names)
y = pd.DataFrame(data.target)
model = LogisticRegression(penalty = 'none', solver = 'saga', random_state = 100)
model.fit(X,y)
model.score(X,y)
```

Model B:

```
import pandas as pd
from sklearn.datasets import load_wine
from sklearn.linear_model import LogisticRegression
data = load_wine()
X = pd.DataFrame(data.data, columns = data.feature_names)
y = pd.DataFrame(data.target)
model = LogisticRegression(penalty = 'l2', solver = 'saga', random_state = 100)
model.fit(X,y)
model.score(X,y)
```

In general, which of the models will have a high bias?

**Options :**

- A. ✘ Model A
- B. ✓ Model B
- C. ✘ Both the models will have same bias
- D. ✘ Can't say

## Question Number : 81 Question Type : MCQ

**Correct Marks : 2**

Question Label : Multiple Choice Question

The below figure (Figure 1) shows AUC-ROC curves for three logistic regression models. Different colors show curves for different hyper parameters values.

Which of the AUC-ROC curves will give best result?

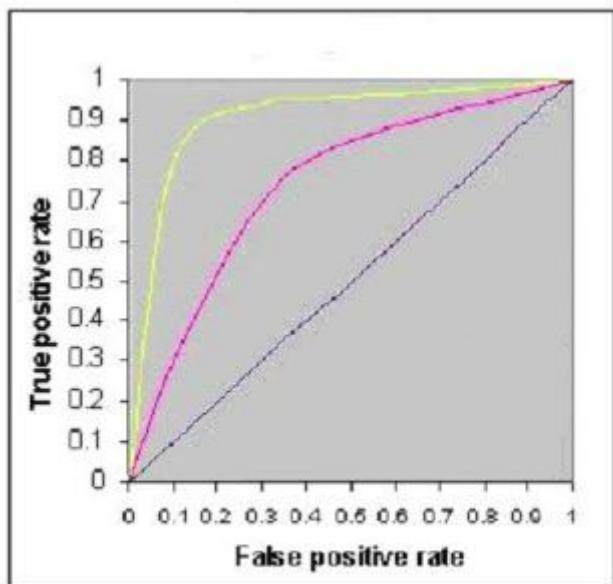


Figure 1

**Options :**

- A. ✓ Yellow
- B. ✗ Pink
- C. ✗ Blue
- D. ✗ All are same

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

**Correct Marks : 2**

Question Label : Multiple Choice Question

What is the default loss value in SGDClassifier API and it gives which classifier?

**Options :**

- A. ✘ 'log', Logistic Regressor
- B. ✘ 'log', Logistic Classifier
- C. ✓ 'hinge', SVM Classifier
- D. ✘ 'hinge', Perceptron

### Question Number : 83 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following will be the correct output of the code snippet given below?

```
from sklearn.neighbors import KNeighborsClassifier
X = [[10], [15], [20], [25], [30]]
y = [0, 0, 1, 1, 2]
neigh = KNeighborsClassifier(n_neighbors=3)
neigh.fit(X, y)
print(neigh.predict([[18]]))
```

#### Options :

- A. ✘ 0
- B. ✓ 1
- C. ✘ 2
- D. ✘ None

### Question Number : 84 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

What would be the best value for k to be used in KNN algorithm based on the graph given below?

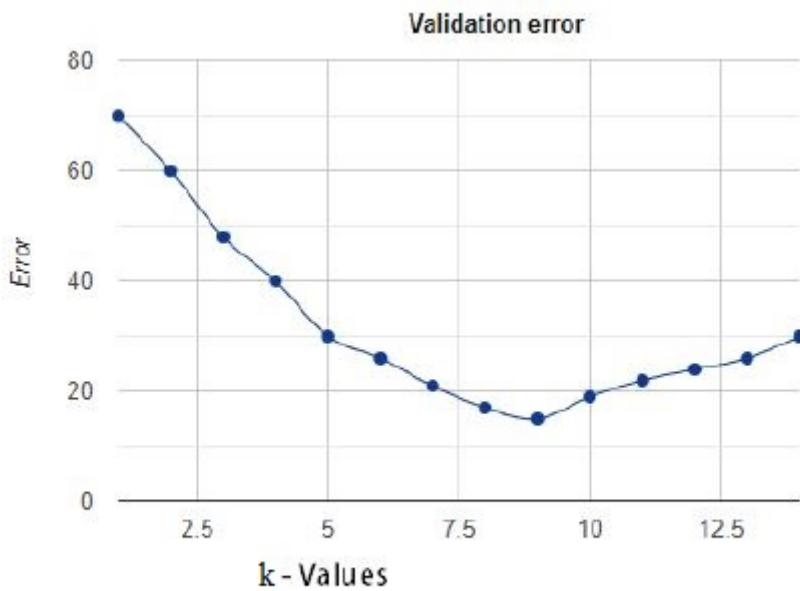


Figure 2

**Options :**

- A. ✘ 4
- B. ✘ 5
- C. ✓ 9
- D. ✘ 12

**Question Number : 85 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following numerical value should be at the place of "?" symbol in the output? (Assume necessary imports)

```

import pandas as pd
text= ['An examination is an official test','It shows knowledge in particular subject ']
countvectorizer = CountVectorizer()
est = countvectorizer.fit_transform(text)
Words = countvectorizer.get_feature_names()
df = pd.DataFrame(data = est.toarray(),index = ['Sentence1','Sentence2'],columns = Words)
df.head()

```

**Output:**

	an	examination	in	is	it	knowledge	official	particular	shows	subject	test		
Sentence1	?		1	0	1	0		1		0	0	0	1
Sentence2	0		0	1	0	1		1		1	1	1	0

Figure 3

**Options :**

- A. ✘ 0
- B. ✘ 1
- C. ✓ 2
- D. ✘ None

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

**Correct Marks : 2**

Question Label : Multiple Choice Question

What is the output of the following block of code?

```

import numpy as np
from sklearn.pipeline import make_pipeline
from sklearn.preprocessing import StandardScaler
X = np.array([[1, 0], [0, 1]])
y = np.array([-1, 1])
from sklearn.svm import SVC
clf = make_pipeline(StandardScaler(), SVC(kernel='linear'))
clf.fit(X, y)
print(clf.predict([-2, 2]))

```

**Options :**

- A. ✘ array[1]
- B. ✘ array[3]
- C. ✘ array[2]

D. ✓ array[-1]

## Question Number : 87 Question Type : MCQ

### Correct Marks : 3

Question Label : Multiple Choice Question

What is the output of following code snippet (assume necessary imports)?

```
X,y= fetch_openml('mnist_784',version=1,return_X_y=True)
X = X.to_numpy()
y = y.to_numpy()

indices1 = np.where(y == 8)[0]
indices2 = np.where(y == 0)[0]

y_train = y[np.concatenate((indices1, indices2), axis = 0)]
X_train = X[np.concatenate((indices1, indices2), axis = 0)]
```

### Options :

- A. ✓ it prepares data for binary classification of 0 and 8
- B. ✗ it prepares data for binary classification of 6 and 9
- C. ✗ it prepares data for multi class classification of 1 to 7 and 9
- D. ✗ none of these

## Question Number : 88 Question Type : MCQ

### Correct Marks : 3

Question Label : Multiple Choice Question

A perceptron model is trained on binary output data  $X_{n \times m}$  and  $y_{n \times 1}$ .

```
clf = Perceptron()
clf.fit(X,y)
```

Which of the following will plot the PR curve correctly?

### Options :

```
scores = clf.decision_function(X)
p,r, _ = precision_recall_curve(y, scores)
```

A. ✓ plt.plot(p[:-1], r[:-1])

```
s = clf.decision_function(X)
p,r, _ = PrecisionRecallCurve(y, s)
plt.plot(p[:-1], r[:-1])
```

B. ✗

```
s = clf.decision_score(X)
p,r, _ = precision_recall_curve(s, y)
plt.plot(p[:-1], r[:-1])
```

C. ✗

```
s = clf.decision_score(X)
p,r, _ = precision_recall_curve(y, s)
plt.plot(p[:-1], r[:-1])
```

D. ✗

## Question Number : 89 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

We have run the following code on a highly imbalanced dataset and we observe that it has performed poorly on parameters like accuracy, precision and recall.

```
import pandas as pd
from sklearn.metrics import classification_report
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
import warnings
warnings.filterwarnings("ignore")
%matplotlib inline

df = pd.read_csv('https://archive.ics.uci.edu/ml/machine-learning-databases
                  /wine-quality/winequality-red.csv', sep = ';')
X = df.iloc[:,0:11].copy()
Y = df.iloc[:,11:12].copy()
X_train,X_test,y_train,y_test = train_test_split(X,Y, test_size = 0.2)
lr = LogisticRegression(random_state = 1)
lr.fit(X_train, y_train)
lrcp = classification_report(y_test, lr.predict(X_test), output_dict = True)
lrcp = pd.DataFrame(lrcp).T
lrcp
```

Which among the following techniques is most likely to improve the accuracy of the model?

**Options :**

- A. ✘ By using a different solver.
- B. ✘ By passing an appropriate value of l1\_ratio.
- C. ✓ By passing an appropriate value for class\_weight.
- D. ✘ By increasing the number of iterations.

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

**Correct Marks : 3**

Question Label : Multiple Choice Question

We have run the following code:

```

import numpy as np
from sklearn.linear_model import LogisticRegression
x1 = 7*np.random.randn(50)
x2 = 8*np.random.randn(50)
x3 = 9*np.random.randn(50)
y = (10 + x1 + x2 + 0.5*np.random.randn()) > 0
X = np.column_stack([x1, x2, x3])
lr = LogisticRegression(solver = 'liblinear', tol = 1e-4, penalty = 'l2',
                        fit_intercept = False, dual = True, random_state = 1)
lr.fit(X, y)
lr.score(X,y)

```

Knowing the details of the data generation, by changing which of the following hyperparameters, we are likely to have the highest improvement in score?

**Options :**

- A. ❌ By changing solver to 'saga' and making penalty as 'elasticnet'.
- B. ❌ By changing dual to False and increasing tol to 1e-3.
- C. ✓ By changing fit intercept to True.
- D. ❌ By changing penalty alone to 'l1'.

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

**Correct Marks : 3**

Question Label : Multiple Choice Question

Rahul is working on a large dataset where he needs to Convert a collection of text documents to a matrix. Which of the following vectorizer would you suggest him to use?

**Options :**

- A. ❌ CountVectorizer
- B. ❌ TfidfVectorizer
- C. ✓ HashingVectorizer
- D. ❌ Both CountVectorizer and HashingVectorizer

**Question Number : 92 Question Type : MSQ**

### **Correct Marks : 2**

Question Label : Multiple Select Question

Consider following code and choose correct options (assume necessary imports).

```
ridge_classifier = RidgeClassifier(alpha=0.0001,  
                                    fit_intercept=True)
```

#### **Options :**

- A. ✓ It fits a model with an intercept.
- B. ✓ The L2 regularization rate is 0.0001.
- C. ✗ It fits a logistic regression model.
- D. ✗ It is suitable for fitting a regression model.

### **Question Number : 93 Question Type : MSQ**

### **Correct Marks : 2**

Question Label : Multiple Select Question

Vishal is working on a classification model. He is having the dataset of 120 GB size. But the ram of his machine is 4GB only. Which of the following algorithms do you think can help him? Select all that apply.

#### **Options :**

- A. ✗ SGDRegressor
- B. ✓ Perceptron
- C. ✗ LogisticRegression
- D. ✓ SGDClassifier
- E. ✓ MultinomialNB

### **Question Number : 94 Question Type : MSQ**

### **Correct Marks : 3**

Question Label : Multiple Select Question

Which of the following code will correctly train a large scale regression model using partial\_fit, If

shape of X\_train,Y\_train are given as (9000,90,10) and (9000,90) respectively?

**Options :**

```
from sklearn.linear_model import SGDRegressor
regressor = SGDRegressor(random_state=10)
for i in range(X_train.shape[[0]]):
    X_batch, Y_batch = X_train[i], Y_train[i]
    regressor.partial_fit(X_batch, Y_batch)
```

A. ✘

```
from sklearn.linear_model import SGDRegressor
regressor = SGDRegressor(random_state=10)
for i in range(Y_train.shape[0]):
    X_batch, Y_batch = X_train[i], Y_train[i]
    regressor.partial_fit(X_batch, Y_batch)
```

B. ✓

```
from sklearn.linear_model import SGDRegressor
regressor = SGDRegressor(random_state=10)
for i in range(Y_train.shape[[0]]):
    X_batch, Y_batch = X_train[i], Y_train[i]
    regressor.partial_fit(X_batch, Y_batch)
```

C. ✘

```
from sklearn.linear_model import SGDRegressor
regressor = SGDRegressor(random_state=10)
for i in range(X_train.shape[0]):
    X_batch, Y_batch = X_train[i], Y_train[i]
    regressor.partial_fit(X_batch, Y_batch)
```

D. ✓

**Question Number : 95 Question Type : MSQ**

**Correct Marks : 3**

Question Label : Multiple Select Question

The one-vs-one approach in multi-class classification is implemented by-

**Options :**

A. ✘ LinearSVC

B. ✓ SVC

C. ✓ NuSVC

## D. \* MultiSVC

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

**Correct Marks : 2**

Question Label : Short Answer Question

Abhishek wrote the following code to train the Figure 4:

```
from sklearn.svm import SVC  
SVC_classifier = SVC()  
clf = SVC_classifier.fit(X_train, y_train)  
print(clf.support_vectors_)
```

what is the output he will get?

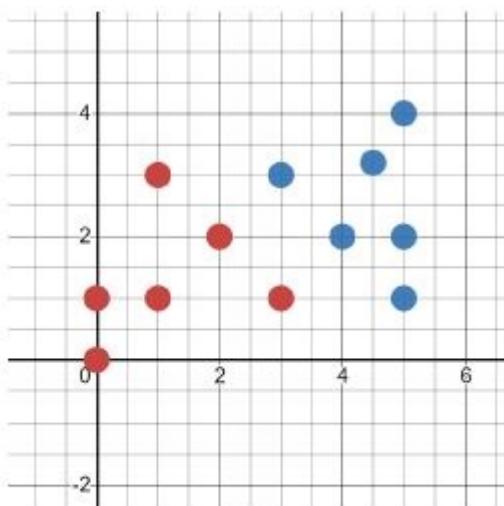


Figure 4

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

## **Question Number : 97 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

What is the output of the following code?

```
from sklearn import svm
X = [[0], [1], [2], [3]]
Y = [0, 1, 2, 3]
clf = svm.SVC(decision_function_shape='ovo')
clf.fit(X, Y)
dec = clf.decision_function([[1]])
dec.shape[1]
```

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

6

## **Question Number : 98 Question Type : SA**

**Correct Marks : 3**

Question Label : Short Answer Question

What will be the output of the following code snippet?

