IIT M DIPLOMA QUIZ2 EXAM QPD2

Notations :

1.Options shown in green color and with ✔ icon are correct.

2.Options shown in red color and with ✖ icon are incorrect.

Question Paper Name : IIT M DIPLOMA QUIZ2 EXAM QPD2 13 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

SUMMARY OUTPUT						
Regression Statistics						
Multiple R	0.841686					
R Square	0.708436					
Adjusted R Square	0.666784					
Standard Error	1824.364					
Observations	9					
ANOVA						
	df	*SS*	*MS*	*F*	*Significance F*	
Regression	1	56609307	56609307	17.00846	0.004437	
Residual	7	23298125	3328304			
Total	8	79907432				
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	8125	1538.439	5.281328	0.001146	4487.171	11762.83
X Variable 1	-194.267	47.10487	-4.12413	0.004437	-305.652	-82.8813

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)

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

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 places)

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 subquestion.

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

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

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

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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 in R, the LHS is a super key, then R is in BCNF as well.
2. If a relation R is in BCNF and has multivalued dependencies, then R is in 4NF as well.
3. If a relation R is in 1NF and has no partial dependencies, then R is in 2NF as well.

Choose the correct option.

Options :

A. ✖ Only Statement 2 is correct.

B. ✖ Only Statements 2 & 3 are correct.

C. ✔ Only Statements 1 & 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")
       --------A--------
        cur.execute('''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.cursor(), B: cur.execute()

B. ✔ A: cur = conn.cursor(), B: cur.close()

C. ✖ A: conn = cur.cursor(), B: cur.execute()

D. ✖ A: conn.cur.open(), B: conn.cur.close()

Question Number : 41 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Consider the following statements.

1. In linear data structures, data elements can be traversed in one way only.

2. In non-linear data structures, data elements are arranged in a networked manner.

3. In linear data structures, data elements are stored in multiple levels.

4. Trees, graph, hash map are examples of non-linear data structures.

Choose the correct option.

Options :

A. ✖ Statements 1 & 2 are correct.

B. ✖ Statements 1, 2 & 3 are correct.

C. ✔ Statements 1, 2, & 4 are correct.

D. ✖ Statements 3 & 4 are correct.

Question Number : 42 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

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

$\mathcal{F} = \{L \rightarrow J, J \rightarrow K, LM \rightarrow K\}$

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

Options :

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

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

C. ✖ $\mathcal{F} = \{L \rightarrow J, LM \rightarrow K\}$

D. ✔ $\mathcal{F} = \{L \rightarrow J, J \rightarrow K\}$

Question Number : 43 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following is not used to read the result of a query using Python psycopg2 module?

Options :

A. ✔ fetch()

B. ✖ fetchone()

C. ✖ fetchmany()

D. ✖ fetchall()

Question Type : COMPREHENSION

Question Numbers : (44 to 45)

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 : 44 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Identify the prime attribute(s) for the **Employee** relation

Options :

A. ✔ *pid*

B. ✖ *mid*

C. ✔ *eid*

D. ✖ None of these

Question Number : 45 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Identify the correct 2NF decomposition for the given relation **Employee**.

Options :

A. ✔ **E1** (*eid, ename, eaddress, mid, mname*), **E2** (*pid, pname*), **E3** (*eid, pid*)

B. ✖ **E1** (*eid, ename, eaddress*), **E2** (*pid, pname*), **E3** (*mid, mname*)

C. ✖ **E1**(*eid, ename, eaddress, mid, mname*), **E2** (*pid, pname*)

D. ✖ **E1**(*eid, ename, eaddress, pid, pname*), **E2** (*mid, mname*)

Question Number : 46 Question Type : SA

Correct Marks : 4

Question Label : Short Answer Question

Let $\mathrm{R}(J, K, L, M, N, O)$ be a given relation with the following functional dependencies:
$\mathcal{F} = \{K \rightarrow JL, L \rightarrow K, J \rightarrow O, M \rightarrow N\}$

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 Number : 47 Question Type : MCQ

Correct Marks : 4

Question Label : Multiple Choice Question

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

$$\mathcal{F} = \{c_id \rightarrow (c_name, mobile),$$
$$(\text{c_name,mobile}) \rightarrow room_no,$$
$$\text{room_no} \rightarrow room_type\}$$

Statement 1: The above relation can be decomposed into smaller relations, each of which is in BCNF, such that the decomposition is dependency preserving.