```
from sklearn.metrics import DistanceMetric
dist = DistanceMetric.get_metric('manhattan')
X = [[3, 4], [5, 6]]
print(dist.pairwise(X)[0][1])
```

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

4

## MLT

**Number of Questions :** 15

**Section Marks :** 50

**Question Number : 99 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

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

**ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?**

**CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.**

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

**Options :**

A. ✓ Yes

B. ✗ No

## **Question Number : 100 Question Type : MCQ**

### **Correct Marks : 0**

Question Label : Multiple Choice Question

Instructions:

1. Read the questions carefully.
2. Answers should be up to correct decimal places.
3. Always add dummy feature in the beginning of feature matrix where necessary.
4. Answers are case sensitive.
5. Do NOT include single or double quotes in your typed answers.

### **Useful Data**

Inference using logistic regression happens as follows.  $T$  is called the threshold and is some real number in the interval  $(0, 1)$ .  $\hat{y}$  stands for the predicted label.

$$\hat{y} = \begin{cases} 1, & P(y = 1 | x) \geq T \\ 0, & \text{otherwise} \end{cases}$$

The threshold is usually set to 0.5 unless otherwise specified.

### **Options :**

- A. ✓ Useful Data has been mentioned above.
- B. ✗ This data attachment is just for a reference & not for an evaluation.

## **Question Number : 101 Question Type : MCQ**

### **Correct Marks : 2**

Question Label : Multiple Choice Question

A logistic regression model is tested on a test set comprising of 100 datapoints. The label 1 corresponds to the positive class and 0 to the negative class. All evaluation metrics should be computed with respect to the positive class.

Consider the following table:

True Label	$P(y = 1   \mathbf{x})$	Number of points
0	(0, 0.5)	30
1	(0, 0.5)	5
0	(0.5, 0.75)	15
1	(0.5, 0.75)	15
0	(0.75, 1)	5
1	(0.75, 1)	30

The table is to be understood as follows. The first row shows that there are 30 points in the test set from class 0 for which the predicted probability falls in the range (0, 0.5). Consider two models based on these predictions,  $M_{0.5}$  and  $M_{0.75}$ , which have thresholds of  $T = 0.5$  and  $T = 0.75$  respectively. Which of these two models has higher precision?

**Options :**

- A. ✗  $M_{0.5}$
- B. ✓  $M_{0.75}$
- C. ✗ Both have the same precision
- D. ✗ Insufficient information to compute the precision of both the models

**Question Number : 102 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

A metal detector can be seen as performing a binary classification task: presence of a metal corresponds to the positive class (label 1) and its absence corresponds to the negative class (label 0).

A really good metal detector should be able to correctly identify almost all objects that have metal content in them. If it incorrectly classifies even a single object that has metal content in it, that could have serious consequences. In this process it may classify some harmless, metal-free objects as belonging to the positive class. But that is a price we are willing to pay.

You have a logistic regression model trained for this task. What can you say about the choice of threshold for a really good metal detector?

**Options :**

- A. ✓ The threshold should be a low value.
- B. ✗ The threshold should be a high value.
- C. ✗ The performance of the model is independent of the threshold

**Question Number : 103 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

A logistic regression model is trained on a dataset where each data-point has  $m + 1$  features (including the dummy feature). The weight vector obtained at the end of the training process is  $w_0$  and has shape  $m+1$ . Note that the first component of the weight vector is the weight corresponding to the dummy feature. Let us call this model  $M_0$ .

Consider two different models  $M_1$  and  $M_2$  generated from  $M_0$ , with the following parameters:

$$w_1 = \frac{w_0}{2}, \quad \text{for } M_1$$

$$w_2 = 2w_0, \quad \text{for } M_2$$

All three models operate at the same threshold of 0.5. Which of the following statements is true regarding the accuracies  $A_0$ ,  $A_1$  and  $A_2$  of the three models  $M_0$ ,  $M_1$  and  $M_2$  on the same test set?

**Options :**

- A. ✗  $A_0 > A_1 > A_2$

- B. ✗  $A_1 = \frac{A_0}{2}$  and  $A_2 = 2A_0$

- C. ✗  $A_0 < A_1 < A_2$

- D. ✓  $A_0 = A_1 = A_2$

**Question Number : 104 Question Type : MCQ****Correct Marks : 2**

Question Label : Multiple Choice Question

Consider a binary classification problem for text documents where the two classes are **spam** and **not-spam**. A Multinomial Naive Bayes model is fit on the training data. The resulting parameter estimates for some words in the dataset are given below:

Word	Class	$P(\text{Word} \mid \text{Class})$
want	spam	0.03
want	not-spam	0.04
more	spam	0.02
more	not-spam	0.09
money	spam	0.1
money	not-spam	0.01

What will be the model's predicted label for the message "want more more money"? Assume that the prior probability is equal to 0.5 for each class.

**Options :**

- A. ✗ spam
- B. ✓ not-spam

**Question Number : 105 Question Type : MCQ****Correct Marks : 2**

Question Label : Multiple Choice Question

Consider two feature vectors of a dataset  $x$  and  $y$  as follows:

$$x = \begin{bmatrix} 2 \\ 1 \\ 4 \\ 3 \\ 2 \end{bmatrix} \quad y = \begin{bmatrix} 3 \\ 3 \\ 1 \\ 2 \\ 2 \end{bmatrix}$$

Apply kernel trick on these two vectors and select the correct answer from the following options.

**Options :**

- A. ✗ 23
- B. ✓ 529
- C. ✗ [5,4,5,6,4]
- D. ✗ [13,10,17,13,8]

**Question Number : 106 Question Type : SA****Correct Marks : 2**

Question Label : Short Answer Question

The weight vector for a trained support vector machine model on a linearly separable dataset is  $w = [1, 2, -2, 1, -1, -3, 2, -3, 0, -1]$ . Compute the width of the margin and enter your answer up to two decimal places.

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

0.3 to 0.4

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

Question Label : Comprehension

A logistic regression model is used for a binary classification problem with labels 0 and 1 that has  $m$  features, excluding the dummy feature. The weights corresponding to the  $m$  features are represented by  $\mathbf{w}$ , a vector of size  $m$ . The weight corresponding to the dummy feature is given by  $b$ , a scalar. The sigmoid activation function is:

$$\sigma(z) = \frac{1}{1 + e^{-z}}$$

Based on the above data, answer the given subquestions.

### **Sub questions**

#### **Question Number : 107 Question Type : MCQ**

#### **Correct Marks : 2**

Question Label : Multiple Choice Question

Given a feature vector  $\mathbf{x}$ , which of the following is the correct expression for the probability:  $P(y = 1 | \mathbf{x})$ ?

#### **Options :**

A. ✓  $\sigma(\mathbf{w}^T \mathbf{x} + b)$

B. ✗  $\sigma(\mathbf{w}^T \mathbf{x})$

C. ✗  $\mathbf{w}^T \mathbf{x} + b$

D. ✗  $\sigma(\mathbf{w}^T \mathbf{x}) + b$

#### **Question Number : 108 Question Type : MCQ**

#### **Correct Marks : 2**

Question Label : Multiple Choice Question

Inference using logistic regression happens as follows.  $T$  is called the threshold and is some real number in the interval  $(0, 1)$ .  $\hat{y}$  stands for the predicted label.

$$\hat{y} = \begin{cases} 1, & P(y = 1 \mid \mathbf{x}) \geq T \\ 0, & \text{otherwise} \end{cases}$$

Given this setup, what is the equation of the decision boundary?  $\ln$  is the natural logarithm or  $\log_e$ .

**Options :**

A. ❌  $\mathbf{w}^T \mathbf{x} + b = 0$

B. ✓  $\mathbf{w}^T \mathbf{x} + b + \ln\left(\frac{1}{T} - 1\right) = 0$

C. ❌  $\mathbf{w}^T \mathbf{x} + b - \ln\left(\frac{1}{T} - 1\right) = 0$

D. ❌  $\mathbf{w}^T \mathbf{x} + b - \ln\left(1 - \frac{1}{T}\right) = 0$

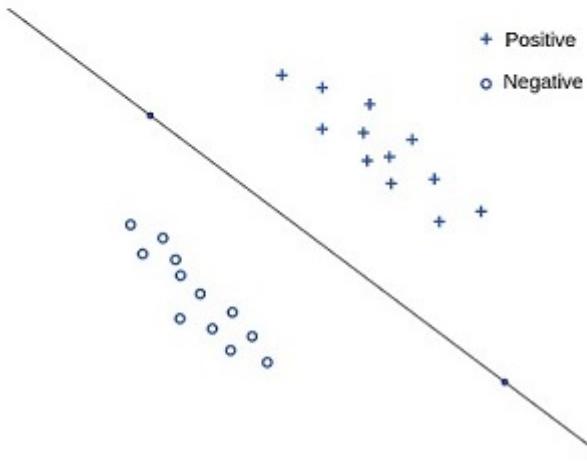
E. ❌  $\mathbf{w}^T \mathbf{x} + b + \ln\left(1 - \frac{1}{T}\right) = 0$

**Question Type : COMPREHENSION**

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

Question Label : Comprehension

A logistic regression model has been trained using SGD for a linearly separable, binary classification problem, with labels 0 and 1. The decision boundary shown below is obtained after several epochs and is stable. That is, the weights no longer change with subsequent iterations of SGD. The learnt weights are stored in the vector  $w^*$ . A threshold of 0.5 is used for all models.



Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 109 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

If  $\mathbf{x}$  is a single data-point that belongs to the negative class (label 0) and  $P(y = 1 \mid \mathbf{x}) = y_{\text{prob}}$ , then during the process of training which of the following is the correct expression for a single update of SGD with unit learning rate?

**Options :**

A. ✓  $w = w - y_{\text{prob}}x$

B. ✗  $w = w + y_{\text{prob}}x$

C. ✗  $w = w - (y_{\text{prob}} - 1)x$

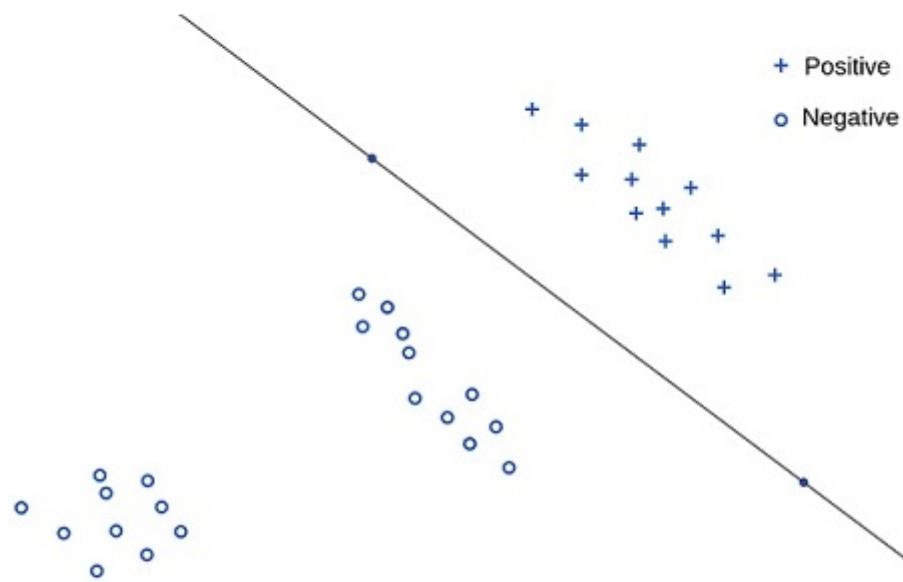
D. \*  $w = w + (y_{\text{prob}} - 1)x$

**Question Number : 110 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

A new set of training data-points that belong to the negative-class, and that are far away from the existing decision boundary are introduced without disturbing the linear separability as shown below:



A new logistic regression model is trained on the entire dataset, which includes the new and the old points. However, before running SGD with unit learning rate, the weights are initialized to  $w^*$  rather than starting with a vector of zeros. We track the movement of the decision boundary through several epochs of SGD. Select the most appropriate option.

**Options :**

- A. ❌ The decision boundary will move a significant amount and will come to rest very close to the negative data-points.
- B. ❌ The decision boundary will move a significant amount and will come to rest very close to the positive data-points.
- C. ✓ There will be very little movement in the decision boundary and the final boundary will be extremely close to the initial one.
- D. ❌ The decision boundary will keep oscillating between the positive and negative class and will never settle in a stable configuration.

### **Question Type : COMPREHENSION**

### **Question Numbers : (111 to 112)**

Question Label : Comprehension

Consider a regression problem where the labels lie in the range  $(0, 1)$ .

We take the help of the sigmoid function to model this problem.

Specifically, if the feature vector  $\mathbf{x}$  is of size  $m + 1$

(including the dummy feature) and the weight vector  $\mathbf{w}$  has the same shape as  $\mathbf{x}$ , then the model predicts a value  $\hat{y}$  as follows:

$$\hat{y} = \sigma(\mathbf{w}^T \mathbf{x})$$

We shall use the standard least square loss for regression. Use a normalizing factor of  $\frac{1}{2}$  in the least square loss.

Based on the above data, answer the given subquestions.

### **Sub questions**

### **Question Number : 111 Question Type : MCQ**

### **Correct Marks : 2**

Question Label : Multiple Choice Question

If  $z$  is some real number find the derivative of  $\sigma(z)$  with respect to  $z$ .

### **Options :**

A. ❌  $\sigma(z) \cdot \sigma(1 - z)$

B. ❌  $\sigma(z) \cdot \sigma(z)$

C. ❌  $\sigma(z) \cdot (1 + \sigma(z))$

D. ✓  $\sigma(z) \cdot (1 - \sigma(z))$

### Question Number : 112 Question Type : MCQ

#### Correct Marks : 3

Question Label : Multiple Choice Question

Find the gradient of the loss with respect to the weight vector for a single data-point  $x$  with true label  $y$ .

The model's prediction is  $\hat{y}$ .

#### Options :

A. ✓  $(\hat{y} - y) \cdot \hat{y} \cdot (1 - \hat{y}) \cdot x$

B. ❌  $(\hat{y} - y) \cdot x$

C. ❌  $(\hat{y} - y) \cdot (1 - \hat{y}) \cdot x$

D. ❌  $\hat{y} \cdot (1 - \hat{y}) \cdot x$

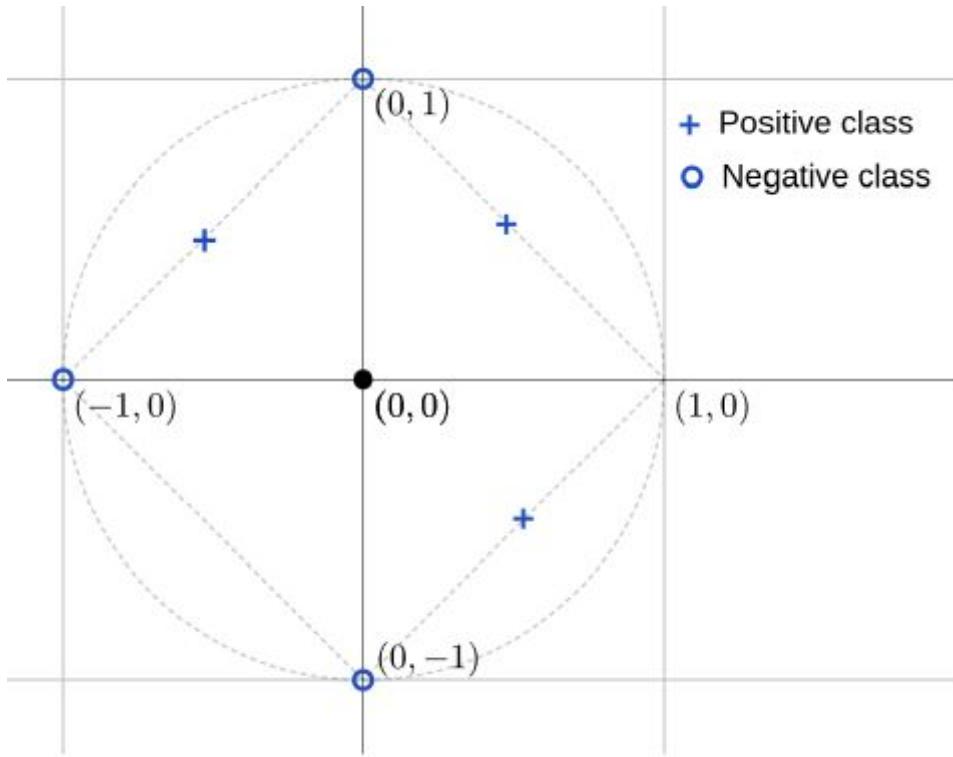
### Question Type : COMPREHENSION

Question Numbers : (113 to 114)

Question Label : Comprehension

Consider a KNN classifier for a binary classification problem with  $k = 3$ . A test-point at  $(0, 0)$  has to be classified using this model. The training-dataset is as follows:

- The three negative class data-points are fixed and occupy three vertices of the diamond.
- The three positive class data-points can be anywhere on the edges of the diamond except the vertices



Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 113 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

If the Manhattan distance metric is used, what is the predicted label of the test-point?

**Options :**

- A. ✘ Positive class
- B. ✘ Negative class
- C. ✓ It could be either of the two classes. An exact decision requires information about how to

break ties.

### Question Number : 114 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

If the Euclidean distance metric is used, what is the predicted label of the test-point?

#### Options :

- A. Positive class
- B. Negative class
- C. It could be either of the two classes. An exact decision requires information about how to break ties.

### Question Type : COMPREHENSION

#### Question Numbers : (115 to 116)

Question Label : Comprehension

Consider a Softmax regression model for a multi-class classification problem that has  $k$  classes.

For an input vector  $\mathbf{x}$ , just before the Softmax, the linear combination is given by  $\mathbf{z}$ .

Based on the above data, answer the given subquestions.

#### Sub questions

### Question Number : 115 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

$p_c = P(y = c \mid \mathbf{x})$  is the conditional probability that the point belongs to class  $c$ . Which of the following is the correct expression for  $p_c$ ?

#### Options :

$$\frac{e^{z_c}}{\sum_{i=1}^k e^{z_i}}$$

A. ✓

$$\frac{z_c}{\sum_{i=1}^k z_i}$$

B. ✗

$$\frac{z_c}{\sum_{i=1}^k e^{z_i}}$$

C. ✗

$$\frac{\sum_{i=1}^k e^{z_i}}{e^{z_c}}$$

D. ✗

## Question Number : 116 Question Type : MCQ

**Correct Marks : 3**

Question Label : Multiple Choice Question

Assume that we have a new input vector  $\mathbf{x}^*$  for which the linear combination just before Softmax turns out to be  $2z$ . Which of the following is the correct expression for  $P(y = c | \mathbf{x}^*)$ ? The value of  $p_c$  is the one computed in the previous question.

**Options :**

A. ✗  $p_c$

B. ✗  $2p_c$

C. ❌  $\frac{p_c}{\sum_{i=1}^k p_i}$

D. ✓  $\frac{(p_c)^2}{\sum_{i=1}^k (p_i)^2}$

**Question Type : COMPREHENSION**

**Question Numbers : (117 to 120)**

Question Label : Comprehension

Consider a binary classification problem. The training-data has several features out of which we have access to only two binary features  $(x_1, x_2)$ . The labels are 1 and 2 for the two classes. The training data set has the following distribution of points:

Feature	Number of points	True label
$(0, 0)$	20	1
$(0, 0)$	5	2
$(0, 1)$	1	1
$(0, 1)$	24	2
$(1, 0)$	18	1
$(1, 0)$	7	2
$(1, 1)$	5	1
$(1, 1)$	20	2

The table is to be parsed as follows. The first row of the table states that there are 20 points from class 1 that have  $x_1 = 0, x_2 = 0$ .

A Bernoulli Naive Bayes model is fit for this data with the following matrix of probabilities:

$$\begin{bmatrix} w_{11} & w_{12} \\ w_{21} & w_{22} \end{bmatrix}$$

Each entry in this matrix can be understood as follows.

For  $i, j \in \{1, 2\}$ :

$$w_{ij} = P(x_i = 1 \mid y = j)$$

You can ignore smoothing. For all questions, report the answer up to two decimal places. Do not round-up or round-down the answer.

For example, if you get a value of 0.37914, just report 0.37.

Based on the above data, answer the given subquestions.

### Sub questions

**Question Number : 117 Question Type : SA**

**Correct Marks : 1.5**

**Question Label :** Short Answer Question

What is the value of  $w_{11}$ ?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.51 to 0.53

**Question Number : 118 Question Type : SA**

**Correct Marks : 1.5**

Question Label : Short Answer Question

What is the value of  $w_{12}$ ?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.47 to 0.49

**Question Number : 119 Question Type : SA**

**Correct Marks : 1.5**

Question Label : Short Answer Question

What is the value of  $w_{21}$ ?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.12 to 0.14

**Question Number :** 120 **Question Type :** SA

**Correct Marks :** 1.5

Question Label : Short Answer Question

What is the value of  $w_{22}$ ?

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.77 to 0.79

**Question Type :** COMPREHENSION

**Question Numbers :** (121 to 124)

Question Label : Comprehension

There is a linearly separable data set of 8 samples with 2 features as given in the below table.

Index	Data Points	Labels
a	(1,1)	1
b	(2,1.5)	-1
c	(1.5,1)	-1
d	(-0.5,1.5)	1
e	(-0.5,0.5)	1
f	(2,2)	-1
g	(2.5,1)	-1
h	(0.5,1)	1

Use support vector machine algorithm to develop a machine learning model that discriminates the two classes. By using visual inspection method identify the support vectors and use them to compute the weight vector ( $w = \begin{bmatrix} w_0 \\ w_1 \end{bmatrix}$ ) and bias ( b ) of the separating hyperplane.

Based on the above data, answer the given subquestions.

### **Sub questions**

**Question Number : 121 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Enter the value of  $w_0$  up to two decimal places.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Range**

**Text Areas : PlainText**

**Possible Answers :**

**-5 to -3**

**Question Number : 122 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Enter the value of **w<sub>1</sub>** up to two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

2 to 3

**Question Number : 123 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Enter the value of **b** up to two decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

2 to 3

**Question Number : 124 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

If there is a new point  $[1, -1.5]$ , what is the predicted class label given by the SVM model you have developed?

**Options :**

- A. ✗ Positive class
- B. ✓ Negative class

## AppDev 1

**Number of Questions :** 17

**Section Marks :** 50

**Question Number : 125 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

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

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

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

**Options :**

- A. ✓ YES
- B. ✗ NO

**Question Number : 126 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following two tables:

Table 1: Article

article_id	title	content
1	Title 1	This is my first article
2	Title 2	This is my second article
3	Title 3	This is my third article.

Table 2: User

user_id	user_name	Email_id
1	Koushik	xyz@gmail.com
2	Ram	abc@gmail.com
3	Prashant	def@gmail.com

Suppose we build a relationship table i.e., “article\_authors” between the table 1 and table 2 in such a way that the “article\_id” of the Article table and “user\_id” of User table becomes foreign keys in the “article\_authors” table. Now assuming a table 3 is created, which of the following queries will return the count of all the users from the User table that have article\_id=1.

**Options :**

Select  
count(user\_name)  
FROM  
user, article\_authors  
WHERE

A. ✓ article\_id=1 and user.user\_id=article\_authors.user\_id;

Select  
user\_name  
FROM  
user, article\_authors  
WHERE

B. ✗ article\_id=2 and user.user\_id=article\_authors.user\_id;

Select  
count(user\_name)  
FROM  
user, article\_authors  
WHERE

C. ✗ article\_id=1;

D. ✗ None of these

## Question Number : 127 Question Type : MCQ

### Correct Marks : 3

Question Label : Multiple Choice Question

Two models ‘Customer’ and ‘Order’ have to be created in the database and they are related by a one-to-many relationship. Assuming that `flask_sqlalchemy` is to be used to create these models, which of the following will correctly achieve the requirements?

### Options :

```
class Customer(db.Model):
    id = db.Column(db.Integer, primary_key=True)
    cust_name = db.Column(db.String(50))

class Order(db.Model):
    ord_id = db.Column(db.Integer, primary_key=True)
    ord_name = db.Column(db.String(50))
A. ❌    customer_id = db.Column(db.Integer, db.ForeignKey('customer.id'))
```

```
class Customer(db.Model):
    id = db.Column(db.Integer, primary_key=True)
    cust_name = db.Column(db.String(50))
    orders = db.relationship(backref='customer')

class Order(db.Model):
    ord_id = db.Column(db.Integer, primary_key=True)
    ord_name = db.Column(db.String(50))
B. ❌    customer_id = db.Column(db.Integer, db.ForeignKey('id'))
```

```
class Customer(db.Model):
    id = db.Column(db.Integer, primary_key=True)
    cust_name = db.Column(db.String(50))
    orders = db.relationship('Order', backref='customer')

class Order(db.Model):
    ord_id = db.Column(db.Integer, primary_key=True)
    ord_name = db.Column(db.String(50))
C. ✓    customer_id = db.Column(db.Integer, db.ForeignKey('customer.id'))
```

- D. ❌ None of these

**Question Number : 128 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the code below.

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

prog_languages=[{'course':'C++'}, {'course':'Python'}, {'course':'Java'}]

@app.route('/home', methods=['GET'])
def func1():
    return jsonify({'The list of Programming languages': prog_languages})

if __name__=='__main__':
    app.run(debug=True)
```

If the above flask application is running locally on “<http://127.0.0.1:5000>”, what will the browser render for URL “<http://127.0.0.1:5000/home>”?

**Options :**

- A. ❌ "The list of Programming languages":  
    {  
        "course": "C++"  
    },  
    {  
        "course": "Python"  
    },  
    {  
        "course": "Java"  
    }

- B. ❌ "The list of Programming languages": "C++", "Python", "Java"

- C. ✓

```

{
    "The list of Programming languages": [
        {
            "course": "C++"
        },
        {
            "course": "Python"
        },
        {
            "course": "Java"
        }
    ]
}

```

D. ❌ None of these

### **Question Number : 129 Question Type : MCQ**

#### **Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the below Python code which takes argument from the command line.  
dummy.py

```

import sys
print("Script name/path executed:",sys.argv[0])
print("Number of arguments:",len(sys.argv))
print("Argument List:",str(sys.argv))

```

Which of the following will be the output for the command given below:

python dummy.py hello MAD1 BSc

#### **Options :**

Script name/path executed: dummy.py

Number of arguments: 3

A. ❌ Argument List: "[‘dummy.py’, ‘hello’, ‘MAD1’, ‘Bsc’]"

B. ✓

Script name/path executed: dummy.py  
Number of arguments: 4  
Argument List: ['dummy.py', 'hello', 'MAD1', 'Bsc']

Script name/path executed: dummy.py  
Number of arguments: 3  
**C. ✘ Argument List: ['dummy.py', 'hello', 'MAD1', 'Bsc']**

Script name/path executed: dummy.py  
Number of arguments: 4  
**D. ✘ Argument List: "[['dummy.py', 'hello', 'MAD1', 'Bsc']]"**

**Question Number : 130 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following Python code.

```
from flask import Flask
from flask_restful import Api, Resource

app = Flask(__name__)
api = Api(app)

def prime(num):
    factors = []
    for i in range(2,num):
        if num % i == 0:
            factors.append(i)
    if len(factors) == 0:
        return True
    else:
        return False

def fact(num):
    fact = 1
    for i in range(1,num+1):
        fact *= i
    return fact

class numbertrick(Resource):
    def get(self,num):
        num = int(num)
        if prime(num):
            return num**2
        else:
            return fact(num)

api.add_resource(numbertrick, '/api/result/<num>')

if __name__ == '__main__':
    app.run(debug = True)
```

If the server is running locally on 'http://127.0.0.1:5000/', what will be the output for the URLs: 'http://127.0.0.1:5000/api/result/7' and 'http://127.0.0.1:5000/api/result/6' respectively?

**Options :**

- A. ❌ 49 and 36
- B. ❌ 5040 and 720
- C. ✓ 49 and 720
- D. ❌ 5040 and 36

## Question Number : 131 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the following Python code snippet.

```
from flask import Flask
from flask_restful import Api, Resource, reqparse

app = Flask(__name__)
api = Api(app)

parser = reqparse.RequestParser()
parser.add_argument('book_id', type = int, help = 'book_id must be an
integer and cannot be empty', required = True)
parser.add_argument('book_name', type = str , help = 'book_name must be a
string and cannot be empty', required = True)

class Library(Resource):
    def get(self):
        args = parser.parse_args()
        Id = args['book_id']
        name = args['book_name']
        return f"The book: { name }, having book-id { Id } is issued to the user"

api.add_resource(Library, '/info')

if __name__ == "__main__":
    app.run(debug = True)
```

If the server is running locally on the URL: 'http://127.0.0.1:5000', what will be the output if the following code is run on the terminal?

```
from requests import get
response = get("http://127.0.0.1:5000/info",
data = {'book_id': '112233', 'book_name': 127 })
print(response.text)
```

Options :

A. \* }

```
{
    "message": {
        "book_id": "book_name must be an integer and cannot be empty"
    }
}
```

```
{  
    "message": {  
        "book_name": "book_name must be a string and cannot be empty"  
    }  
}
```

B. ✘ }

C. ✓ "The book: 127, having book-id 112233 is issued to the user"

```
{  
    "message": {  
        "book_id": "book_id must be an integer and cannot be empty"  
    }  
}
```

```
{  
    "message": {  
        "book_name": "book_name must be a string and cannot be empty"  
    }  
}
```

D. ✘ }

**Question Number : 132 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

A flask app and an HTML file are given below.

Python file: app.py

```
from flask import Flask, render_template

app = Flask(__name__)

@app.route('/')
def home():
    return '<p>This is a HTML document</p>'

@app.route('/home', methods=['GET', 'POST'])
def function_1():
    products = ['Television', 'Refrigerator', 'Mobile Phone']
    statement = 'This is the list of the devices we generally find in our homes.'
    category = 'Electronic gadgets'
    return render_template('index.html', statement=statement, category = category,
    products = products)

if __name__=='__main__':
    app.run(debug=True)
```

HTML file: index.html

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <title>My Title</title>
  </head>
  <body>
    <h3> Info: {{ statement }}</h3>
    These are {{ category }}</h3>
    <p>The list of the devices are:</p>
    {% for product in products %}
      <h4> {{ product }} </h4>
    {% endfor %}
  </body>
</html>
```

How the above flask application will render the given HTML file, if it is running on URL "http://127.0.0.1:5000/home"?

### Options :

A. ❌ It will show a 404 error.

B. ✓

It will render :

Info: This is the list of the devices we generally find in our homes.

These are Electronic gadgets

The list of the devices are:

Television

Refrigerator

Mobile Phone

C. ✖ It will render “This is an HTML document” on the webpage.

D. ✖ None of these

### Question Number : 133 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

Consider the code below.

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

info = {
    "brand": "BMW",
    "model": "9875700",
    "release_year": 1970
}

@app.route('/info/<string:strng>', methods=['GET'])
def home(strng):
    if info["brand"] == strng:
        return jsonify({'Info': info})
    return "Model information is not Available"

if __name__=='__main__':
    app.run(debug=True)
```

If the above flask application is running locally on “<http://127.0.0.1:5000>”, what will the browser render for the URL “<http://127.0.0.1:5000/info/BMW>”?

#### Options :

A. ❌ It will throw 404 “Page not found” error.

```
{  
  "Info": {  
    "brand": "BMW",  
    "model": "9875700",  
    "release_year": 1970  
  }  
}
```

B. ✓ }

```
"Info": {  
  "brand": "BMW",  
  "model": "9875700",  
  "release_year": 1970  
}
```

C. ❌

D. ❌ None of these

**Question Number : 134 Question Type : MSQ**

**Correct Marks : 2**

Question Label : Multiple Select Question

Consider the following code.

```
from flask import Flask
from flask_restful import Resource, Api

app = Flask(__name__)
api = Api(app)

fruit_list={
1:"Apple", 2: "Pear", 3: "Mango"
}
class Fruit_list(Resource):
    def get(self):
        return fruit_list

class Fruit(Resource):
    def get(self, f_id):
        return fruit_list[f_id]

api.add_resource(Fruit_list, '/')
api.add_resource(Fruit, '/<int:f_id>')

if __name__ == '__main__':
    app.run(debug=True)
```

If this flask application is running locally on “<http://127.0.0.1:5000>”, then which of the following statements is/are true about the code snippet given above?

**Options :**

- A. ❌ On the URL, “<http://127.0.0.1:5000/>”, the browser will show ‘page not found’ error.

On the URL, “<http://127.0.0.1:5000/>”, the browser will render.

{  
    "1": "Apple",  
    "2": "Pear",  
    "3": "Mango"

- B. ✓ }

On the URL, “<http://127.0.0.1:5000/3>”, the browser will render

- C. ❌        "Pear"

On the URL, “<http://127.0.0.1:5000/2>”, the browser will render

"Pear"

- D. ✓

**Question Number : 135 Question Type : MSQ**

**Correct Marks : 2**

Question Label : Multiple Select Question

Which of the following statements is/are correct about a static web page and a dynamic web page?

**Options :**

- A. ✓ In static webpage information rarely changes, whereas in dynamic webpage, information can change frequently.
- B. ✗ Static web pages always need a database to store information.
- C. ✗ Static web pages are generated at runtime.
- D. ✓ Dynamic web pages are generated at runtime.

**Question Number : 136 Question Type : MSQ**

**Correct Marks : 4.5**

Question Label : Multiple Select Question

Consider the following Python code and an HTML document given below.

```
from flask import Flask, render_template, redirect

app = Flask(__name__)
limit = 6
@app.route('/colour/purple/<int:initial>')
def purple(initial):
    style = {'background-color': 'purple', 'color': 'white'}
    if initial != limit:
        initial += 2
        return redirect(f'/colour/yellow/{initial}')
    else:
        return render_template('display.html', style = style)

@app.route('/colour/yellow/<int:initial>')
def yellow(initial):
    style = {'background-color': 'yellow', 'color': 'black'}
    if initial != limit:
        initial -= 1
        return redirect(f'/colour/purple/{initial}')
    else:
        return render_template('display.html', style = style)

if __name__ == "__main__":
    app.run(debug = True)
```

HTML file: templates/display.html

```
<!DOCTYPE html>
<html>
    <head>
        <title>Doc</title>
    </head>
    <body>
        <div style = "width: 200px; color: {{style['color']}};
            background-color: {{style['background-color']}}">
            This is how it is displayed
        </div>
    </body>
</html>
```

If the server is running locally on URL: “<http://localhost:5000>”, which of the following is/are correct?

#### Options :

for URL: “<http://localhost:5000/colour/purple/0>”, the rendered output will

- A. ✓ have text in black colour with yellow background

for URL: “<http://localhost:5000/colour/purple/0>”, the rendered output will

- B. ✗ have text in white colour with purple background

for URL: “<http://localhost:5000/colour/purple/0>”, the final URL on the URL

C. ❌ tab will be “<http://localhost:5000/colour/purple/6>”

for URL: “<http://localhost:5000/colour/purple/0>”, the final URL on the URL

D. ✓ tab will be “<http://localhost:5000/colour/yellow/6>”

## Question Number : 137 Question Type : MCQ

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the following HTML file with integrated JavaScript in it.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Script</title>
  </head>
  <body>
    <script>
      var variable = 5;
      (()=>{
        variable_3 = 25;
        console.log(variable_3);
        var variable_3 = 20;
        variable_2 = 15;
        console.log(variable);
      })();
      console.log(variable_2);
      console.log(variable_3);
      var variable = 30;
    </script>
  </body>
</html>
```

What will be the output on the browser's console?

**Options :**

A. ❌ 25 5 15

B. ❌ 25 5 15 20

C. ❌ 25 5 20 and an error “ Variable\_2 is Not defined”

D. ✓ 25 5 15 and an error “ Variable\_3 is Not defined”

## Question Number : 138 Question Type : MSQ

**Correct Marks : 3**

Question Label : Multiple Select Question

Consider the following code.

```
from flask import Flask
import logging

app = Flask(__name__)

logging.basicConfig(filename='event.log', level=logging.DEBUG,
    format=f'%(asctime)s %(levelname)s %(name)s %(threadName)s : %(message)s')

@app.route('/logging')
def foo():
    app.logger.warning('A warning level log.')
    app.logger.error('An error level log.')
    app.logger.info('An Info level log.')
    return "One of the main reason of logging is to debug errors."
app.run(host='localhost', debug=True)
```

Which of the following statements is/are true in case this flask app is running on the URL “<http://localhost:5000/logging>”?

**Options :**

A. ✓ The logs are stored in files with ‘.log’ extension.

B. ❌ A log file “record” will be created inside the flask application folder.

C. ❌ All the log messages about the application after running it will be displayed in the console

D. ✓ Whenever we hit the URL “<http://localhost:5000/logging>”, the return message i.e., “One of the

main reason of logging is to debug errors" will be displayed on the screen.

### Question Number : 139 Question Type : MSQ

#### Correct Marks : 3

Question Label : Multiple Select Question

A model 'Article' is to be created in the database, with fields and their properties given in the table below.

article_id	title	content
1	Title 1	This is my first article.
2	Title 2	This is my second article.
3	Title 3	This is my third article.

Assuming that flask\_sqlalchemy is to be used in the 'main.py' file, which of the following statements is/are true regarding the query written below?

```
>>> from main import Article
>>> from main import db
>>> update = Article.query.filter_by(article_id=2).first()
>>> update.title='Title 5'
>>> db.session.commit()
>>> delete_this = Article.query.filter_by(article_id=2).first()
>>> db.session.delete(delete_this)
>>> db.session.commit()
```

#### Options :

- A. ✓ The above query will update the record having article\_id=2 and changes the title column to 'Title 5'.
- B. ✗ The above query will create one record having article\_id=2 and title "Title 5".
- C. ✗ The above query will delete all the records from the Article table.
- D. ✓ The above query will delete the record having article\_id=2.

### Question Number : 140 Question Type : SA

#### Correct Marks : 4.5

Question Label : Short Answer Question

Software packages A and B of complexity  $O(n\log n)$  and  $O(n)$ , respectively, spend exactly  $T_A(n) = c_{A1}n \log(n)$  and  $T_B(n) = c_{B1}n$  milliseconds to process  $n$  data items. During a test, the average time of

processing  $n = 10^4$  data items with the package A and B is 200 milliseconds and 600 milliseconds, respectively. Which software package would you recommend as the best choice if up to  $n = 10^{10}$  items are to be processed.

**NOTE:** Your answer should not exceed 50 words.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** No

**Max Word Count :** 50

**Show Word Count :** Yes

**Min Word Count :** 0

**Highlight min word :** Yes

**Single Line Response :** No

**Number of Rows :** 10

**Number Of Columns :** 70

**Text Areas :** PlainText

**Question Number :** 141 **Question Type :** SA

**Correct Marks :** 4.5

**Question Label :** Short Answer Question

A magnetic disk operating at 6000 rpm is being used to store data. The disk can only spin in one direction at a constant speed of 6000 revolutions per minute. If the operating system sends a request to the disk controller to fetch data from the disk, but by the time the request reached the disk controller, the information had already moved a quarter circle ahead from the reader, what will be the latency (in milliseconds) before it can start retrieving data?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas : PlainText**

**Possible Answers :**

7.5

## AppDev 2

**Number of Questions :** 17

**Section Marks :** 50

**Question Number : 142 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: MODERN APPLICATION DEVELOPMENT 2"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

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

**Options :**

A. ✓ YES

B. ✗ NO

**Question Number : 143 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following JavaScript program, and predict the output if executed.

```

new Promise((res, rej) => {
    function check(a, b){
        if (a === b){
            res("Matched");
        }
        else if (a.toString() === b){
            rej("Partial Match");
        }
        else{
            rej("Unmatched");
        }
    }

    check(9, "9");
}).then(fail => console.log("Fail Summary:", fail),
pass => console.log("Pass Summary:", pass));

```

#### Options :

- A. ✖ Pass Summary: Matched
- B. ✓ Pass Summary: Partial Match
- C. ✖ Fail Summary: Partial Match
- D. ✖ Fail Summary: Matched

#### Question Number : 144 Question Type : MCQ

#### Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following statements is false, regarding REST and GraphQL?

#### Options :

- A. ✖ GraphQL helps to fetch exactly the same data which is needed, and avoids over fetching as well as under fetching.
- B. ✖ In general, a GraphQL response always returns 200 status code, with the “error” field containing the errors (if any).
- C. ✖ A REST API provides multiple endpoints to access multiple resources.
- D. ✓ All browsers follow cross-origin resource policy by default.

**Question Number : 145 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following Vue application with markup index.html, and javascript file app.js.

index.html:

```
<div id="app">
  <router-link to="/"> Home </router-link>
  <router-link to="/set"> Change Player </router-link>
  <router-view style="padding-top:30px"></router-view>
  <script src="app.js"></script>
</div>
```

app.js:

```
const setName = {
  template: "<div><button @click='setNameMethod'>set name</button></div>",
  methods: {
    setNameMethod() {
      const user = localStorage.getItem('name')
      user
        ? localStorage.removeItem('name')
        : localStorage.setItem('name', 'Rohit Sharma')
    },
  },
}

const getName = {
  template: '<div>Hello {{userName}}</div>',
  computed: {
    userName() {
      uname = localStorage.getItem('name')
      return uname ? uname : 'Virat Kohli'
    },
  },
}

const routes = [
  { path: '/', component: getName },
  { path: '/set', component: setName },
]

const router = new VueRouter({
  routes,
  base: '/',
})

const app = new Vue({
  el: '#app',
  router,
})
```

Suppose the application is running on "<http://localhost:8080>". What will be rendered inside the router-view if you visit the application for the first time?

### Options :

- A. ✓ Hello Virat Kohli
- B. ✗ Hello Rohit Sharma
- C. ✗ Hello
- D. ✗ None of these

**Question Number : 146 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following Vue application with markup index.html, and javascript file app.js.

index.html:

```
<div id="app">
  <router-link to="/"> Home </router-link>
  <router-link to="/user/1/home"> User </router-link>
  <router-view style="padding-top: 30px"></router-view>
  <script src="app.js"></script>
</div>
```

app.js:

```
const home = {
  template: '<div> Welcome to the home page</div>',
}

const user = {
  template: `<div><div>User ID: {{this.$route.params.id}}</div>
  <router-view></router-view></div>`,
}

const profile = {
  template: '<div> Name: Rohit Sharma </div>',
}

const error = {
  template: '<div> 404: Profile not found </div>',
}

const routes = [
  { path: '/', component: home },
  {
    path: '/user/:id',
    component: user,
    children: [
      { path: '', component: profile },
      { path: 'profile', component: error },
      { path: '*', component: profile },
    ],
  },
]

const router = new VueRouter({
  routes,
  base: '/',
})

const app = new Vue({
  el: '#app',
  router,
})
```

What will be rendered inside the router-view for 'User' page?

**Options :**

- A. ❌ User ID: 1

User ID: 1

B. ✓ Name: Rohit Sharma

User ID: 1

404: Profile not found

C. ✗

D. ✗ None of these

**Question Number : 147 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following Vue application with markup index.html, and javascript file app.js.

index.html:

```
<div id="app">
  <input
    type="text"
    placeholder="search for fruits"
    v-model="filter_text"
  />
  <ul v-for="fruit in fruits_temp">
    <li>{{fruit}}</li>
  </ul>
</div>
```

app.js:

```
const fruits = ['Apple', 'abiu', 'Acrola', 'ackee']

const app = new Vue({
  el: '#app',
  data: {
    fruits: ['Apple', 'abiu', 'Acrola', 'ackee'],
    fruits_temp: [...fruits],
    filter_text: '',
  },
  watch: {
    filter_text() {
      this.fruits_temp = this.fruits.filter((fruit) => {
        return this.filter_text
          ? fruit.startsWith(this.filter_text == 'A' ? 'a' : 'A')
          : this.fruits
      })
    },
  },
})
```

Suppose the application is running on “<http://localhost:8080>”. What will be rendered if the user types ‘A’ (uppercase) in the input box?

**Options :**

- A. ✓ abiu
- B. ✗ ackee

- A. Apple
- B. ✗ Acrola

Apple  
abiu  
Acrola  
Ackee

C. ✘ ackee

D. ✘ None of these

**Question Number : 148 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following Vue application. What will be rendered if the user types 'a' (lowercase) in the input box?

index.html:

```
<div id="app">
  <input
    type="text"
    placeholder="search for fruits"
    v-model="filter_text"
  />
  <ul v-for="fruit in fruits_temp">
    <li>{{fruit}}</li>
  </ul>
</div>
```

app.js:

```
const fruits = ['Apple', 'abiu', 'Acrola', 'ackee']

const app = new Vue({
  el: '#app',
  data: {
    fruits: ['Apple', 'abiu', 'Acrola', 'ackee'],
    fruits_temp: [...fruits],
    filter_text: '',
  },
  watch: {
    filter_text() {
      this.fruits_temp = this.fruits.filter((fruit) => {
        return this.filter_text
          ? fruit.startsWith(this.filter_text == 'A' ? 'a' : 'A')
          : this.fruits
      })
    },
  },
})
```

**Options :**

A. ✘ abiu  
A. ✘ ackee

B. ✓ Apple  
B. ✓ Acrola

Apple

abiu

Acrola

C. ❌ ackee

D. ❌ None of these

### Question Number : 149 Question Type : MCQ

**Correct Marks : 3**

Question Label : Multiple Choice Question

Which of the following shows the correct output after 20 seconds, if the below program is executed?