Statement 2: The above relation can be decomposed into smaller relations, each of which is in 3NF, such that the decomposition is dependency preserving.

Options :

A. ✖ Statement 1 is correct and Statement 2 is wrong

B. ✖ Both the statements are wrong.

C. ✖ Statement 1 is wrong and Statement 2 is correct.

D. ✔ Both the statements are correct.

Question Number : 48 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:

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

Options :

A. ✖

Credit
7
8
9
6

B. ✔

Credit
9
7
9
7

C. ✖

Credit
9
7
7
9

D. ✖

Credit
7
7
9
9

Question Number : 49 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. The surface of each platter is logically divided into 64 tracks, each of which is subdivided into 128 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 : 50 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Consider the relation **mobile** (*c_name, imei_no, model, price*). If all the mobile phones have the same price, then which of the following functional dependency/dependencies hold(s) in **mobile**?

NOTE [*imei_no* is unique for every mobile]

Options :

A. ✔ *c_name* → price

B. ✖ *price* → model

C. ✔ *imei_no* → price

D. ✖ *price* → c_name

Question Number : 51 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' or '5' = '5'`

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 : 52 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Consider an **NPTEL** database having the following tables:

students($\underline{roll_no}$, $sname$, age, $university$)
course($\underline{course_id}$, $cname$, $grade$, $roll_no$)

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/are true?

Options :

A. ✔ Query 1 will execute more efficiently when multitable clustering file organization scheme is used.

B. ✖ Both the queries will execute more efficiently when sequential clustering file organization scheme is used.

C. ✔ Query 2 will execute more efficiently when sequential clustering file organization scheme is used.

D. ✖ Query 1 will execute more efficiently when sequential clustering file organization scheme is used.

Question Number : 53 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Consider a relation $\mathbf{R}(U, V, W, X, Y)$ with the following functional dependencies:

$\mathcal{F} = \{X \rightarrow Y, U \rightarrow VW, V \rightarrow W\}$

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

Options :

A. ✖ R1(X,Y) and R2(Y,V,W)

B. ✔ R1(X,Y,U) and R2(U,V,W)

C. ✖ R1(X,Y,U) and R2(V,W)

D. ✔ R1(X,Y,U) and R2(X,U,V,W)

Question Number : 54 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: 17, 23, 33, 49, 51, 32, 73, 2, 98. 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 :

6

Question Number : 55 Question Type : MSQ

Correct Marks : 2

Question Label : Multiple Select Question

Which of the following statements is/are true about a **data dictionary**?

Options :

A. ✔ It is a collection of names, definitions, and attributes about data elements that are being used or captured in a database

B. ✔ DDL commands are capable of updating data dictionary.

C. ✖ The data dictionary cannot be updated once a database is created.

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 $-i * A$ 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 $S = \begin{bmatrix} 1 & i & 2i \\ -i & 2 & -i \\ -2i & i & 1 \end{bmatrix}$ is QTQ^*. Let

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

Options :

A. ✖ unaltered

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

E. ✖ The matrix T will be divided by k

F. ✖ The matrix Q will be divided by k

Question Number : 60 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

The function $f(x, y) = 2x^2 + 2xy + 2y^2 - 12x$ has a stationary point at

Options :

A. ✖ (4, 2)

B. ✖ (-4, -2)

C. ✖ (-2, 4)

D. ✔ (4, -2)

Question Number : 61 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. ✔ $\begin{bmatrix} x & y & z \end{bmatrix} \begin{bmatrix} 1 & -1 & 0 \\ 0 & -1 & 0 \\ 1 & 1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

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

C. ✖

$$\begin{bmatrix} x & y & z \end{bmatrix} \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 0 \\ 1 & -1 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix}$$

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

Question Number : 62 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

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

Options :

A. ✔ positive definite

B. ✖ positive semi-definite

C. ✖ negative definite

D. ✖ negative semi-definite

Question Number : 63 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

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

Options :

A. ✖ $k \geq \frac{1}{2}$

B. ✔ $k > 0$

C. ✖ $k < 1$

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 : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Check whether the matrix $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ -\frac{1}{\sqrt{2}}i & \frac{1}{\sqrt{2}}i & 0 \\ 0 & 0 & i \end{bmatrix}$ is unitary and choose the eigenvalues of the matrix A.