```
function resolver1() {
  return new Promise(resolve => {
    setTimeout(function() {
      resolve("mad1")
      console.log("Resolver1 promise is done")
    }, 2000)
  })
}

function resolver2() {
  return new Promise(resolve => {
    setTimeout(function() {
      resolve("mad2")
      console.log("Resolver2 promise is done")
    }, 1000)
  })
}

async function Start() {
  const p1 = resolver1();
  const p2 = resolver2();
  console.log(await p1);
  console.log(await p2);
}
Start();
```

**Options :**

Resolver2 promise is done

Resolver1 promise is done

mad1

mad2

A. ✓

Resolver1 promise is done

Resolver2 promise is done

mad1

B. ✗ mad2

Resolver2 promise is done

Resolver1 promise is done

mad2

C. ✗ mad1

Resolver1 promise is done

Resolver2 promise is done

mad2

D. ✗ mad1

**Question Number : 150 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following function schemas simulates the callback-like behavior?

**Options :**

```
function doSomething(successCB, failureCB) {  
    let result = doSomeComputation();  
    if (result) successCB(success_message);  
    else failureCB(failure_message);  
}
```

A. ✗

B. ✗

```
function doSomething(successCB, failureCB) {  
    let result = doSomeComputation();  
    if (!result) failureCB(failure_message);  
    else successCB(success_message);  
}
```

Both

```
function doSomething(successCB, failureCB) {  
    let result = doSomeComputation();  
    if (result) successCB(success_message);  
    else failureCB(failure_message);  
}
```

and

```
function doSomething(successCB, failureCB) {  
    let result = doSomeComputation();  
    if (!result) failureCB(failure_message);  
    else successCB(success_message);  
}
```

C. ✓

D. ✖ None of these

**Question Number : 151 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following URLs has the same origin as

["http://www.iitm.ac.in:8080/home.html"](http://www.iitm.ac.in:8080/home.html)?

**Options :**

- A. ✖ <https://www.iitm.ac.in:8080/home.html>
- B. ✖ <http://www.iitm.ac.in:5000/home.html>
- C. ✓ <http://www.iitm.ac.in:8080/departments.html>
- D. ✖ <http://onlinedegree.iitm.ac.in:8080/home.html>

## Question Number : 152 Question Type : MCQ

Correct Marks : 4.5

Question Label : Multiple Choice Question

Consider the following Vue application with markup index.html, and javascript file app.js.

index.html:

```
<div id = "demo">
  <input v-model = "name" />
  <p :class = "[token ? 'Present' : 'Not Present']"> Present or Not? </p>
</div>
<script src = "app.js">
```

app.js:

```
const app = new Vue({
  el: '#demo',
  data: {
    name : '',
    token : true,
  },
  mounted () {
    this.token = localStorage.getItem("token");
    this.name = localStorage.getItem("token");
  },
  watch: {
    name (n) {
      if (n.length < 2 && true)
        this.token = false;
      else
        this.token = true;

      localStorage.setItem("token", this.token);
    }
  }
})
```

Say you open the “index.html” file in a browser, and write “iitm” in the text input shown on screen, then force reload the page. What will be the value in the input text box and class applied to the paragraph element with text “Present or Not?”, respectively?

**Options :**

- A. ✘ 'iitm', 'Not Present'
- B. ✘ 'iitm', 'Present'
- C. ✘ 'true', 'Not Present'
- D. ✓ 'true', 'Present'

**Question Number : 153 Question Type : MCQ****Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the following Vue application. Suppose user visits the '/set' route, and clicks on 'set name' button for 6 times. And again visits the '/' route, then what will be rendered inside the router-view?

index.html:

```
<div id="app">
    <router-link to="/"> Home </router-link>
    <router-link to="/set"> Change Player </router-link>
    <router-view style="padding-top:30px"></router-view>
    <script src="app.js"></script>
</div>
```

app.js:

```
const setName = {
  template:
    "<div><button @click='setNameMethod'>set name</button></div>",
  methods: {
    setNameMethod() {
      const user = localStorage.getItem('name')
      user
        ? localStorage.removeItem('name')
        : localStorage.setItem('name', 'Rohit Sharma')
    },
  },
}

const getName = {
  template: '<div>Hello {{userName}}</div>',
  computed: {
    userName() {
      uname = localStorage.getItem('name')
      return uname ? uname : 'Virat Kohli'
    },
  },
}
const routes = [
  { path: '/', component: getName },
  { path: '/set', component: setName },
]

const router = new VueRouter({
  routes,
  base: '/',
})

const app = new Vue({
  el: '#app',
  router,
})
```

**Options :**

- A. ✓ Hello Virat Kohli
- B. ✗ Hello Rohit Sharma
- C. ✗ Hello
- D. ✗ None of these

**Question Number : 154 Question Type : MCQ**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Consider the following Vue application with markup index.html, and javascript file app.js.

index.html:

```
<div id="app">
  <router-link to="/"> Home </router-link>
  <router-link to="/user/1/profile"> User </router-link>
  <router-view style="padding-top: 30px"></router-view>
  <script src="app.js"></script>
</div>
```

app.js:

```
const home = {
  template: '<div> Welcome to the home page</div>',
}

const user = {
  template: `<div><div>User ID: {{this.$route.params.id}}</div>
    <router-view></router-view></div>`,
}

const profile = {
  template: '<div> Name: Rohit Sharma </div>',
}

const error = {
  template: '<div> 404: Profile not found </div>',
}

const routes = [
  { path: '/', component: home },
  {
    path: '/user/:id',
    component: user,
    children: [
      { path: '', component: profile },
      { path: 'profile', component: error },
      { path: '*', component: profile },
    ],
  },
]

const router = new VueRouter({
  routes,
  base: '/',
})

const app = new Vue({
  el: '#app',
  router,
})
```

Suppose the application is running on "<http://localhost:8080>". What will be rendered inside the router-view for "User" page?

### Options :

A. ❌ User ID: 1

User ID: 1

B. ❌ Name: Rohit Sharma

C. ✓

User ID: 1

404: Profile not found

D. ✘ None of these

**Question Number : 155 Question Type : MCQ**

**Correct Marks : 4.5**

Question Label : Multiple Choice Question

Fill in **code1** & **code2**, which can be used in Vuex Store to update the “toppers” state variable with the objects of those students who have scored more than 90 marks.

```

const store= new Vuex.Store({
    strict:true,
    state:{ 
        student_total:0,
        students:[
            {
                name : 'Ram',
                marks : 94
            },
            {
                name : 'Shyam',
                marks : 57
            },
            {
                name : 'Geeta',
                marks : 98
            }
        ],
        toppers:[]
    },
    getters:{
        studentTotal(state){
            return state.students.length
        },
        toppersTotal(state){
            return state.toppers.length
        }
    },
    code1:{
        topStudents(state){
            code2
        },
    }
})

```

## Options :

code1: mutations

code2: students.forEach(student=>{
 if(student.marks>=90){
 toppers.push(student) } })

A. ✘

B. ✘

code1: actions

code2: state.students.forEach(student=>{  
    if(student.marks>=90){  
        state.toppers.push(student) } })

code1: actions

code2: context.students.forEach(student=>{  
    if(student.marks>=90){  
        context.toppers.push(student) } })

C. ❌

code1: mutations

code2: state.students.forEach(student=>{  
    if(student.marks>=90){  
        state.toppers.push(student) } })

D. ✓

## Question Number : 156 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Which of the following statement(s) is/are true regarding JavaScript language?

```
function rule (num, obj) {  
    // some code here  
}  
rule(num, obj);
```

Options :

- A. ✓ In the above function call, the variable “num” is passed by value, assuming it to be holding a string literal.
- B. ✓ In the above function call, the variable “obj” is passed by reference, assuming it to be holding an object.
- C. ❌ A variable declared using the keyword “let” will have the value “null”, before it is initialized.
- D. ❌ All of these

**Question Number : 157 Question Type : MSQ**

**Correct Marks : 2**

Question Label : Multiple Select Question

Which of the following statement(s) is/are true regarding fetch API?

**Options :**

- A. ❌ A fetch API can only be used to make HTTP GET and POST requests.
- B. ❌ A fetch API call always responds with "OK" status set to true.
- C. ✓ The "credentials : 'omit'" ensures that the browser never sends the cookies with the request.
- D. ✓ A fetch API call can also have a body associated with the request.

**Question Number : 158 Question Type : MSQ**

**Correct Marks : 2**

Question Label : Multiple Select Question

Consider the following API (app.py).

```

from flask import Flask, jsonify
from flask_cors import cross_origin
app = Flask(__name__)

# home resource
@app.route('/')
@cross_origin()
def home():
    return jsonify({"resource": "home"})

# profile resource
@app.route('/profile')
def profile():
    return jsonify({"resource": "profile"})

if __name__ == "__main__":
    app.run(debug=True)

```

Suppose the API is running on 'http://localhost:5000' Which of the following is correct regarding the fetch call to the routes '/' and '/profile' (assuming the client to be Chrome browser)?

**Options :**

- A. ❌ A fetch call to get the home resource from origin "<http://localhost:8080>" will result in CORS error.
- B. ✓ A fetch call to get the home resource from origin "<http://localhost:8080>" will be successful.
- C. ✓ A fetch call to get the profile resource from origin "<http://localhost:8080>" will result in CORS error.
- D. ❌ A fetch call to get the profile resource from origin "<http://localhost:8080>" will be successful.

## Java

**Number of Questions :** 16

**Section Marks :** 50

**Question Number : 159 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

**THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: JAVA "**

**ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?**

**CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.**

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

**Options :**

A.  YES

B.  NO

**Question Number : 160 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following code and choose the correct option.

```
public class DivisionException extends Exception {  
    public DivisionException(String msg) {  
        super(msg);  
    }  
}  
  
public class Test {  
    public static void divideby7() throws DivisionException {  
        throw new DivisionException("Division by 7 is not allowed");  
    }  
    public static void main(String[] args) {  
        try {  
            divideby7();  
            System.out.print("Completed successfully"); // LINE-1  
        }  
        catch(DivisionException de) { // LINE-2  
        }  
        catch(Exception e) { // LINE-3  
        }  
    }  
}
```

**Options :**

- A. ✖ Compilation fails because the print statement in LINE-1 is not reachable.
- B. ✓ Compilation succeeds
- C. ✖ Compilation fails because the exception handler in LINE-3 is not reachable.
- D. ✖ The code generates the output:

Completed successfully

**Question Number : 161 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following code.

```
import java.util.*;
public class Test{
    public static void main(String[] args) {
        var m = new HashMap<String, Integer>();
        m.put("Raju", 1991);
        m.put("Mohan", 1995);
        m.put("Shiva", 1996);
        m.put("Vinay", 1993);
        m.put("Mahi", 1992);
        int year = 0;
        String name = "";
        Set<String> keys = m.keySet();
        for(String s : keys){
            int e = m.get(s);
            if(e > year){
                year = e;
                name = s;
            }
        }
        System.out.println(name);
    }
}
```

What will the output be?

**Options :**

- A. ✓ Shiva
- B. ✗ Mahi
- C. ✗ Raju
- D. ✗ Compilation error

**Question Number : 162 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Consider the following code.

```

import java.util.*;
public class Test {
    public static void main(String[] args) {
        List<Integer> runs1 = new ArrayList<>();
        runs1.add(34);
        runs1.add(42);
        runs1.add(50);

        List<Integer> runs2 = new ArrayList<>();
        runs2.add(45);
        runs2.add(90);
        runs2.add(34);

        Map<String, Integer> am = new HashMap<>();
        Map<String, List<Integer>> hm = new HashMap<>();
        hm.put("Anil", runs1);
        hm.put("Vikas", runs2);
        ****
        CODE BLOCK
        ****
    }
}

```

Choose the correct option to fill in the CODE BLOCK that adds the name and the average runs of both the players as map entries in `Map<String, Integer> am`.

#### Options :

```

Set<String> names = hm.keySet();
for(Set name : names){
    List<Integer> temp = hm.get(name);
    int count = 0;
    int sum = 0;
    for(List i : temp){
        count = count + 1;
        sum = sum + i;
    }
    int avg = sum/count;
    am.put(name, avg);
}

```

A. ✘ }

B. ✘

```
Set<String> names = hm.keySet();
for(Set<String> name : names){
    List<Integer> temp = hm.get(name);
    int count = 0;
    int sum = 0;
    for(List<Integer> i : temp){
        count = count + 1;
        sum = sum + i;
    }
    int avg = sum/count;
    am.put(name, avg);
}
```

```
Set<String> names = hm.keySet();
int count = 0;
int sum = 0;
for(String name : names){
    List<Integer> temp = hm.get(name);
    sum = sum + temp;
    count = count + 1;
    int avg = sum/count;
    am.put(name, avg);
}
```

C. ✘ }

```
Set<String> names = hm.keySet();
for(String name : names){
    List<Integer> temp = hm.get(name);
    int count = 0;
    int sum = 0;
    for(Integer i : temp){
        count = count + 1;
        sum = sum + i;
    }
    int avg = sum/count;
    am.put(name, avg);
```

D. ✓ }

**Question Number : 163 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider two Java files located in two different packages as shown below.

```
//MathUtility.java
package mathutil;
public class MathUtility{
    public long getFactorial(int n) { // returns n! }
    protected long add(long n1,long n2) { // returns n1+n2 }
    long subtract(long n1, long n2) { // return n1-n2 }
}

//Test1.java
package test;
import mathutil.*;
class Calculator extends MathUtility{
    public long FactorialSum(int num, int i) {
        long fact = this.getFactorial(i);           // LINE-1
        long sum = this.add(num, fact);             // LINE-2
        return sum;
    }
    public long FactorialDifference(int num, int i) {
        long fact = this.getFactorial(i);           // LINE-3
        long diff = this.subtract(num, fact);       // LINE-4
        return diff;
    }
}

public class Test{
    public static void main(String args[]) {
        Calculator c = new Calculator();
        System.out.println("Factorial Sum: "+ c.FactorialSum(4,2));
        System.out.println("Factorial Difference: "+ c.FactorialDifference(4,2));
    }
}
```

Choose the correct option regarding these two .java files.

**Options :**

- A. ❌ LINE-1 & LINE-3 will lead to compilation error.
- B. ❌ LINE-2 will lead to compilation error.
- C. ❌ LINE-3 will lead to compilation error.
- D. ✓ LINE-4 will lead to compilation error.

**Question Number : 164 Question Type : MCQ**

## **Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following code.

```
class ArrayOperations{
    public <T> void display(T[] arr){
        for(T e : arr)
            //print e
    }
    public <T extends Number> T findMax(T[] elements){
        T max = elements[0];
        // returns the largest element in the array
    }
}
```

What is class ArrayOperations converted to, after type erasure?

**Options :**

A. \*

```
class ArrayOperations{
    public void display(T[] arr){
        for(T e : arr)
            //print e
    }
    public Number findMax(Number[] elements){
        Number max = elements[0];
        // returns the largest element in the array
    }
}
```

B. \*

```
class ArrayOperations{
    public void display(Object[] arr){
        for(Object e : arr)
            //print e
    }
    public Double findMax(Double[] elements){
        Double max = elements[0];
        // returns the largest element in the array
    }
}
```

C. ✓

```
class ArrayOperations{  
    public void display(Object[] arr){  
        for(Object e : arr)  
            //print e  
    }  
    public Number findMax(Number[] elements){  
        Number max = elements[0];  
        // returns the largest element in the array  
    }  
}
```

```
class ArrayOperations{  
    public void display(Object[] arr){  
        for(Object e : arr)  
            //print e  
    }  
    public Object findMax(Object[] elements){  
        Object max = elements[0];  
        // returns the largest element in the array  
    }  
}
```

D. ✘ }

**Question Number : 165 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the following code.

```

import java.util.*;
interface Shape{
    public abstract int area();
}
class Rectangle implements Shape, Cloneable{
    int length, breadth;
    public Rectangle(int l, int b){
        length = l;
        breadth = b;
    }
    public int area(){
        return length * breadth;
    }
    public Rectangle clone() throws CloneNotSupportedException{
        return (Rectangle)super.clone();
    }
}
public class Test{
    public static void main(String[] args){
        Rectangle r1 = new Rectangle(10, 2);
        try{
            Rectangle r2 = r1.clone();
            r1.length = 4;
            r2.breadth = 3;
            System.out.print(r1.area() + r2.area());
        }
        catch(CloneNotSupportedException e){
            System.out.println("Cloning not supported");
        }
    }
}

```

What will the output be?

**Options :**

- A. ✓ 38
- B. ✗ 40
- C. ✗ 24
- D. ✗ 28

**Question Number : 166 Question Type : MCQ**

**Correct Marks : 3**

## Question Label : Multiple Choice Question

Consider the code given below.

```
import java.util.*;
class Calculator{
    public static int getMax(int a, int b){
        if(a > b)
            return a;
        return b;
    }
}
public class FClass{
    public static void main(String[] args){
        Map<String, Integer> asgmt1 = new TreeMap<String, Integer>();
        Map<String, Integer> asgmt2 = new TreeMap<String, Integer>();
        Map<String, Integer> score = new TreeMap<String, Integer>();

        asgmt1.put("math", 66);
        asgmt1.put("physics", 76);
        asgmt1.put("chemistry", 66);

        asgmt2.put("biology", 76);
        asgmt2.put("physics", 56);
        asgmt2.put("chemistry", 76);

        for (Map.Entry<String, Integer> e : asgmt1.entrySet())
            score.put(e.getKey(), e.getValue());

        for (Map.Entry<String, Integer> e : asgmt2.entrySet())
            score.merge(e.getKey(), e.getValue(), Calculator::getMax);

        for (Map.Entry<String, Integer> e : score.entrySet())
            System.out.print(e.getKey() + " : " + e.getValue() + ", ");
    }
}
```

What will the output be?

**Options :**

A. ❌ biology : 76, chemistry : 66, math : 66, physics : 76,

B. ❌ biology : 76, chemistry : 76, math : 66, physics : 56,

C. ✓ biology : 76, chemistry : 76, math : 66, physics : 76,

D. \* biology : 76, chemistry : 66, chemistry : 76, math : 66, physics : 76, physics : 56,

**Question Number : 167 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the code given below.

```
class Address{
    private String addr;
    private long pincode;
    public Address(String a, long p){
        assert a.length() == 4: "addr = " + a; //assert-1
        addr = a;
        assert p >= 100000 && p <= 999999: "pincode = " + p; //assert-2
        pincode = p;
    }
}
class Product{
    private String name;
    public Product(String n){
        assert n.length() == 4: "pname = " + n; //assert-3
        name = n;
    }
}
class Order{
    private Product pd;
    private int qty;
    private Address shpAddr;
    public Order(String pn, int q, String addr, long pc){
        pd = new Product(pn);
        assert q > 0: "qty = " + q; //assert-4
        qty = q;
        shpAddr = new Address(addr, pc);
    }
}
public class FClass{
    public static void main(String[] args){
        Order od = new Order("P12", 10, "DELH", 65234);
    }
}
```

Identify the assert statement that throws the `AssertionError` when the class is executed as:

```
java -ea:... -da:Product FClass
```

#### Options :

- A. ✘ assert-1
- B. ✓ assert-2
- C. ✘ assert-3
- D. ✘ assert-4

**Question Number : 168 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

The following Java program displays customized messages about three students, based on their credits and attendance for a course. Consider this code, and answer the question that follows.

```

class CreditsException extends Exception{
    public CreditsException(String str){
        super(str);
    }
}
class AttendanceException extends Exception{
    public AttendanceException(String str){
        super(str);
    }
}
class Student{
    private String name;
    private int credits;
    private double attendance;
    public Student(String name, int credits,double attendance) {
        this.name = name;
        this.credits = credits;
        this.attendance=attendance;
    }

    public void promote() {
        System.out.print(this.name+" ");
        if(this.credits<40) {
            try {
                throw new CreditsException("has credits shortage.");
            }
            catch (CreditsException e) {
                System.out.println(e.getMessage());
            }
        }
        else {
            if(this.attendance<65) {
                try {
                    throw new AttendanceException("has attendance shortage.");
                }
                catch(AttendanceException e) {
                    System.out.println(e.getMessage());
                }
            }
            else {
                System.out.println("is promoted to final year.");
            }
        }
    }
}

public class ExceptionTest{
    public static void main(String[] args) {
        Student student1=new Student("Virat", 34, 54);
        student1.promote();
        Student student2=new Student("Rohit", 40, 75);
        student2.promote();
        Student student3=new Student("Shivam", 42, 64.5);
        student3.promote();
    }
}

```

Choose the correct option.

#### Options :

This program generates the output:

Virat has credits shortage.

Rohit is promoted to final year.

A. ✓ Shivam has attendance shortage.

- This program generates a compilation error because you cannot create more than one user defined exception in a program.
- B. ❌ This program terminates abnormally due to unhandled exception(s).

This program generates the output:

Virat has credits shortage.  
has attendance shortage.  
Rohit is promoted to final year.

- D. ❌ Shivam has attendance shortage.

### **Question Number : 169 Question Type : MSQ**

#### **Correct Marks : 3**

Question Label : Multiple Select Question

Consider the code given below, that prints the maximum area of a set of rectangles, and the maximum area of a set of triangles. Based on the code, answer the question that follows.

```

abstract class Shape{
    public abstract double area();
}

class Rectangle extends Shape{
    // instance variables and constructors here
    // Definition of public double area()
}

class Triangle extends Shape{
    // instance variables and constructors here
    // Definition of public double area()
}

public class Test {
    //LINE-1
    {
        double max = arr[0].area();
        for(int i = 0; i < arr.length; i++){
            if(arr[i].area() > max){
                max = arr[i].area();
            }
        }
        return max;
    }
    public static void main(String[] args){
        Rectangle[] r = {/* 5 Rectangle objects here */ };
        Triangle[] t = {/* 5 Triangle objects here */ };
        double max_rect = maxArea(r);
        double max_trian = maxArea(t);
        System.out.println("Largest area in rectangles: "+max_rect);
        System.out.println("Largest area in triangles: "+max_trian);
    }
}

```

Identify the header(s) for function maxArea (at LINE-1) such that the code prints the largest area in the rectangles and that in the triangles.

**Options :**

- A. ✓ public static <T extends Shape> double maxArea(T[] arr)
- B. ✗ public static <T> double maxArea(T[] arr)
- C. ✗ public static double maxArea(T[] arr)
- D. ✓ public static double maxArea(Shape[] arr)

## Question Number : 170 Question Type : MSQ

### Correct Marks : 3

Question Label : Multiple Select Question

The following Java code maps a set of countries to their capitals. Based on the code, answer the question that follows.

```
import java.util.*;
public class Test {
    public static void main(String[] args) {
        TreeSet<String> set1=new TreeSet<String>();
        HashSet<String> set2=new HashSet<String>();
        HashMap<String, String> map1=new HashMap<String, String>();
        map1.put("India", "New Delhi");
        map1.put("Australia", "Sydney");
        map1.put("Srilanka", "Colombo");
        map1.put("Bangladesh", "Dhaka");

        for(Map.Entry<String, String> entry:map1.entrySet()) {
            set1.add(entry.getKey());
            set2.add(entry.getValue());
        }
        System.out.println(set1);          //LINE-1
        System.out.println(set2);          //LINE-2
    }
}
```

Choose the correct option(s).

### Options :

A. ✓ In LINE-1, the values in `set1` are printed in sorted order.

B. ✗ In LINE-2, the values in `set2` are printed in sorted order.

C. ✗ We cannot predict the order in which elements of `set1` are printed.

- D. ✓ We cannot predict the order in which elements of `set2` are printed.

**Question Number : 171 Question Type : MCQ**

**Correct Marks : 5**

Question Label : Multiple Choice Question

Consider the code given below.

```

import java.util.*;
class School implements Cloneable{
    String schoolName;
    String place;
    public School(String s, String p){
        schoolName = s;
        place = p;
    }
    public School clone() throws CloneNotSupportedException{
        return (School)super.clone();
    }
}
class Student implements Cloneable{
    School sch;
    String stuName;
    public Student(String n, School s) {
        sch = s;
        stuName = n;
    }
    public Student clone() throws CloneNotSupportedException{
        Student s = (Student) super.clone();
        return s;
    }
    public String toString(){
        return stuName + ":" + sch.schoolName + ":" + sch.place;
    }
}

public class Test{
    public static void main(String[] args){
        Student s1 = new Student("Vasanth", new School("DAV", "Chennai"));
        try{
            Student s2 = s1.clone();
            s2.stuName = "Neeraj";
            s2.sch.place = "Delhi";
            System.out.println(s1 + ", " + s2);
        }
        catch(CloneNotSupportedException e){
            System.out.println("Cloning not supported");
        }
    }
}

```

What will the output be?

**Options :**

- A. ❌ Cloning not supported
- B. ✓ Vasanth:DAV:Delhi, Neeraj:DAV:Delhi

C. ✘ Vasanth:DAV:Chennai, Neeraj:DAV:Delhi

D. ✘ Neeraj:DAV:Delhi, Neeraj:DAV:Delhi

**Question Number : 172 Question Type : MCQ**

**Correct Marks : 5**

Question Label : Multiple Choice Question

The following code maps a set of names of students to their scores, and groups the names based on their scores. Based on the code, answer the question that follows.

```

import java.util.*;
public class MapTest {
    TreeSet<String> set1=new TreeSet<String>();
    TreeSet<String> set2=new TreeSet<String>();
    public boolean property(Integer marks) {
        if(marks>=40)
            return false;
        return true;
    }
    public void validate(TreeMap<String, Integer> stuMap) {
        for(Map.Entry<String, Integer> entry:stuMap.entrySet()) {
            if(property(entry.getValue()))
                set1.add(entry.getKey());
            else
                set2.add(entry.getKey());
        }
    }
    public void display() {
        System.out.println(set1);
        System.out.println(set2);
    }
    public static void main(String[] args) {
        TreeMap<String, Integer> student=new TreeMap<String, Integer>();
        student.put("Beas", 90);
        student.put("Mahanadhi", 36);
        student.put("Kaveri", 80);
        student.put("Krishna", 26);
        student.put("Chambal", 38);
        student.put("Yamuna", 48);
        MapTest obj=new MapTest();
        obj.validate(student);
        obj.display();
    }
}

```

Choose the correct option.

**Options :**

This program generates the output:

[Beas, Kaveri, Yamuna]

A. ❌ [Chambal, Krishna, Mahanadhi]

This program generates the output:

[Chambal, Krishna, Mahanadhi]

B. ✓ [Beas, Kaveri, Yamuna]

This program generates the output:

[Mahanadhi, Krishna, Chambal]

[Beas, Kaveri, Yamuna]

C. ✘

D. ✘ We cannot predict the order in which elements of set1 and set2 are printed.

**Question Number : 173 Question Type : MSQ**

**Correct Marks : 5**

Question Label : Multiple Select Question

Consider the following program.

```

import java.util.*;
class OrderedPair<T extends Number>{
    private T a;
    private T b;
    public OrderedPair(T a_val, T b_val){
        a = a_val;
        b = b_val;
    }
    public T get_a() {
        return a;
    }
    public T get_b() {
        return b;
    }
    public boolean isMinPair(____ LINE-1 ____){
        if(this.a.doubleValue() < pair2.get_a().doubleValue()
            && this.b.doubleValue() < pair2.get_b().doubleValue()){
            return true;
        }
        else
            return false;
    }
}

public class Test{
    public static void main(String args[]){
        OrderedPair<Integer> op1 = new OrderedPair<Integer>(5,6);
        OrderedPair<Integer> op2 = new OrderedPair<Integer>(3,2);

        op2.isMinPair(op1);
    }
}

```

Choose all the options which can be used in place of LINE-1 for successful compilation.

**Options :**

A. ❌ OrderedPair <Number> pair2

B. ✓ OrderedPair <T> pair2

C. ❌ OrderedPair <Object> pair2

D. ✓ OrderedPair <?> pair2

## Question Number : 174 Question Type : MSQ

**Correct Marks : 5**

Question Label : Multiple Select Question

From among the options, choose the code segment(s) that give(s) the same output as is given by the Java code inside the CODE BLOCK.

```
import java.util.*;
import java.util.stream.*;

public class FClass{
    public static void main(String[] args){
        //CODE BLOCK begins here
        double c = Stream.iterate(1, n -> n+1)
            .map(n -> n * n * n)
            .limit(5)
            .count();
        //CODE BLOCK ends here
        System.out.println(c);
    }
}
```

**Options :**

A. ❌  
double c = Stream.iterate(1, n -> n+1)
 .map(n -> n \* n \* n)
 .filter(n -> n <= 5)
 .count();

A. ❌

B. ✓  
double c = Stream.iterate(1, n -> n <= 5,n -> n + 1)
 .map(n -> n \* n \* n)
 .limit(5)
 .count();

B. ✓

C. ✓  
double c = Stream.iterate(1, n -> n+1)
 .takeWhile(n -> n <= 5)
 .map(n -> n \* n \* n)
 .count();

C. ✓

```
double c = Stream.iterate(1, n -> n+1)
    .map(n -> n * n * n)
    .dropWhile(n -> n <= 125)
    .count();
```

D. ✘

## PDSA

**Number of Questions :** 14

**Section Marks :** 50

**Question Number : 175 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

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

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

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

**Options :**

A. ✓ YES

B. ✘ NO

**Question Number : 176 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Let  $G$  be a complete undirected graph on 4 vertices, having 6 edges with weights being 1, 2, 3, 4, 5,

and 6. The maximum possible weight that a minimum weight spanning tree of  $G$  can have is \_\_\_\_\_.

**Options :**

- A. ✗ 9
- B. ✗ 8
- C. ✓ 7
- D. ✗ 6

**Question Number : 177 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

If we perform the following operations in the given order on the min-heap [2, 6, 12, 10, 8, 15, 20, 25, 18] then the resulting min-heap would be\_\_\_\_\_.

```
1 | delete_min()  
2 | insert(5)
```

**Options :**

- A. ✗ [5, 6, 12, 8, 18, 15, 20, 10, 20]
- B. ✓ [5, 6, 12, 8, 18, 15, 20, 25, 10]
- C. ✗ [5, 6, 12, 18, 8, 15, 20, 25, 10]
- D. ✗ [5, 6, 12, 8, 15, 18, 20, 25, 10]

**Question Number : 178 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Suppose we have a Min heap  $H$  which contains  $n$  elements and is implemented using a list. We want to update the value located at index  $i$ . What will be the complexity of the worst case of an efficient algorithm to perform this update operation?

**Options :**A. ❌  $O(n \log n)$ B. ✓  $O(\log n)$ C. ❌  $O(n)$ D. ❌  $O(1)$ **Question Number : 179 Question Type : MCQ****Correct Marks : 3**

Question Label : Multiple Choice Question

While inserting the elements 50, 80, 20, 60, 10, 45, 65, 30, and 90 in an empty binary search tree (BST) in the sequence shown, the elements at maximum depth are\_\_\_\_\_.

**Options :**

A. ❌ 30, 90

B. ❌ 10, 90

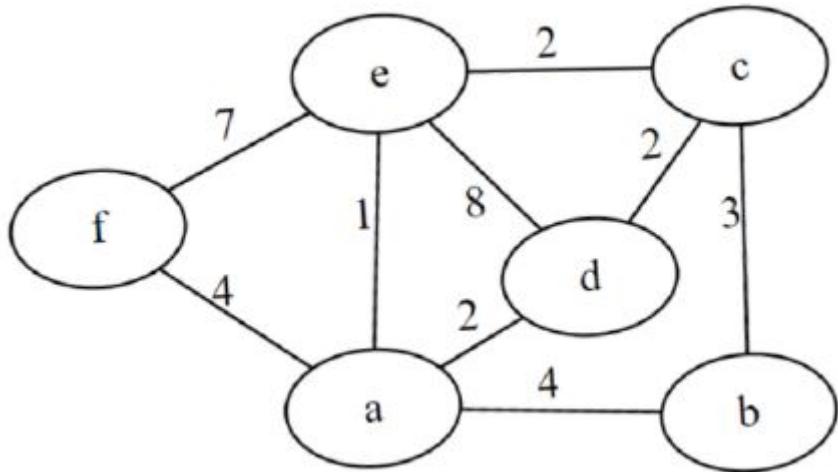
C. ✓ 30, 65

D. ❌ 65, 90

**Question Number : 180 Question Type : MSQ****Correct Marks : 3**

Question Label : Multiple Select Question

Consider the graph shown below.



Which of the following can be the sequence of edges added, in that order, to create a minimum spanning tree using Kruskal's algorithm?

**Options :**

A. ✓ (a, e), (a, d), (c, d), (b, c), (a, f)

B. ✓ (a, e), (c, e), (a, d), (b, c), (a, f)

C. ✗ (a, e), (a, d), (b, c), (a, b), (a, f)

D. ✗ (a, e), (c, d), (a, d), (a, b), (a, f)

E. ✓ (a, e), (c, d), (a, d), (b, c), (a, f)

**Question Number : 181 Question Type : MSQ**

**Correct Marks : 3**

Question Label : Multiple Select Question

Which of the following is/are always **true** about the Floyd-Warshall algorithm?

**Options :**

If the shortest path entry `SP[i][i]` in the resultant matrix is negative, then it represents the

A. ✓ graph has a negative weight cycle.

B. ❌ The time complexity of Floyd-Warshall is  $O(V^3)$ , where V is the number of vertices in the graph.

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

The formula to compute the shortest path from vertex  $i$  to  $j$  in Floyd-Warshall algorithm is

D. ❌  $SP^k[i, j] = \min[SP^{k-1}[i, j] + SP^{k-1}[i, k], SP^{k-1}[k, j]]$

### Question Number : 182 Question Type : MSQ

**Correct Marks : 3**

Question Label : Multiple Select Question

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

**Options :**

Character	A	B	C	D	E	F
Huffman code	000	0010	0101	01	10	11

A. ❌

Character	A	B	C	D	E	F
Huffman code	000	0010	0011	01	10	11

B. ✓

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

C. ❌

Character	A	B	C	D	E	F
Huffman code	00	010	011	10	110	111

D. ✓

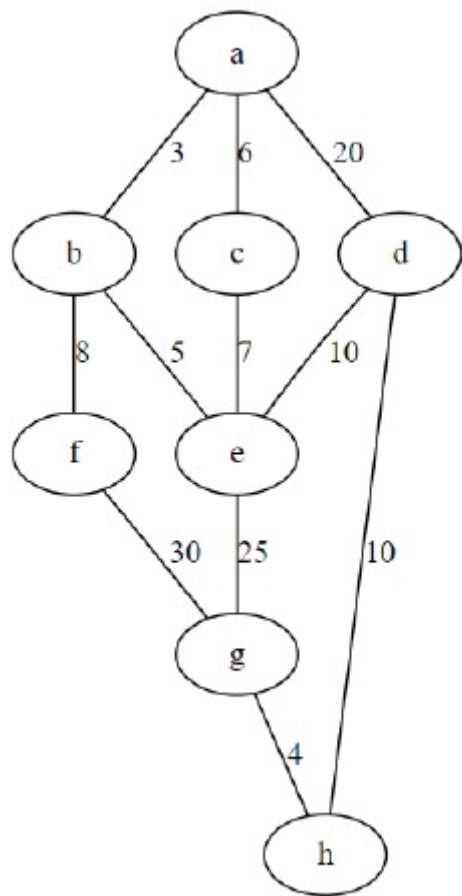
## Question Number : 183 Question Type : MCQ

Correct Marks : 4

Question Label : Multiple Choice Question

In the given graph, if we try to find the shortest path from node `a` to all other nodes using the Dijkstra's algorithm given below, in what order will the nodes be marked as `True` in the `visited` dictionary?

```
1 def dijkstralist(wList,s):
2     infinity = 1 + len(wList.keys())*max([d for u in wList.keys() for (v,d)
3     in wList[u]])
4     (visited,distance) = ({},{})
5     for v in wList.keys():
6         (visited[v],distance[v]) = (False,infinity)
7     distance[s] = 0
8     for u in wList.keys():
9         nextd = min([distance[v] for v in wList.keys() if not visited[v]])
10        nextvlist = [v for v in wList.keys() if (not visited[v]) and
11        distance[v] == nextd]
12        if nextvlist == []:
13            break
14        nextv = min(nextvlist)
15        visited[nextv] = True
16        for (v,d) in wList[nextv]:
17            if not visited[v]:
18                distance[v] = min(distance[v],distance[nextv]+d)
19
20    return(distance)
```



**Options :**

A. ✘ a b c d f e h g

B. ✘ a b c e f d g h

C. ✓ a b c e f d h g

D. ✘ a b c f e d h g

**Question Number : 184 Question Type : MSQ**

**Correct Marks : 4**

Question Label : Multiple Select Question

Which of the following is/are **true** about AVL Trees? Assume that the height of the empty tree is 0.

**Options :**

A. ✘

Let  $s(h)$  denote the minimum number of nodes in an AVL tree of height  $h$  then  
 $s(h) = s(h-1) + s(h-2) - 1$ , where  $s(0) = 0$  and  $s(1) = 1$ .

- In AVL tree, the absolute difference between the height of the left subtree and the height of the right subtree of any node can't be more than 1.
- C. ✓ The complexity of searching in an AVL tree is  $O(\log n)$ .
- D. ✓ If the height of an AVL tree is  $h$ , the maximum number of nodes will be  $2^h - 1$ .
- E. ✗ The complexity of both insertion and deletion in AVL tree is  $O(n)$ .

### Question Number : 185 Question Type : SA

#### Correct Marks : 4

#### Question Label : Short Answer Question

Meetings M1, M2, ..., M11 are to be conducted in a single available meeting room. The table below gives the start and end times of these meetings. If any activity finishes at time T, then other activities can be started at time T or afterward.

What is the maximum number of meetings that can be held in the meeting room without conflicts?

	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
start	4	2	11	9	10	7	6	3	6	2	13
end	7	3	12	12	11	9	8	5	9	7	15

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

6

**Question Number : 186 Question Type : SA**

**Correct Marks : 4**

**Question Label :** Short Answer Question

In an array A, two elements A[i] and A[j] form an inversion pair, if A[i] > A[j] for i < j.

The maximum number of inversion pairs possible in an integer array A of size 12 is \_\_\_\_\_.

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

66

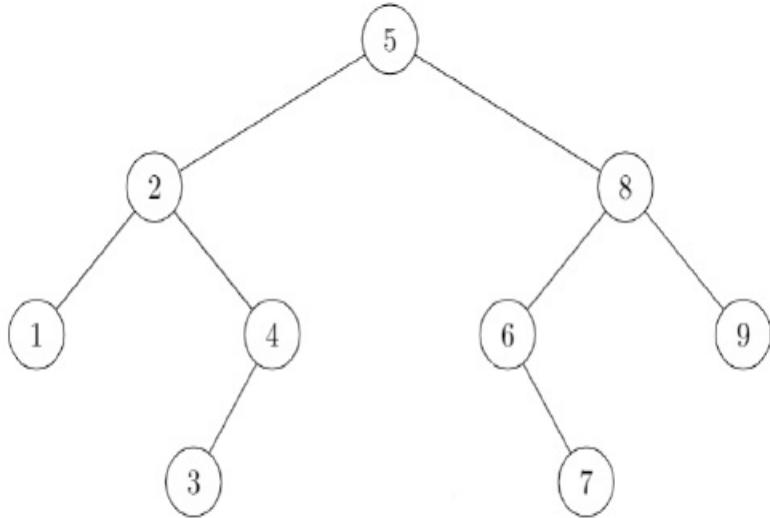
**Question Type : COMPREHENSION**

**Question Numbers : (187 to 188)**

**Question Label :** Comprehension

Consider the following class for tree nodes in the given tree and answer the subquestions.

```
1 class Node:  
2     def __init__(self, value = None):  
3         self.value = value  
4         self.left = None  
5         self.right = None
```



```
1 def traversal(t):  
2     if t != None:  
3         traversal(t.left)  
4         traversal(t.right)  
5         print(t.value, end = ' ')  
6 traversal(root) #'root' is the reference of the root node of the given tree.
```

## Sub questions

**Question Number : 187 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Which of the following order will be printed by the given code-snippet?

**Options :**

A. ✘ 1 3 4 2 7 6 8 9 5

B. ✘ 5 2 1 4 3 8 6 7 9

C. ✘ 1 3 4 2 5 7 6 9 8

**Question Number : 188 Question Type : MCQ****Correct Marks : 3**

Question Label : Multiple Choice Question

Which of the following statements is

**true** about the complexity of thegiven `traversal` function,where `n` is the number of nodes?**Options :**A. ✘  $O(n \log n)$  whether the tree is balanced or unbalanced.B. ✘  $O(n)$  if the tree is balanced,  $O(n \log n)$  otherwise.C. ✓  $O(n)$  whether the tree is balanced or unbalanced.D. ✘  $O(\log n)$  if the tree is balanced,  $O(n^2)$  otherwise.**Question Type : COMPREHENSION****Question Numbers : (189 to 190)**

Question Label : Comprehension

Consider the following function `mystery(arr, low, high)`, where `arr` is a list of strings and `low` and `high` are the first and last index of list `arr` respectively.