Options :

A. ✔ $\{0.9659 - 0.2588i, -0.2588 + 0.9659i, i\}$

B. ✖ $\{0.8414 - 0.1586i, -0.1586 + 0.8414i, i\}$

C. ✖ $\{1 - i, -i, i\}$

D. ✖ $\{1 + i, 1 - i, -1\}$

Question Number : 66 Question Type : MSQ

Correct Marks : 2

Question Label : Multiple Select Question

Which of the following is a convex function?

Options :

A. ✖ $f(x) = \frac{1}{x^3}$ over $\mathbb{R}$

B. ✔ $f(x) = -log(x)$ over $\mathbb{R}$

C. ✖ $-e^{2x}$ given $x \in \mathbb{R}$

D. ✔ $f(x) = 7x^2 + 5x$ over $\mathbb{R}$

Question Number : 67 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. ✖ $-0.1x_1 + 0.2x_2 + 0.6x_3 + 0.7x_4$

B. ✔ $0.2x_1 + 0.2x_2 + 0.3x_3 + 0.3x_4$

C. ✖ $0.1x_1 + 0.1^2x_2 + 0.1^3x_3 + 0.1^3x_4$

D. ✔ $0.25x_1 + 0.25x_2 + 0.15x_3 + 0.35x_4$

Question Number : 68 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

Consider the vector $w = \begin{bmatrix} 2 \\ -2 \\ 1+i \\ -1-i \end{bmatrix}$ and $z = \begin{bmatrix} 1+i \\ 1+i \\ -1-i \\ 1+i \end{bmatrix}$. $z = u + v$ for some u, v from $\mathbb{C}^4$. If $v.w$ is $-4-2i$, $u.w = a + ib$, 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 :

2

Question Number : 69 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

A matrix S is decomposed using SVD as given below

$$S = \begin{bmatrix} -0.9739 & -0.1146 & 0.1961 \\ -0.1539 & -0.3023 & -0.9407 \\ 0.1671 & -0.9463 & 0.2768 \end{bmatrix} \begin{bmatrix} 3.8287 & 0 & 0 \\ 0 & 1.6607 & 0 \\ 0 & 0 & 1.2582 \end{bmatrix} \begin{bmatrix} -0.2578 & 0.6829 & 0.6835 \\ -0.4651 & -0.7078 & 0.5317 \\ -0.8469 & 0.1808 & -0.5001 \end{bmatrix}$$

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 :

62 to 66

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 $f(10) = 2500$, $f'(10) = 250$ 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 :

2550 to 2552

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

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

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 $C = \frac{1}{n}\Sigma_{i=1}^{n}(x_i - \overline{x})(x_i - \overline{x})^T$ are

Options :

A. ✖ 0.5, 1.18

B. ✖ 0.34, 0.34

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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(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 one of the following is the correct way to instantiate perceptron model, with unit learning rate and without regularization?

Options :

A. ✔
```
SGDClassifier(loss="perceptron", eta0=1,
              learning_rate="constant", penalty=None)
```

B. ✖
```
SGDClassifier(model="perceptron", alpha=1,
              learning_rate="constant", penalty=None)
```

C. ✖
```
SGDClassifier(model="perceptron", eta0=1,
              learning_rate="constant", penalty=null)
```

D. ✖
```
SGDClassifier(loss="perceptron", eta0=1,
              learning_rate="constant", regularize=None)
```

Question Number : 79 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Given that sklearn's Wine data set has 3 classes, how many binary classifiers will be created internally by the following code?

```
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(multi_class = 'ovr', random_state = 10)
model.fit(X,y)
model.score(X,y)
```

Options :

A. ✖ 1

B. ✖ 2

C. ✔ 3

D. ✖ 4

Question Number : 80 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Suppose the decision boundaries shown in Figure 1 were generated for the different values of regularization. Which of the decision boundaries shows the maximum regularization?

Figure 1

Options :

A. ✔ Figure A

B. ✖ Figure B

C. ✖ Figure C

D. ✖ All have equal regularization

Question Number : 81 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

We run the following code:

```
import pandas as pd
from sklearn.datasets import load_iris
from sklearn.linear_model import LogisticRegression
data = load_iris()
X = pd.DataFrame(data.data, columns = data.feature_names)
y = pd.DataFrame(data.target)
model = LogisticRegression(solver = 'saga', penalty = 'elasticnet',
                           random_state = 1)
model.fit(X,y)
model.score(X,y)
```

What do you think will be the output?