```
1 def match(str1, str2):
2     result = ''
3     n1, n2 = len(str1), len(str2)
4     i, j = 0, 0
5     while i < n1 and j < n2:
6         if str1[i] != str2[j]:
7             break
8         result += str1[i]
9         i, j = i + 1, j + 1
10    return result
11
12 def mystery(arr, low, high):
13     if low == high:
14         return arr[low]
15     if high > low:
16         mid = (low + high) // 2
17         str1 = mystery(arr, low, mid)
18         str2 = mystery(arr, mid + 1, high)
19         return match(str1, str2)
```

### Terminology:-

For example if string `t = abcdef`

- **Suffix** - A string `s` is a suffix of a string `t` if there exist a string `p` such that `t = ps`. (for example, `def`, `ef`)
- **Prefix** - A string `p` is a prefix of a string `t` if there exist a string `s` such that `t = ps`. (for example, `abc`, `ab`)
- **Subsequence** - A subsequence of a string is a sequence that can be derived from the given string by deleting zero or more elements without changing the order of the remaining elements. (for example, `acef`, `adf`)
- **Substring** - A substring is a contiguous sequence of characters within a string.(for example, `bcd`, `cdef`)

Based on the above data, answer the given subquestions.

### Sub questions

Question Number : 189 Question Type : MCQ

### **Correct Marks : 4**

Question Label : Multiple Choice Question

What does function `mystery` return?

#### **Options :**

- A. ❌ Longest common subsequence of all strings in list `arr` .
- B. ✓ Longest common prefix of all strings in list `arr` .
- C. ❌ Longest common suffix of all strings in list `arr` .
- D. ❌ Longest common substring of all strings in list `arr` .

### **Question Number : 190 Question Type : MSQ**

### **Correct Marks : 3**

Question Label : Multiple Select Question

Which of the following is/are **true** about  
the `mystery` function? Assume the size  
of the input list is `n` and the length of the  
longest string in the list is `m`.

#### **Options :**

- A. ❌ Function `mystery` is an example of a greedy algorithm.
- B. ✓ Function `mystery` is an example of a divide and conquer algorithm.
- C. ❌ Time complexity for function `mystery` is  $O(n + m)$
- D. ❌ Time complexity for function `mystery` is  $O(n \log m)$

E. ✓ Time complexity for function `mystery` is  $O(nm)$

## System Commands

**Number of Questions :** 20

**Section Marks :** 50

**Question Number : 191 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL: SYSTEM COMMANDS"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

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

**Options :**

A. ✓ YES

B. ✘ NO

**Question Number : 192 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

Which of the following shell commands will concatenate the two files `f1.txt` and `f2.txt` into a new file named `f3.txt`.

**Options :**

- A. ❌ `mv f1.txt f2.txt f3.txt`
- B. ✓ `cat f1.txt f2.txt > f3.txt`
- C. ❌ `cp f1.txt f2.txt f3.txt`
- D. ❌ `mv f1.txt f2.txt | f3.txt`

**Question Number : 193 Question Type : MCQ****Correct Marks : 2**

Question Label : Multiple Choice Question

What is the output of the following bash script?

Note: Operators `||` and `&&` have same precedence. And the operations will be executed from left to right.

```
#!/bin/bash
x=1
y=10
z=2
if [ $x -eq 1 ] && [ $y -gt 5 ] || [ $z -eq 10 ]
then
    echo $y/$z
else
    echo $z/$x
fi
```

**Options :**

- A. ❌ 5
- B. ❌ 2
- C. ✓ 10/2
- D. ❌ 2/1

**Question Number : 194 Question Type : MCQ**

## Correct Marks : 2

Question Label : Multiple Choice Question

Choose the output of the following bash script if the input to stdin is 123321.

```
#!/bin/bash

read line
rline=`echo $line | rev` # rev command will reverse the input string
if [[ $line == $rline ]]; then
    exec bash -c "echo It is a palindrome"
fi
echo It is not a palindrome
```

Options :

A. ✓ It is a palindrome

A. ✓

B. ✗ It is not a palindrome

B. ✗

C. ✗ It is a palindrome  
It is not a palindrome

C. ✗

D. ✗ No output will be shown

Question Number : 195 Question Type : MCQ

## Correct Marks : 2

Question Label : Multiple Choice Question

Consider a file named `fnames` that contains the first name of a student in each line, located in the current working directory. What will be the output of the below command?

```
awk '++seen[$0] == 2 {print $0}' fnames
```

#### Options :

- A. ✘ Names that are present only one time.
- B. ✓ Names that are repeated more than one time.
- C. ✘ Distinct names with the number of occurrences.
- D. ✘ Prints only the distinct names present in the file.

#### Question Number : 196 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

Consider a file `fnames` that contains the first name of a student in each line, located in the current working directory. What will be the output of running the below awk script on the input as file `fnames` ?

```
#!/usr/bin/awk -f
{
    fname[$0]++;
}
END {
    for ( i in fname ) {
        print i, fname[i];
    }
}
```

#### Options :

- A. ✘ Names that are present only one time.
- B. ✘ Names that are repeated more than one time.
- C. ✓ Distinct names with the number of occurrences.
- D. ✘ Prints only the distinct names present in the file.

#### Question Number : 197 Question Type : MCQ

## **Correct Marks : 2**

Question Label : Multiple Choice Question

What will be the output of the below command?

```
history | awk '{
    arr[$2]++
}
END {
    for (i in arr) {
        print arr[i],i
    }
}' | sort -rn | head -n 10
```

Note: `-n` and `-r` options in sort command are used for numerical sorting and reverse sorting respectively, and check the below sample history command output for the output format of history command. The below options refer `vim`, `cat`, `egrep` etc as commands, not the complete command syntax executed on the shell.

```
$ history
1029  vim input
1030  cat input
1031  cat input | egrep "abd"
1032  cat input | egrep "def"
1033  cat input
1034  vim input
```

## **Options :**

- A. ❌ First ten commands after the system booted.
- B. ❌ The last ten commands executed.
- C. ❌ Least frequently used ten commands.
- D. ✅ Most frequently used ten commands.

**Question Number : 198 Question Type : MCQ**

## **Correct Marks : 3**

Question Label : Multiple Choice Question

The file `file1.txt` contains the following text

```
abc,def  
ghij,klm  
n,o
```

What is the output of the below command?

```
sed 's/(.*\)\abc,/\1DEF/g' file1.txt | awk 'BEGIN{FS=",";}{print$2,$1}'
```

**Options :**

```
DEF,def  
ghij,klm  
n,o
```

A. ❌

```
def,abc  
klm,ghij  
o,n
```

B. ❌

```
,DEFdef  
klm,ghij  
o,n
```

C. ✓

```
DEF,def  
klm,ghij  
o,n
```

D. ❌

**Question Number : 199 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Given below are the top five lines of access log file of a server. Each line corresponds to one

request received on the server. In each line

- The first field(before space), containing four numbers separated by a dot('.'), is the ip address of the client that made this request.
- The second field(inside square brackets), contains date, time and timezone offset. Frist 11 characters represents the date, followed by a colon, followed by time represented by next 8 characters, followed by a space and finally next 5 characters representing the timezoneoffset.

Note: In the below sample the lines are very big and hence wrapped. So there are only 5 lines, where each line starts with an ip address.

```
103.47.219.249 -- [27/Jan/2022:00:01:11 +0530] "GET / HTTP/1.1" 301 429 "-"
Mozilla/5.0 (Macintosh; Intel Mac OS X 10_11_6) AppleWebKit/601.7.7 (KHTML, like
Gecko) Version/9.1.2 Safari/601.7.7"
54.209.123.136 -- [27/Jan/2022:00:01:18 +0530] "GET /AlloyOnto/AlloyOnto.owl HTTP/1.1"
301 494 "-" "Python-urllib/3.6"
54.209.123.136 -- [27/Jan/2022:00:01:18 +0530] "GET /AlloyOnto/AlloyOnto.owl HTTP/1.1"
301 494 "-" "Python-urllib/3.6"
54.209.123.136 -- [27/Jan/2022:00:01:19 +0530] "GET /AlloyOnto/AlloyOnto.owl HTTP/1.1"
200 1410215 "-" "Python-urllib/3.6"
54.209.123.136 -- [27/Jan/2022:00:01:19 +0530] "GET /AlloyOnto/AlloyOnto.owl HTTP/1.1"
200 1410215 "-" "Python-urllib/3.6"
```

What is the expected output of the below awk script, if executed on the complete access log file?

```
#!/usr/bin/awk -f

{
    datetime = $4 ":" $5
    time=substr(datetime, 14, 8)

    if (time < "06:00:00" ) {
        if ( $1 in ip ) { ip[$1]++ }
        else { ip[$1]=1 }
    }
}

END {
    mi=0
    for (i in ip) {
        if (ip[i] > mi) {
            mi = ip[i]
            mip = i
        }
    }
    print mip
}
```

## Options :

- \* The ip address of the client that made the least number of requests from midnight to 6 am.
- \* The ip address of the client that made the least number of requests from 6 am to midnight.
- ✓ The ip address of the client that made the most number of requests from midnight to 6 am.

- D. ✘ The ip address of the client that made the most number of requests from 6 am to midnight.

### Question Number : 200 Question Type : MCQ

#### Correct Marks : 3

Question Label : Multiple Choice Question

Consider the below state of the current working directory,

```
$ ls -l
total 78864
-rw-rw-rw- 1 user user      6274 Feb 14 15:25 access50.log
-rw-rw-r-- 1 user user 80386681 Feb 14 15:21 access-full.log
-rwxrw-r-- 1 user user      157 Feb  5 10:50 email.awk
-rw-rw-r-- 1 user user      180 Feb  4 11:27 employee_details.txt
-r-xrwxr-x 1 user user    16456 Feb  5 02:07 fact
-rwxrw-r-- 1 user user      62 Feb  5 02:06 f.c
--wx-wx-wx 1 user user      0 Feb 15 16:16 freq
-rw-rw-r-- 1 user user      81 Feb  5 11:56 groceries.csv
-rwxrwxrwx 1 user user      0 Feb 15 16:07 gui
-rw-rw-r-- 1 user user      46 Feb  4 21:19 sc
-rwxrw-rwx 2 user user    213 Feb  5 02:10 script.sh
-rwxrw-r-- 2 user user    397 Feb 14 17:42 temp.sh
-r--rw-rw- 1 user user      8 Feb  4 17:24 v
```

What will be the output of the below command , when executed in the current working directory?

```
ls -l | egrep "[-]([-rwx]{3})\1\1" | awk '{print $NF}'
```

#### Options :

- A. ✘ Files/directories with the same set of permissions for user and group.
- B. ✘ Files/directories with the same set of permissions for group and others.
- C. ✘ Files/directories with the same set of permissions for user and others.
- D. ✓ Files/directories with the same set of permissions for user, group and others.

### Question Number : 201 Question Type : MCQ

## Correct Marks : 3

### Question Label : Multiple Choice Question

Consider a fruit shop selling only countable fruits like mango, apple, banana etc. The shopkeeper creates a file named `list_x` for each order, where `x` is the order number. Each order has a unique order number. Each file contains the information of fruits and quantity sold. Each line in the file contains two fields separated by a space, the first field is the fruit name and the second is the quantity of that fruit. A sample file for order number `13` is given below.

```
$ cat list_13
Mango 3
Pomegranate 5
Orange 3
```

The above file `file_13` tells that, for order number 13, 3 mangoes, 5 Pomegranates and 3 Oranges were sold.

Consider that all the files are located in the current working directory. The shopkeeper wants to calculate in total how many fruits were sold out. Choose the awk script which will print the total number of fruits sold by this shopkeeper till now. The below commands are executed in current working directory.

### Options :

- A. ❌ `awk '{ fruits[$1]++ } END { for (i in fruits) print i, fruits[i] }' list_*`
- B. ✓ `awk '{ fruits[$1] += $2 } END { for (i in fruits) print i, fruits[i] }' list_*`
- C. ❌ `awk '{ fruits[$2] += $1 } END { for (i in fruits) print i, fruits[i] }' list_*`
- D. ❌ `awk '{ fruits[$1] += $2 } END { for (i in fruits) print i, fruits[i] }' list_*`

## Question Number : 202 Question Type : MCQ

## Correct Marks : 3

## Question Label : Multiple Choice Question

Consider the below information,

```
$ whatis last
last (1)          - show a listing of last logged in users

$ last | head -n 20
user pts/4      tmux(8855).%4    Wed Feb 16 16:09 - 16:20  (00:11)
user pts/4      tmux(8855).%3    Wed Feb 16 13:19 - 15:56  (02:37)
user pts/3      tmux(8855).%2    Wed Feb 16 10:40    still logged in
user pts/2      tmux(8855).%1    Wed Feb 16 10:20    still logged in
user pts/0      tmux(8855).%0    Wed Feb 16 10:19    still logged in
user :0          :0            Wed Feb 16 09:21    still logged in
reboot  system boot  5.13.0-28-generi Wed Feb 16 09:21    still running
user pts/6      tmux(2923).%7    Mon Feb 14 15:08 - 09:20  (1+18:12)
user pts/6      tmux(2923).%6    Mon Feb 14 15:07 - 15:07  (00:00)
user pts/5      tmux(2923).%5    Mon Feb 14 15:01 - 09:20  (1+18:19)
user pts/4      tmux(2923).%4    Mon Feb 14 15:01 - 09:20  (1+18:19)
user pts/3      tmux(2923).%3    Fri Feb 11 10:56 - 09:21  (4+22:24)
user pts/3      tmux(2923).%2    Fri Feb 11 10:17 - 10:56  (00:38)
user pts/2      tmux(2923).%1    Fri Feb 11 10:05 - 09:21  (4+23:15)
user pts/1      tmux(2923).%0    Fri Feb 11 09:21 - 09:21  (4+23:59)
user :0          :0            Fri Feb 11 09:20 - down   (5+00:00)
reboot  system boot  5.13.0-28-generi Fri Feb 11 09:20 - 09:21  (5+00:00)
user pts/4      tmux(34909).%3    Thu Feb 10 17:53 - 21:20  (03:27)
user pts/3      tmux(34909).%2    Thu Feb 10 17:34 - 21:20  (03:46)
user pts/2      tmux(34909).%1    Thu Feb 10 17:25 - 21:21  (03:55)
```

What will be the output of the below bash command?

```
last | grep . | grep -v reboot | awk '{ print $1 }' | sort --unique
```

Note: `sort --unique` command will sort the input and remove the duplicate lines.

### Options :

- A. ❌ List of users who have logged into the system since the last reboot.
- B. ❌ List of users who have logged into the system before the last reboot.
- C. ✓ List of users who have logged into the system previously.
- D. ❌ List of users who failed to login to the system.

**Question Number : 203 Question Type : MCQ****Correct Marks : 3**

Question Label : Multiple Choice Question

Match the command used in vi editor with their use

Commands	Function
1. a	a. Move to start of the current line.
2. 0(zero)	b. Enter into insert mode and write after the cursor.
3. dd	c. Deletes a character at the position of the cursor.
4. i	d. Goes into insert mode at the position of the cursor.
5. x	e. Delete line.

OR

Match the command used in emacs editor with their use. Note that Ctrl and Meta refers to Control and Alt key respectively.

Commands	Function
1. Ctrl+n	a. Move to start of the current line.
2. Ctrl+a	b. Move to the next line.
3. Ctrl+e	c. Move forward a word.
4. Ctrl+b	d. Move one character to the left.
5. Meta+f	e. Move to the end of the current line.

**Options :**

A. ✓ 1—&gt;b; 2—&gt;a; 3—&gt;e; 4—&gt;d; 5—&gt;c;

B. ❌ 1—>a; 2—>b; 3—>c; 4—>d; 5—>e;

C. ❌ 1—>b; 2—>a; 3—>c; 4—>d; 5—>e;

D. ❌ 1—>a; 2—>b; 3—>e; 4—>d; 5—>c;

## Question Number : 204 Question Type : MSQ

### Correct Marks : 2

Question Label : Multiple Select Question

Which of the following commands can be used to match a valid phone number i.e. exactly in the format `twoDigit-tenDigit`, where `twoDigit` is a two digit number and `tenDigit` is a ten digit number and these two numbers are separated by a hyphen(-), for example "91-9876543210" is a valid phone number. Every character as given in the pattern is required for a match including the hyphen. The command should print only the lines that contain a valid phone number anywhere in the file `file1.txt`.

### Options :

A. ✓ `grep "[0-9]{2}[-]{1}[0-9]{10}" file1.txt`

B. ✓ `egrep "[0-9]{2}[-]{1}[0-9]{10}" file1.txt`

C. ❌ `egrep "[0-9]{2}[-]{1}[0-9]{10}" file1.txt`

D. ❌ `grep "[0-9][0-9][[:punct:]][0-9]{10}" file1.txt`

## Question Number : 205 Question Type : MSQ

### Correct Marks : 2

Question Label : Multiple Select Question

In Linux any file/directory whose name starts with a `.` is considered a hidden file/directory, for e.g. `.file_hid` is a name of a hidden file. Command `la` is used to display all the files including the hidden files, it is similar to `ls -a`. Select the commands that show only the hidden files and directories in the home directory of the current user.

### Options :

A. ❌ `la ~ | grep "^.."`

B. ✓ `la ~ | grep "^\\.."`

C. ❌ `la ~ | egrep "^.."`

D. ✓ `la ~ | grep -v "^[^.]"`

E. ❌ `la ~ | grep -v "^[^.]*"`

**Question Number : 206 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

How many lines will be printed by the given bash script?

```
#!/bin/bash

flag=0
for i in {1..20}; do
    if [[ $((i%7)) == 0 ]]; then
        continue
        flag=1
    fi
    if [[ $((i%2)) && flag == 1 ]]; then
        break
    fi
    echo $i
done
```

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

18

**Question Number : 207 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Consider the below information,

```
$ wc -l file
6 file
```

How many lines of text will be printed to stdout by the below command?

```
sed -e "1~2p" file
```

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

9

**Question Number : 208 Question Type : MSQ**

**Correct Marks : 3**

Question Label : Multiple Select Question

Choose the commands that will show the csv file `file.csv` without first and last column.

**Options :**

A. ❌ `sed -e 's/[(^.*,)|(.*$)]//g' file.csv`

B. ❌ `sed -e 's/^.*,//g' -e 's/,.*$/g' file.csv`

C. ✓ `awk 'BEGIN {FS=","} { for (i=2; i<NF; i++) printf $i ",";printf "\n" }' file.csv`

D. ✓ `sed -e 's/^[^,]*,//g' -e 's/,[^,]*$//g' file.csv`

**Question Number : 209 Question Type : MSQ**

## Correct Marks : 3

### Question Label : Multiple Select Question

Choose the correct statement(s) based on the below bash script that is stored in a file named `script.sh`.

```
#!/bin/bash
opt="^-"
files="^-x"
prefix="^-p"
curropt=
for arg in "${@}"; do
    if [[ $arg =~ $opt ]]; then
        curropt=$arg
        continue
    fi
    if [[ $curropt =~ $files ]]; then
        arr+=($arg)
    elif [[ $curropt =~ $prefix ]]; then
        prefixtext=$arg
    fi
done
for i in ${arr[@]}; do mv "$i" "$prefixtext$i"; done
```

### Options :

A. ✓ Commands `./script.sh -x 1 2 3 4 -p file` and `./script.sh -p file -x 1 2 3 4` will give the same output.

B. ✗ The arguments after `-x` option are limited to 4.

C. ✓ The value of `$1` after the completion of the outer while-loop will be the first command line argument given while running the script.

D. ✗ If the files/directories with absolute paths are given as arguments to `-x` option, then the files/directories will be renamed but will not be moved to other directories irrespective of the absolute paths given.

### Question Type : COMPREHENSION

## Question Numbers : (210 to 211)

Question Label : Comprehension

Consider the below command outputs,

```
$ ls
08ad5739dcd918615bba8dc86aa645f3
0fbe20919af19912c5c3a9dd8d911ce1
26c54d48bf60e8c63260ec5f24a2278e
4affcecd92c100f6caf3b07a7242a892
5069f6b45f6a5bc73c3acc21aba2c762
8755d0e42097448f27a584e0fc8c1037
87784fa86ab94449917ac98aa5e22d92
af2f43fefef6d0c519889947fffb011d7
e90ba71c91ecf45a53a25452d7ddabb2
eed46795a227c013280e9b0371f734fe

$ cat eed46795a227c013280e9b0371f734fe
[DETAILS]
2021R0001
Himesh Pratap Borase
himesh@studentmail.com
EDUCATIONAL_BACKGROUND:NON-TECHNICAL
[COURSES COMPLETED]
BSCMA1001
BSCMA1003
BSCCS1001
BSCCS1002

BSCHS1001
BSCHS1002
BSCMA1002
BSCMA1004
BSCSE2001
BSCCS2001
[COURSES ENROLLED]
BSCCS2002
BSCCS2003
```

Each file in the current working directory contains details of a single student. All the files contains information in the same format, as the sample given above. Each section in these files are named within square brackets

Based on the above data, answer the given subquestions.

### Sub questions

#### Question Number : 210 Question Type : MSQ

#### Correct Marks : 3

Question Label : Multiple Select Question

Consider every command/script below is run in the same directory. Choose the bash script(s) from the options that will give the same output as the given grep command.

```
grep -r -l "^\$BSCCS30.*\b" | wc -l
```

Note: The usage of options,

- `-r` will recursively go through the files in the current directory and its sub-directories.
- `-l` will print only names of files with a match.

#### Options :

```
count=0
for file in *; do
    while read line; do
        pat="^\$BSCCS30.*"
        if [[ $line =~ $pat ]]; then
            ((count++))
            break
        fi
        done < $file
    done
    echo $count
```

A. ✓

B. ✗

```
count=0
for file in *; do
    while read line; do
        pat="^BSCCS30.*"
        if [[ $line =~ $pat ]]; then
            ((count++))
        fi
        done < $file
    done
    echo $count
```

```
count=0
for file in *; do
    grep "^\BSCCS30.*" $file > /dev/null
    if [[ $? == 0 ]]; then
        ((count++))
        break
    fi
done
echo $count
```

C. \*

```
count=0
for file in *; do
    grep "^\BSCCS30.*" $file > /dev/null
    if [[ $? == 0 ]]; then
        ((count++))
    fi
done
echo $count
```

D. ✓

**Question Number : 211 Question Type : MSQ**

**Correct Marks : 3**

Question Label : Multiple Select Question

Consider an associative array `level` (*available as a shell variable*) that contains the current level information of the student in the programme. A student can be currently in any one of the three levels represented by the strings `FOUNDATION`, `DIPLOMA` or `DEGREE`. The key in this array is the student roll number and the corresponding value gives the level the student is in.

We want to add a new line to each student file at the end of `[DETAILS]` section i.e. just before the line containing the text `[COURSES COMPLETED]`.

This newly added line should contain the text `LEVEL:<level>` where `<level>` is the current level the student is in.

Which of the following scripts will do the required changes to all the student files.

#### Options :

```
pat="COMPLETED"
for file in *; do
    rollno=`head $file_tmp -n 2 | tail -n 1`
    file_tmp=${file}_tmp

    mv "$file" "$file_tmp"
    while read line; do
        if [[ $line =~ $pat ]]; then
            echo "LEVEL:${level[$rollno]}"
        fi
        echo $line
    done < "$file_tmp" > "$file"
done
```

A. ✓

```
pat="COMPLETED"
for file in *; do
    rollno=`head $file -n 2 | tail -n 1`
    while read line; do
        if [[ $line =~ $pat ]]; then
            echo "LEVEL:${level[$rollno]}"
        fi
        echo $line
    done > "$file"
done
```

B. ✘

```

for file in *; do
    file_tmp=${file}_tmp
    mv "$file" "$file_tmp"

    rollno=`head $file_tmp -n 2 | tail -n 1`
    completed=`grep -n "COMPLETED" $file_tmp | cut -d ":" -f 1`
    total=`wc -l $file_tmp | cut -d " " -f 1`

    head -n $((completed-1)) $file_tmp > $file
    echo "LEVEL:${level[$rollno]}" >> $file
    tail -n $((total-completed+1)) $file_tmp >> $file
done

```

C. ✓

```

for file in *; do
    file_tmp=${file}_tmp
    mv "$file" "$file_tmp"

    rollno=`head $file_tmp -n 2 | tail -n 1`
    completed=`grep -n "COMPLETED" $file_tmp | cut -d ":" -f 1`
    total=`wc -l $file_tmp | cut -d " " -f 1`

    head -n $((completed-1)) $file_tmp > $file
    echo "LEVEL:${level[$rollno]}" > $file
    tail -n $((total)) $file_tmp > $file
done

```

D. ✘

## Sem1 CT

**Number of Questions :** 11

**Section Marks :** 50

**Question Number : 212 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

**THIS IS QUESTION PAPER FOR THE SUBJECT " SEMESTER 1: COMPUTATIONAL THINKING"**

**ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?**

**CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.**

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

**Options :**

A. ✓ YES

B. ✗ NO

**Question Number : 213 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

## Scores

RowNo	Name	Gender	DateOfBirth	CityTown	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

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

## Library

RowNo	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

Seq. No.	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 :

- A. ✓ Useful Data has been mentioned above.
- B. ✗ This data attachment is just for a reference & not for an evaluation.

### Question Type : COMPREHENSION

### Question Numbers : (214 to 219)

Question Label : Comprehension

Let **L** be a non-empty list, and **D** be a non-empty Dictionary. Choose whether the statements given in the subquestions are true or false:

### Sub questions

### Question Number : 214 Question Type : MCQ

**Correct Marks : 1**

Question Label : Multiple Choice Question

Elements of **L** can be Dictionaries

**Options :**

A. ✓ TRUE

B. ✗ FALSE

**Question Number : 215 Question Type : MCQ**

**Correct Marks : 1**

Question Label : Multiple Choice Question

Let **a** be a key of Dictionary **D**, then **a** is always an integer.

**Options :**

A. ✗ TRUE

B. ✓ FALSE

**Question Number : 216 Question Type : MCQ**

**Correct Marks : 1**

Question Label : Multiple Choice Question

For keys **a** and **b** in **D**, if **a** ≠ **b** then **D[a]** ≠ **D[b]** is always True.

**Options :**

A. ✗ TRUE

B. ✓ FALSE

**Question Number : 217 Question Type : MCQ**

**Correct Marks : 1**

Question Label : Multiple Choice Question

For keys **a** and **b** in **D**, **a** ≠ **b** is always True.

**Options :**

A. ✓ TRUE

B. ✗ FALSE

### Question Number : 218 Question Type : MCQ

**Correct Marks : 1**

Question Label : Multiple Choice Question

For a key **a** in **D**, **D[a]** can be a dictionary.

**Options :**

A. ✓ TRUE

B. ✗ FALSE

### Question Number : 219 Question Type : MCQ

**Correct Marks : 1**

Question Label : Multiple Choice Question

Let **D** = { 3 : {'a': 5, 'b' : 4}, 5 : {'c' : 6}}, then the value of **D['b']** is 4.

**Options :**

A. ✗ TRUE

B. ✓ FALSE

### Question Number : 220 Question Type : MCQ

**Correct Marks : 3**

Question Label : Multiple Choice Question

Consider the procedure **doSomething** given below. If **A** = [3, 4, 5, 3, 1, 9, 4, 6, 5, 9] and **B** = **doSomething(A)**.

```

1 Procedure doSomething(A)
2     outList = [first(A)]
3     foreach X in rest(A) {
4         if (X ≠ first(A)) {
5             outList = outList ++ [X]
6         }
7     }
8     return (outList)
9 End doSomething

```

Choose the correct option.

**Options :**

- A. ✓ B = [3, 4, 5, 1, 9, 4, 6, 5, 9]
- B. ✗ B = [3, 4, 5, 1, 9, 6]
- C. ✗ B = [1, 6]
- D. ✗ B = [4, 1, 3, 4, 6, 5, 9]

**Question Number : 221 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

The following table contains information regarding authors from the “Library” dataset. Each row in the table corresponds to an author and list of publication years. There are **n** authors, each author is being assigned a unique index between 0 and **n-1**.

S.No	Author Name	Publication year
0	Kalam	[1998,..., 2015]
...	...	....
n - 1	Narayanan	[1935,..., 2001]

The table is represented by a dictionary named **authors**, with S.No as keys and lists of publication years as values. Assume that **authors** has already been computed. For example, we have: **authors** [0] = [1998,..., 2015]

**isCommon(L1, L2)** returns True if there are at least two common elements in lists **L1** and **L2**.

```

M = createMatrix (n, n)
foreach i in keys (authors) {
    foreach j in keys (authors) {
        if (i < j and isCommon(authors[i], authors[j])) {
            M[i][j] = 1
            M[j][i] = 1
        }
    }
}
A = { }
foreach i in rows (M) {
    count = 0
    foreach j in columns (M) {
        if (M[i][j] > 0) {
            count = count + 1
        }
    }
    A[i]= count
}

```

What does an entry **A[i]** represent at the end of the execution of the pseudocode above?

**Options :**

- A. ✘ Author **A[i]** has published books in **i** years
- B. ✘ Author **i** has published books in **A[i]** years
- C. ✘ Author **A[i]** has published at least two books in common years with **i** authors
- D. ✓ Author **i** has published at least two books in common years with **A[i]** authors

**Question Number : 222 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

In a shop selling soft drinks, Ritvika wants to combine two soft drinks to see which combinations taste better. The drinks are labeled from 0 to  $n - 1$ . To keep track of these combinations, she creates a matrix **M**. For drink **i** and **j** such that  $i \neq j$ , if the combination of **i** and **j** tastes good, then **M[i][j] = 1**, otherwise 0. **mostSuitable(M)** returns the list of drinks which are suitable for mixing

with the maximum number of drinks. Choose the correct code fragment.

```
Procedure mostSuitable(M)
    max = 0
    maxList = []
    foreach i in rows(M) {
        k = 0
        *****
        *      Fill the code      *
        *****
    }
    return (maxList)
End mostSuitable
```

#### Options :

```
foreach j in columns(M) {
    k = k + M[i][j]
}
if (k == max) {
    maxList = maxList ++ [i]
}
if (k > max) {
    max = k
    maxList = [i]
}
```

A. ✓

```
foreach j in columns(M) {
    k = k + M[i][j]
}
if (k == max) {
    maxList = maxList ++ [i]
}
if (k < max) {
    max = k
    maxList = [i]
}
```

B. ✗

C. ✗

```
foreach j in columns(M) {  
    k = k + M[i][j]  
}  
if (k == max) {  
    maxList = [i]  
}  
if (k > max) {  
    max = k  
    maxList = maxList ++ [i]  
}
```

```
foreach j in columns(M) {  
    k = k + M[i][j]  
}  
if (k == max) {  
    maxList = [i]  
}  
if (k < max) {  
    max = k  
    maxList = maxList ++ [i]
```

D. ❌ }

**Question Type : COMPREHENSION**

**Question Numbers : (223 to 224)**

Question Label : Comprehension

Consider the procedure given below.

```

Procedure eliminate (L1, L2)
    L3 = [ ], Found = False
    foreach i in L1 {
        foreach j in L2 {
            if (i == j) {
                Found = True
            }
        }
        if (not Found) {
            L3 = L3 ++ [i]
        }
        Found = False
    }
    return (L3)
End eliminate

```

If **L1** and **L2** are two lists, and **L** = **eliminate (L1, L2)**, then answer the given subquestions.

### **Sub questions**

#### **Question Number : 223 Question Type : MCQ**

#### **Correct Marks : 3**

Question Label : Multiple Choice Question

What will **L** represent?

#### **Options :**

- A. ❌ It will contain all elements of **L2** that are not present in **L1**.
- B. ✅ It will contain all elements of **L1** that are not present in **L2** .
- C. ❌ It will contain the elements common to **L1** and **L2** .
- D. ❌ It will contain the elements present in **L1** or **L2** but not both.

#### **Question Number : 224 Question Type : MSQ**

#### **Correct Marks : 2**

Question Label : Multiple Select Question

Which of the following option(s) is/are always correct? It is a Multiple Select Question (MSQ).

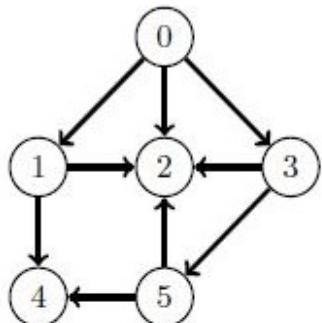
**Options :**

- A. ✘ **length(L1) – length(L2 ) = length(L)**
- B. ✘ **length(L1) > length(L2)**
- C. ✓ **length(L1) ≥ length(L)**
- D. ✘ **length(L2 ) ≤ length(L)**

**Question Type : COMPREHENSION****Question Numbers : (225 to 226)**

Question Label : Comprehension

Let  $M$  be the adjacency matrix of the graph  $G$  given below, where  $M[i][j] = 1$  if there is an edge from  $i$  to  $j$ , otherwise 0.



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

Based on the above information, answer the given subquestions.

**Sub questions****Question Number : 225 Question Type : SA****Correct Marks : 3**

**Question Label :** Short Answer Question

What will **countSomething(M, 0, 2)** return?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Number :** 226 **Question Type :** SA

**Correct Marks :** 2

Question Label : Short Answer Question

If Line 2 is replaced by **count = M[i][j]**, then what will **countSomething(M, 0, 2)** return?

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

3

**Question Type :** COMPREHENSION

**Question Numbers :** (227 to 228)

## Question Label : Comprehension

The following pseudocode is executed using the “Words” dataset. Assume that words are arranged in increasing order of sequence number.

```
B = 10000
sList = [ ], wList = []
while (Table 1 has more rows) {
    Read the first row X in Table 1
    Move X to Table 2
    wList = wList ++ [X.PartOfSpeech]
    if (X.Word ends with a full stop) {
        A = doSomething(wList)
        if (A < B) {
            B = A
        }
        sList = sList ++ [wList]
        wList = []
    }
}
Procedure doSomething(L)
    count = 0
    foreach p in L {
        if (p == "Noun") {
            count = count + 1
        }
    }
    return(count)
End doSomething
```

Based on the above data, answer the given subquestions.

### Sub questions

#### Question Number : 227 Question Type : MCQ

#### Correct Marks : 3

Question Label : Multiple Choice Question

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

#### Options :

- A. ✘ Maximum number of nouns in a sentence across all sentences.

- B. ❌ Total number of nouns across all sentences.
- C. ✓ Minimum number of nouns in a sentence across all sentences.
- D. ❌ Number of sentences having minimum number of nouns.

### **Question Number : 228 Question Type : MCQ**

#### **Correct Marks : 4**

Question Label : Multiple Choice Question

What will **length(sList)** represent at the end of execution.

#### **Options :**

- A. ❌ Total number of words in "Words" dataset
- B. ✓ Total number of sentences in "Words" dataset
- C. ❌ Total number of words with same part of speech in "Words" dataset
- D. ❌ Total number of words with different part of speech in "Words" dataset

### **Question Type : COMPREHENSION**

#### **Question Numbers : (229 to 230)**

Question Label : Comprehension

The following pseudocode is executed using the "Shopping Bills" dataset.

```

D = { }
while (Pile 1 has more cards) {
    Read the top card X in Pile 1
    foreach a in X.ItemList {
        if (isKey(D, a.Category)) {
            if (isKey(D[a.Category], a.ItemName)) {
                D[a.Category][a.ItemName] = D[a.Category][a.ItemName] ++ [a.Price]
            }
            else {
                D[a.Category][a.ItemName] = [a.Price]
            }
        }
        else {
            D[a.Category] = { }
            D[a.Category][a.ItemName] = [a.Price]
        }
    }
    Move card X to Pile 2
}

```

Based on the above data, answer the given subquestions.

### **Sub questions**

#### **Question Number : 229 Question Type : MCQ**

#### **Correct Marks : 4**

Question Label : Multiple Choice Question

What will each value **D[j][k]** represent at the end of the execution?

#### **Options :**

- A. ✘ Price of item **j** of category **k** across all bills
- B. ✘ Price of item **k** of category **j** across all bills
- C. ✘ List of prices of item **j** of category **k** across all bills
- D. ✓ List of prices of item **k** of category **j** across all bills

#### **Question Number : 230 Question Type : MCQ**

#### **Correct Marks : 4**

### Question Label : Multiple Choice Question

Using the dictionary **D** created in the previous question, what will the value of **L** represent at the end of the execution of the pseudocode below?

```
A = 0, L = [ ]
foreach i in keys(D) {
    foreach j in keys(D[i]) {
        data = findRange(D[i][j])
        B = first(data) - last(data)
        if (B == A) {
            L = L ++ [j]
        }
        if (B > A) {
            A = B
            L = [j]
        }
    }
}
Procedure findRange(Y)
    p = 0, q = 100000
    foreach k in Y{
        if (k > p) {
            p = k
        }
        if (k < q) {
            q = k
        }
    }
    return([p, q])
End findRange
```

### Options :

- A. ❌ List of items for which the difference between the highest and lowest price is the same
- B. ✓ List of items for which the difference between the highest and lowest price is maximum
- C. ❌ List of items for which the difference between the highest and lowest price is minimum
- D. ❌ List of items with same price in all shops

### Question Type : COMPREHENSION

### Question Numbers : (231 to 232)

## Question Label : Comprehension

The following pseudocode is executed using the “Shopping Bills” dataset. Procedure **similar(X, Y)** returns True if the difference between **X** and **Y** is less than 100.