Options :

A. ✖ The model will output the score at the end of the training.

B. ✖ The model will throw an error as the dataset is a classificiation dataset and we are using LogisticRegression.

C. ✖ The model will throw an error as we are using elasticnet with saga which is not supported.

D. ✔ The model will throw an error as we need to specify l1_ratio since we are using elasticnet.

Question Number : 82 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 = [[5],[10], [15], [20], [25]]
y = [0, 0, 1, 1, 1]
neigh = KNeighborsClassifier(n_neighbors=3)
neigh.fit(X, y)
print(neigh.predict([[13]]))
```

Options :

A. ✖ 0

B. ✔ 1

C. ✖ 2

D. ✖ None

Question Number : 83 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. ✖ 2

B. ✔ 6

C. ✖ 10

D. ✖ 3

Question Number : 84 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([[0, 0], [1, 1]])
y = np.array([0, 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[4]

B. ✖ array[3]

C. ✖ array[2]

D. ✔ array[1]

Question Number : 85 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

$l1$ penalty in LinearSVC classifier leads to coef_vectors which are-

Options :

A. ✔ sparse

B. ✖ dense

C. ✖ dense but not sparse

D. ✖ None of these

Question Number : 86 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 == 4)[0]
indices2 = np.where(y == 3)[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 4 and 3

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 : 87 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

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

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

Which of the following will plot the ROC curve correctly?

Options :

A. ✔
```
scores = clf.decision_function(X)
p,r, _ = roc_curve(y, scores)
plt.plot(p[:-1], r[:-1])
```

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

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

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

Question Number : 88 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the following code:

```
import pandas as pd
from sklearn.datasets import load_iris
from sklearn.linear_model import LogisticRegression
data = load_iris()
X = pd.DataFrame(data.data, columns = data.feature_names)
y = pd.DataFrame(data.target)
model = LogisticRegression(penalty = '12', solver = ..........,
                           random_state = 100)
model.fit(X,y)
model.score(X,y)
```

What is the correct solver to be filled in the blank space to avoid any error?

Options :

A. ✖ ‘lbfgs’

B. ✖ ‘liblinear’

C. ✖ ‘saga’

D. ✖ ‘newton-cg’

E. ✔ Any of these

Question Number : 89 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

What can we conclude after seeing the following visualization?

Figure 1

1. The training error in first plot is maximum as compare to second and third plot.
2. The best model for this regression problem is the last (third) plot because it has minimum training error (zero).
3. The second model is more robust than first and third because it will perform best on unseen data.
4. The third model is overfitting more as compare to first and second.
5. All will perform same because we have not seen the testing data.

Options :

A. ✖ 1 and 3

B. ✖ 1 and 2

C. ✔ 1, 3 and 4

D. ✖ 5

Question Number : 90 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

In _____, parameters are updated after computing the gradient of error with respect to a subset (of size greater than one and less than number of weights) of the training set.

Options :

A. ✖ Stochastic Gradient Descent

B. ✔ Batch Gradient Descent

C. ✖ Mini-Batch Gradient Descent

D. ✖ None of these

Question Number : 91 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Rakesh is getting very high variance for *k* = 12. What idea would you suggest him to decrease the variance ?

Options :

A. ✖ Decrease the k value

B. ✔ Increase the k value

C. ✖ Ignore that because it won't affect model's performance

Question Number : 92 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following numerical value should be at the place of * symbol. (Assume necessary imports)

```
text- ['We went to college',' We got good grades .We got jobs' ]
countvectorizer = CountVectorizer()
est  = countvectorizer.fit_transform(text)
Words - countvectorizer.get_feature_names()
df = pd.DataFrame(data = est.toarray(),index = ['Sen1','Sen2'],
                  columns = Words)
df.head()
```

	college	good	got	grades	jobs	to	we	went
Sen1	1	0	0	0	0	1	1	1
Sen2	0	1	2	1	1	0	*	0

Figure 3

Options :

A. ✖ 0

B. ✔ 2

C. ✖ 1

D. ✖ None

Question Number : 93 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=0.002,
                                   fit_intercept=False)
```

Options :

A. ✔ It fits a model that doesn't have weight parameter for dummy feature.

B. ✔ The L2 regularization rate is 0.002.

C. ✖ It fits a logistic regression model.

D. ✖ It is suitable for fitting a regression model.

Question Number : 94 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 would not help him ? Check all that apply.