```
A = { }
while (Pile 1 has more cards) {
    Read the top card X in Pile 1
    A[X.Seq_No] = [X.ShopName, X.Total]
    Move card X to Pile 2
}
n = length(keys(A))
S = CreateMatrix(n, n)
foreach i in keys(A) {
    foreach j in keys(A) {
        if (i < j and isPair(A[i], A[j])) {
            S[i][j] = 1
            S[j][i] = 1
        }
    }
}
Procedure isPair(P, Q)
    if (first(P) == first(Q) and similar(last(P), last(Q))) {
        return (True)
    }
    else {
        return (False)
    }
End isPair
```

A graph is constructed using matrix **S** created by the above pseudocode. Based on the given information answer the subquestions.

### Sub questions

**Question Number : 231 Question Type : MSQ**

### Correct Marks : 4

Question Label : Multiple Select Question

Choose the correct statement(s). It is a Multiple Select Question (MSQ).

### Options :

- A. ❌ For all  $i, j$  with  $i \neq j$ ,  $S[i][j] + S[j][i] = 1$
- B. ❌ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 0$  then  $S[j][i] = 1$
- C. ✓ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 1$  then  $S[j][i] = 1$
- D. ❌ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 1$  then  $S[j][i] = 0$
- E. ✓ For all  $i, j$  with  $i \neq j$ , if  $S[i][j] = 0$  then  $S[j][i] = 0$

**Question Number : 232 Question Type : MSQ**

**Correct Marks : 4**

Question Label : Multiple Select Question

There will be an edge between bills  $i$  and  $j$  if:

It is a Multiple Select Question (MSQ).

**Options :**

- A. ✓ The total bill amount of  $i$  is lower than the total bill amount of  $j$  by less than 100 and both bills are from the same shop.
- B. ✓ The total bill amount of  $i$  is greater than the total bill amount of  $j$  by less than 100 and both bills are from the same shop.
- C. ❌ The total bill amounts of bills  $i$  and  $j$  are same but both bills are from the different shops.
- D. ✓ The total bill amounts of bills  $i$  and  $j$  are same and both bills are from the same shop.

## Sem2 Maths2

**Number of Questions :** 6

**Section Marks :** 50

**Question Number : 233 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

**THIS IS QUESTION PAPER FOR THE SUBJECT "SEMESTER 2: MATHEMATICS FOR DATA SCIENCE 2"**

**ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?**

**CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.**

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

**Options :**

A. YES

B. NO

**Question Type : COMPREHENSION**

**Question Numbers : (234 to 235)**

Question Label : Comprehension

Let  $A$  be a  $3 \times 2$  non-zero real matrix.

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 234 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

The minimum value of  $\text{rank}(A)$  is \_\_\_\_\_.

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number :** 235 **Question Type :** SA

**Correct Marks :** 2

Question Label : Short Answer Question

The maximum value of  $\text{nullity}(A)$  is \_\_\_\_\_.

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number :** 236 **Question Type :** MSQ

**Correct Marks :** 8

Question Label : Multiple Select Question

An inner product on a vector space  $V$  is a function  $\langle \cdot, \cdot \rangle : V \times V \rightarrow \mathbb{R}$  satisfying the following conditions:

- Condition 1:  $\langle v, v \rangle > 0$  for all  $v \in V \setminus \{0\}$ ;  $\langle v, v \rangle = 0$  if and only if  $v = 0$ .
- Condition 2:  $\langle v_1 + v_2, v_3 \rangle = \langle v_1, v_3 \rangle + \langle v_2, v_3 \rangle$ .
- Condition 3:  $\langle v_1, v_2 \rangle = \langle v_2, v_1 \rangle$ .
- Condition 4:  $\langle cv_1, v_2 \rangle = c\langle v_1, v_2 \rangle$

Define  $V = \mathbb{R}^2$  and the function defined as:

$$\begin{aligned}\langle \cdot, \cdot \rangle : V \times V &\rightarrow \mathbb{R} \\ \langle (x_1, y_1), (x_2, y_2) \rangle &= 2x_1x_2 + 3y_1y_2.\end{aligned}$$

Which of the above conditions are satisfied for the above function?

**Options :**

- A. ✓ Condition 1.
- B. ✓ Condition 2.
- C. ✓ Condition 3.
- D. ✓ Condition 4.

**Question Number : 237 Question Type : MSQ**

**Correct Marks : 10**

Question Label : Multiple Select Question

Consider the following set  $S = \{(1, 1, 1), (-2, 1, 1), (0, 1, -1)\}$ . Which of the following options are true for  $S$ ?

**Options :**

- A. ✓ The cardinality of  $S$  is equal to the number of elements in any basis of  $\mathbb{R}^3$ .
- B. ✓  $S$  is a linearly independent set.
- C. ✓  $S$  spans  $\mathbb{R}^3$  (with respect to usual addition and scalar multiplication).
- D. ✓  $S$  is a basis of  $\mathbb{R}^3$  (with respect to usual addition and scalar multiplication).

E. ✓  $S$  is an orthogonal set with respect to usual inner product, i.e. dot product on  $\mathbb{R}^3$ .

F. ✗  $S$  is an orthonormal set with respect to usual inner product, i.e. dot product on  $\mathbb{R}^3$ .

## Question Type : COMPREHENSION

### Question Numbers : (238 to 241)

Question Label : Comprehension

Determine whether the statements given in the subquestions are true or false.

#### Sub questions

### Question Number : 238 Question Type : MCQ

#### Correct Marks : 4

Question Label : Multiple Choice Question

If  $A$  or  $B$  is invertible, then  $AB$  and  $BA$  are similar matrices (i.e.,  $AB$  is similar to  $BA$ ).

#### Options :

A. ✓ TRUE

B. ✗ FALSE

### Question Number : 239 Question Type : MCQ

#### Correct Marks : 2

Question Label : Multiple Choice Question

Any two scalar matrices are similar.

#### Options :

A. ✗ TRUE

B. ✓ FALSE

**Question Number : 240 Question Type : MCQ**

**Correct Marks : 2**

Question Label : Multiple Choice Question

If  $A$  is similar to  $B$ , then  $A^k$  is similar to  $B^k$ , for any positive integer  $k$ .

**Options :**

A. ✓ TRUE

B. ✗ FALSE

**Question Number : 241 Question Type : MCQ**

**Correct Marks : 4**

Question Label : Multiple Choice Question

If  $A$  and  $B$  are two  $3 \times 3$  matrices, which are similar to each other. Suppose the homogeneous system of linear equations  $Ax = 0$  has a unique solution, then the homogeneous system of linear equations  $Bx = 0$  also has a unique solution.

**Options :**

A. ✓ TRUE

B. ✗ FALSE

**Question Type : COMPREHENSION**

**Question Numbers : (242 to 246)**

Question Label : Comprehension

Anamika, Subhasis and Shreya pool together  $x$ ,  $y$ , and  $z$  amounts of money (in thousands) respectively, every month. The sum is distributed across three accounts  $A_1$ ,  $A_2$  and  $A_3$  as  $x + y + z$ ,  $z - 2y$  and  $2y - z$  respectively. This can be thought of as a linear transformation

$$T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$$

defined by

$$T(x, y, z) = (x + y + z, z - 2y, 2y - z) .$$

**Note:** A negative amount of money signifies the amount withdrawn from the accounts. Answer the subquestions using the information given above.

### Sub questions

#### Question Number : 242 Question Type : MCQ

##### Correct Marks : 6

Question Label : Multiple Choice Question

Which of the following vector spaces consists of vectors which could denote the amount of money deposited by Anamika, Subhasis and Shreya in a particular month such that in that month the amount deposited is 0 in each of the accounts  $A_1$ ,  $A_2$  and  $A_3$ .

##### Options :

A.  $\text{Span}\{(-3t, t, 0), (0, t, 2t) \mid t \in \mathbb{R}\}$

B.  $\text{Span}\{(-3t, t, 2t) \mid t \in \mathbb{R}\}$

C.  $\text{Span}\{(3t, -t, 2t) \mid t \in \mathbb{R}\}$

D.  $\text{Span}\{(3t, -t, 0), (0, -t, 2t) \mid t \in \mathbb{R}\}$

#### Question Number : 243 Question Type : SA

##### Correct Marks : 2

Question Label : Short Answer Question

Find out  $\text{nullity}(T)$ .

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

1

**Question Number :** 244 **Question Type :** SA

**Correct Marks :** 2

Question Label : Short Answer Question

Find out  $\text{rank}(T)$ .

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

**Question Number :** 245 **Question Type :** MCQ

**Correct Marks :** 2

Question Label : Multiple Choice Question

Which of the following options is true?

**Options :**

- A. ✘  $T$  is one to one.
- B. ✘  $T$  is onto.
- C. ✘  $T$  is both one to one and onto.
- D. ✓  $T$  is neither one to one nor onto.

**Question Number : 246 Question Type : MCQ****Correct Marks : 4**

Question Label : Multiple Choice Question

Which of the following matrices  
is the matrix representation of  $T$   
with respect to the ordered basis  
 $\{(1, 0, 0), (1, 1, 0), (1, 1, 1)\}$  of the  
domain and standard ordered  
basis of  $\mathbb{R}^3$  for the co-domain?

**Options :**

A. ✘ 
$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & -2 & 2 \\ 1 & 1 & -1 \end{bmatrix}$$

B. ✘ 
$$\begin{bmatrix} 1 & 1 & 1 \\ 0 & -2 & 1 \\ 0 & 2 & -1 \end{bmatrix}$$

C. ✘ 
$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & -2 & 2 \\ 3 & -1 & 1 \end{bmatrix}$$

D. ✓ 
$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -2 & -1 \\ 0 & 2 & 1 \end{bmatrix}$$

## Sem2 Stats2

**Number of Questions :** 12

**Section Marks :** 50

**Question Number : 247 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "SEMESTER 2: STATISTICS FOR DATA SCIENCE 2"

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 TOP FOR THE SUBJECTS REGISTERED BY YOU)

**Options :**

A.  Yes

B.  No

**Question Number : 248 Question Type : MCQ**

**Correct Marks : 0**

Question Label : Multiple Choice Question

Use the following values of  $F_Z$  if needed:

$$F_Z(0.13) = 0.55, F_Z(1.88) = 0.96995, F_Z(-1.88) = 0.03005, F_Z(0.4) = 0.65542, F_Z(1.64) = 0.95,$$

$$F_Z(-1.64) = 0.05, F_Z(1.9) = 0.97128, F_Z(1.33) = 0.90824, F_Z(-1.33) = 0.09176$$

List of options:

$$1. P(Z > a) = 1 - F_Z(a)$$

$$2. E[aX + bY] = aE[X] + bE[Y]$$

$$3. p^* = \arg \max_p \prod_{i=1}^{10} f_X(x_i; p)$$

$$4. P(|\bar{X} - \mu| > \delta) \leq \frac{\sigma^2}{n\delta^2}$$

$$5. \int_a^b x^n dx = \frac{x^n}{n+1} \Big|_a^b$$

6. Central Limit Theorem

7. If  $X$  and  $Y$  are independent, then  $\text{Var}[aX + Y] = a^2\text{Var}[X] + \text{Var}[Y]$ .

8.  $X \sim \text{Geometric}(p)$ ,  $f_X(k) = (1-p)^{k-1}p$ .

9. Sum of  $n$  i.i.d.  $\text{Bernoulli}(p)$  is  $\text{Binomial}(n, p)$

$$10. P(E) = \iint_{\text{Supp}(E)} f_{XY}(x, y) dx dy$$

$$11. P(a < X < b) = F_X(b) - F_X(a)$$

$$12. L(x_1, \dots, x_{10}) = \prod_{i=1}^{10} f_X(x_i; p)$$

$$13. \iint_{\text{Supp}} f_{XY}(x, y) dx dy = 1$$

$$14. F_Z(-a) = 1 - F_Z(a), Z \sim \text{Normal}(0, 1)$$

$$15. X \sim \text{Poisson}(\lambda), f_X(k) = \frac{e^{-\lambda} \lambda^k}{k!}.$$

16. If  $X$  and  $Y$  are independent, then  $E[XY] = E[X]E[Y]$ .

17. For an event  $E$ ,  $P(E^c) = 1 - P(E)$ .

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( $n, p$ )	${}^n C_k p^k (1-p)^{n-k},$ $k = 0, 1, \dots, n$	$\begin{cases} 0 & x < 0 \\ \sum_{i=0}^k {}^n C_i p^i (1-p)^{n-i} & k \leq x < k+1 \\ & k = 0, 1, \dots, n \\ 1 & x \geq n \end{cases}$	$np$	$np(1-p)$
Geometric( $p$ )	$(1-p)^{k-1} p,$ $k = 1, \dots, \infty$	$\begin{cases} 0 & x < 0 \\ 1 - (1-p)^k & k \leq x < k+1 \\ & k = 1, \dots, \infty \end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$
Poisson( $\lambda$ )	$\frac{e^{-\lambda} \lambda^k}{k!},$ $k = 0, 1, \dots, \infty$	$\begin{cases} 0 & x < 0 \\ e^{-\lambda} \sum_{i=0}^k \frac{\lambda^i}{i!} & k \leq x < k+1 \\ & k = 0, 1, \dots, \infty \end{cases}$	$\lambda$	$\lambda$

### 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,  $M_k(X_1, X_2, \dots, X_n) = \frac{1}{n} \sum_{i=1}^n X_i^k$

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:**

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

### Options :

A. ✓ Useful Data has been mentioned above.

B. ✗ This data attachment is just for a reference & not for an evaluation.

**Question Number : 249 Question Type : MCQ**

**Correct Marks : 3**

Question Label : Multiple Choice Question

Let  $X$  and  $Y$  be independent Poisson random variables with mean 1. Then

$P(\min(X, Y) = 0)$  equals

**Options :**

A. ✗  $e^{-2}$

B. ✗  $1 + e^{-2} - 2e^{-1}$

C. ✗  $2e^{-1}$

D. ✓  $2e^{-1} - e^{-2}$

**Question Number : 250 Question Type : MSQ****Correct Marks : 4**

Question Label : Multiple Select Question

Suppose the moment generating function of a random variable  $X$  is given by  $M_X(\lambda) = e^{8\lambda^2}$  and  $X_1, X_2, \dots, X_9$  are 9 i.i.d. samples with distribution  $X$ . Let  $Y$  be a random variable defined as  $Y = X_1 + X_2 + \dots + X_9$ . Which of the following options are true?

**Options :**

A. ✗  $X \sim \text{Normal}(0, 8)$ .

B. ✓  $X \sim \text{Normal}(0, 16)$ .

C. ✓ The moment generating function of  $Y$  is given by  $M_Y(\lambda) = e^{72\lambda^2}$ .

D. ✗ The moment generating function of  $Y$  is given by  $M_Y(\lambda) = 9e^{8\lambda^2}$ .

**Question Number : 251 Question Type : MSQ****Correct Marks : 5**

Question Label : Multiple Select Question

Suppose  $X_1, X_2, \dots, X_9 \sim \text{i.i.d. Poisson}(\lambda)$ . Let  $\hat{\lambda}_1 = \frac{1}{8} \sum_{i=1}^8 \frac{X_i + X_{i+1}}{2}$  and  $\hat{\lambda}_2 = \frac{1}{9} \sum_{i=1}^8 \frac{X_i + X_{i+1}}{2}$  be two estimators of  $\lambda$ . Which of the following statements are correct?

**Options :**

A. ❌ Both  $\hat{\lambda}_1$  and  $\hat{\lambda}_2$  are biased estimators of  $\lambda$ .

B. ✓  $\hat{\lambda}_1$  is an unbiased estimator of  $\lambda$ .

C. ❌  $\hat{\lambda}_2$  is an unbiased estimator of  $\lambda$ .

D. ✓ The variance of  $\hat{\lambda}_1$  is  $\frac{15\lambda}{128}$ .

E. ✓ The bias of  $\hat{\lambda}_2$  is  $\frac{-\lambda}{9}$ .

**Question Number : 252 Question Type : SA****Correct Marks : 2**

Question Label : Short Answer Question

A random sample of size 64 is collected from a normal population with mean  $\mu$  and variance  $\sigma^2$ .

Suppose the expected value and the variance of the sample mean is 50 and 0.25, respectively. Find the value of  $\mu - 11\sigma$ .

**Response Type :** Numeric**Evaluation Required For SA :** Yes**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

6

**Question Type : COMPREHENSION**

**Question Numbers : (253 to 254)**

Question Label : Comprehension

Answer the given subquestions.

**Sub questions**

**Question Number : 253 Question Type : SA**

**Correct Marks : 5**

Question Label : Short Answer Question

An urn contains a certain number of balls and one of them is numbered 1. Let the probability of drawing a 1 be  $p$ . Independent draws are made with replacement until ball 1 is drawn. The experiment is conducted 10 times and number of draws made are as follows: 4, 3, 1, 5, 7, 5, 4, 2, 6, 8. Find the maximum likelihood estimate of  $p$ . Enter your 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 :**

0.20 to 0.24

**Question Number : 254 Question Type : SA**

**Correct Marks : 0**

**Question Label :** Short Answer Question

Select three facts/formulae/steps from the list of options that you will use for solving the previous question.

**Note:** "This question is optional. We will check your answer to this question if you make a mistake in the previous one. Please enter your answers in comma-separated format. E.g. 1, 2, 3". Check the list of options given in the data attachment.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

3, 8, 12

**Question Type :** COMPREHENSION

**Question Numbers :** (255 to 257)

**Question Label :** Comprehension

At a particular petrol pump, petrol is stocked in a bulk tank each week. Let random variable  $X$  denote the proportion of the tank's capacity that is filled for a given week, and let  $Y$  denote the proportion of the tank's capacity that is sold in the same week.

The petrol pump cannot sell more than what was stocked in a given week. Assume the joint density function of  $X$  and  $Y$  is given by

$$f_{XY}(x, y) = \begin{cases} c & \text{if } 0 \leq y \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Based on the above data, answer the given subquestions.

### **Sub questions**

#### **Question Number : 255 Question Type : SA**

##### **Correct Marks : 2**

Question Label : Short Answer Question

Find  $c$  so that  $f_{XY}$  is a valid PDF.

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

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

2

#### **Question Number : 256 Question Type : SA**

##### **Correct Marks : 2**

Question Label : Short Answer Question

Find the probability that in a given week the amount of petrol sold is less than half the amount that is stocked. Enter the answer correct to one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.5

**Question Number : 257 Question Type : SA**

**Correct Marks : 0**

Question Label : Short Answer Question

Select three facts/formulae/steps from the list of options that you will use for solving question number 255 & 256.

**Note:** "This question is optional. We will check your answer to this question if you make a mistake in the previous one. Please enter your answers in comma-separated format. E.g. 1, 2, 3". Check the list of options given in the data attachment.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

5, 10, 13, 17

**Question Type : COMPREHENSION**

**Question Numbers : (258 to 259)**

Question Label : Comprehension

Answer the given subquestions

**Sub questions**

**Question Number : 258 Question Type : SA**

**Correct Marks : 4**

**Question Label :** Short Answer Question

A truck can hold 50 containers (identical in shape and size) and can safely carry 2700 kg. The average weight of the containers is 50 kg with standard deviation of 15 kg. What is the approximate probability that 50 containers will overload the truck? Write your answer correct to 3 decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

0.029 to 0.031

**Question Number : 259 Question Type : SA**

**Correct Marks : 0**

**Question Label :** Short Answer Question

Select three facts/formulae/steps from the list of options that you will use for solving the previous question.

**Note:** "This question is optional. We will check your answer to this question if you make a mistake in the previous one. Please enter your answers in comma-separated format. E.g. 1, 2, 3". Check the list of options given in the data attachment.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

1, 2, 6, 7, 14

**Question Type : COMPREHENSION**

**Question Numbers : (260 to 262)**

Question Label : Comprehension

Let the joint PDF of two random variables  $X$  and  $Y$  be given by

$$f_{XY}(x, y) = \begin{cases} kxy & \text{if } 0 < x < 1, 0 < y < 1. \\ 0 & \text{otherwise} \end{cases}$$

Based on the above data, answer the given subquestions.

**Sub questions**

**Question Number : 260 Question Type : SA**

**Correct Marks : 2**

Question Label : Short Answer Question

Find the value of  $k$  so that  $f_{XY}$  is a valid PDF.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

4

**Question Number : 261 Question Type : SA**

**Correct Marks : 2**

**Question Label :** Short Answer Question

Find  $P\left(Y \leq \frac{X}{2}\right)$ . Enter the answer correct to three decimal places.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.125

**Question Number :** 262 **Question Type :** SA

**Correct Marks :** 3

Question Label : Short Answer Question

Find  $P\left(Y \leq \frac{X}{4} | Y \leq \frac{X}{2}\right)$ . Enter the

answer correct to two decimal places.

**Hint:**

$$\text{Use } \int_{x=a}^b x^n dx = \frac{1}{n+1} (b^{n+1} - a^{n+1})$$

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.25

**Question Type :** COMPREHENSION

**Question Numbers : (263 to 265)**

Question Label : Comprehension

A fair die is rolled  $n$  times. Let  $S$  denote the total number of times six is obtained.

Based on the above data, answer the given subquestions.

**Sub questions****Question Number : 263 Question Type : SA****Correct Marks : 3**

Question Label : Short Answer Question

Use Weak Law of Large Numbers to find the minimum value of  $n$  such that

$$P \left( \left| \frac{S}{n} - \frac{1}{6} \right| > 0.1 \right) < 0.1$$

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

139

**Question Number : 264 Question Type : SA****Correct Marks : 4**

Question Label : Short Answer Question

Use CLT to find the value of  $n$  such that

$$P\left(\left|\frac{S}{n} - \frac{1}{6}\right| > 0.1\right) < 0.1$$

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

38

**Question Number :** 265 **Question Type :** SA

**Correct Marks :** 0

Question Label : Short Answer Question

Select four facts/formulae/steps from the list of options that you will use for solving question number 263 & 264.

**Note:** "This question is optional. We will check your answer to this question if you make a mistake in the previous one. Please enter your answers in comma-separated format. E.g. 1, 2, 3". Check the list of options given in the data attachment.

**Response Type :** Alphanumeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Set

**Answers Case Sensitive :** No

**Text Areas :** PlainText

**Possible Answers :**

1, 2, 4, 6, 7, 9, 11, 14

**Question Type :** COMPREHENSION

**Question Numbers : (266 to 268)**

Question Label : Comprehension

Let  $X$  be a discrete random variable with the following probability mass function:

$X$	0	1	2	3
$f_X(x)$	$\theta/2$	$(1 - \theta)/2$	$\theta/2$	$(1 - \theta)/2$

where  $0 < \theta < 1$ . Suppose we want to estimate the parameter  $\theta$  from i.i.d. samples of  $X$ .

Based on the above data, answer the given subquestions.

**Sub questions****Question Number : 266 Question Type : MCQ****Correct Marks : 2**

Question Label : Multiple Choice Question

Calculate the first moment of  $X$ .

**Options :**A. ✘  $\theta + 2$ B. ✓  $2 - \theta$ C. ✘  $1 + \frac{\theta}{2}$ D. ✘  $\theta - 2$ **Question Number : 267 Question Type : SA**

**Correct Marks : 3**

**Question Label :** Short Answer Question

Find the estimate of  $\theta$  for the samples 0, 1, 2, 3, 3, 2, 0, 0, 2, 1 using method of moments. Write your answer correct to one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.6

**Question Number : 268 Question Type : SA**

**Correct Marks : 4**

**Question Label :** Short Answer Question

Find the maximum likelihood estimate of  $\theta$  for the samples 1, 2, 3, 2, 1. Write your answer correct to one decimal place.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

0.4