Options :

A. ✔ MiniBatchKMeans

B. ✖ Perceptron

C. ✔ LogisticRegression

D. ✖ SGDClassifier

E. ✖ MultinomialNB

Question Number : 95 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 :

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[[1]]):
    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. ✖
```
from sklearn.linear_model import SGDRegressor
regressor = SGDRegressor(random_state=10)
for i in range(X_train.shape[[1]]):
    X_batch, Y_batch = X_train[i], Y_train[i]
    regressor.partial_fit(X_batch, Y_batch)
```

Question Number : 96 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

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

```
from sklearn.metrics import DistanceMetric
dist = DistanceMetric.get_metric('manhattan')
X = [[0, 1,],
     [2, 3,]]
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

Question Number : 97 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 :

5

Question Number : 98 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],[4]]
Y = [0, 1, 2,3,4]
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 :

10

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.

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

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	$P(y = 1 \mid x)$	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 $\mathbf{w_0}$ 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:

$$\boldsymbol{w_1} = \frac{\boldsymbol{w_0}}{2}, \quad \text{for } M_1$$
$$\boldsymbol{w_2} = 2\boldsymbol{w_0}, \quad \text{for } M_2$$

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 money 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:

$$x = \begin{bmatrix} 3 \\ 2 \\ 1 \\ 3 \\ 4 \end{bmatrix} \quad y = \begin{bmatrix} 5 \\ 4 \\ 6 \\ 2 \\ 4 \end{bmatrix}$$

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

Options :

A. ✖ 51

B. ✔ 2601

C. ✖ [34,20,37,13,32]

D. ✖ [8,6,7,6,16]

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** = [-2, 0, 2, -2, -1, 2, -2, -3, -3, 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 $\boldsymbol{w}$, 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 **x**, which of the following is the correct expression for the probability: *P(y = 1 | **x**)*?

Options :

A. ✔ $\sigma(\boldsymbol{w}^T\boldsymbol{x}+b)$

B. ✖ $\sigma(\boldsymbol{w}^T\boldsymbol{x})$

C. ✖ $\boldsymbol{w}^T\boldsymbol{x}+b$

D. ✖ $\sigma(\boldsymbol{w}^T\boldsymbol{x})+b$

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.

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

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

Options :

A. ✖ $\boldsymbol{w}^T \boldsymbol{x} + b = 0$

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

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

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

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

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 **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 $\boldsymbol{x}$ is of size $m+1$ (including the dummy feature) and the weight vector $\boldsymbol{w}$ has the same shape as $\boldsymbol{x}$, then the model predicts a value $\hat{y}$ as follows:

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

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 $\boldsymbol{x}$ with true label y. The model's prediction is $\hat{y}$.

Options :

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

B. ✖ $(\hat{y} - y) \cdot \boldsymbol{x}$

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

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

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 **x**, just before the Softmax, the linear combination is given by **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 :

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

B. ✖ $\frac{z_c}{\sum_{i=1}^{k} z_i}$

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

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

Question Number : 116 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Assume that we have a new input vector $\boldsymbol{x}^*$ for which the linear combination just before Softmax turns out to be $2\boldsymbol{z}$. Which of the following is the correct expression for $P(y = c \mid \boldsymbol{x}^*)$? 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
$(0,0)$	15	1
$(0,0)$	5	2
$(0,1)$	5	1
$(0,1)$	30	2
$(1,0)$	20	1
$(1,0)$	10	2
$(1,1)$	5	1
$(1,1)$	15	2

The table is to be parsed as follows. The first row of the table states that there are 15 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 :

0.54 to 0.56

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 :

0.40 to 0.42

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 :

0.21 to 0.23

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 :

0.74 to 0.76

Question Type : COMPREHENSION

Question Numbers : (121 to 124)

Question Label : Comprehension

There is a linearly separable dataset 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 ($\mathrm{w} = \begin{bmatrix} w_0 \\ w_1 \end{bmatrix}$) and bias (b) of the separating hyper plane.

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 :

3 to 5

Question Number : 122 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

Enter the value of w_1 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 :

-3 to -2

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 :

-3 to -2

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 :

A. ✖
```
Select
user_name
FROM
user, article_authors
WHERE
article_id=2 and user.user_id=article_authors.user_id;
```

B. ✖
```
Select
count(user_name)
FROM
user, article_authors
WHERE
article_id=1;
```

C. ✔
```
Select
count(user_name)
FROM
user, article_authors
WHERE
article_id=1 and user.user_id=article_authors.user_id;
```

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 :

A. ✖

```
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))
    customer_id = db.Column(db.Integer, db.ForeignKey('customer.id'))
```

B. ✔

```
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))
    customer_id = db.Column(db.Integer,
    db.ForeignKey('customer.id'))
```

C. ✖

```
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))
    customer_id = db.Column(db.Integer, db.ForeignKey('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[1]})

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

If the above flask application is running 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": "Python"
  }
}
```

B. ✖
```
"The list of Programming languages":
  {
    "course": "C++"
  },
  {
    "course": "Python"
  },
  {
    "course": "Java"
  }
```

C. ✖
```
"The list of Programming languages": "C++", "Python", "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:",(sys.argv))
```

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

```
python dummy.py MAD1 BSc
```

Options :

A. ✖
```
Script name/path executed: dummy.py
Number of arguments: 3
Argument List: "['dummy.py', 'MAD1', 'Bsc']"
```

B. ✖
```
Script name/path executed: dummy.py
Number of arguments: 2
Argument List: ['dummy.py', 'MAD1', 'Bsc']
```

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

D. ✖
```
Script name/path executed: dummy.py
Number of arguments: 2
Argument List: "['dummy.py', '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 on 'http://127.0.0.1:5000/', what will be the out for the URLs: 'http://127.0.0.1:5000/api/result/4' and 'http://127.0.0.1:5000/api/result/11' respectively?

Options :

A. ✖ 16 and 121

B. ✔ 24 and 121

C. ✖ 24 and 39916800

D. ✖ 16 and 39916800

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 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': '123', 'book_name': '127 hours' })
print(response.text)
```

Options :

A. ✖

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

B. ✔ “The book: 127 hours having book-id 123 is issued to the user”

C. ✖

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

D. ✖

```
{
    "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"
    }
}
```

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 function1():
    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 }}
     These are {{ category }}</h3>
     <p>The list of the devices are:</p>
     {% for product in products %}
       {{ product }}
     {% endfor %}

</body>
</html>
```

How will 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. ✔ 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

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/BM”?

Options :

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

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

C. ✔ It will show.
Model information is not Available

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, '/fruits_list/<int:f_id>')


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

If this flask application is running 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://127.0.0.1:5000/2", the browser will show 'page not found' error.

B. ✔ On the URL, "http://127.0.0.1:5000/", the browser will render.

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

C. ✖ On the URL, "http://127.0.0.1:5000/3", the browser will render

```
"Pear"
```

D. ✖ None of these

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. ✖ Static web pages always need a database to store information.

B. ✔ In static webpage information rarely changes, whereas in dynamic webpage, information can change frequently.

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 on URL: "http://localhost:5000", which of the following is/are correct?

Options :

A. ✖ for URL: "http://localhost:5000/colour/purple/5", the rendered output will have text in black colour with yellow background

B. ✔ for URL: "http://localhost:5000/colour/purple/5", the rendered output will have text in white colour with purple background

C. ✔ for URL: “http://localhost:5000/colour/purple/0”, the final URL on the URL tab will be “http://localhost:5000/colour/purple/6”

D. ✖ for URL: “http://localhost:5000/colour/purple/0”, the final URL on the URL 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 out on the browser’s console?

Options :

A. ✖ 50 7 25

B. ✖ 50 7 25 30

C. ✔ 50 7 25 and an error “Variable_2 is Not defined”

D. ✖ 7 25 30 and an error “Variable_1 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/”?

Options :

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

B. ✔ 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.

C. ✖ A log file “record” will be created inside the flask application folder.

D. ✖ Whenever we hit the URL “http://localhost:5000/”, 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_sqlachemy 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 create one record having article_id=2 and title "Title 5".

B. ✔ The above query will update the record having article_id=2 and changes the title column to '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(nlogn) and O(n), respectively, spend exactly $T_A(n) = c_A n \log(n)$ and $T_B(n) = c_B n$ milliseconds to process n data items. During a test, the average time of processing $n = 10^5$ data items with the package A and B is 250 milliseconds and 500 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 7200 rpm is being used to store data. The disk can only spin in one direction at a constant speed of 7200 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 half circle ahead from the reader, what will be the latency (in milliseconds) before it can start retrieving data?

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 :

4.15 to 4.20

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 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 number 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 “undefined”, before it is initialized.

D. ✔ All of these

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', 'Virat Kohli')
    },
  },
}

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

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: profile},
      { path: '*', component: error },
    ],
  },
]

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

B. ✖ User ID: 1
Name: Rohit Sharma

C. ✔ User ID: 1
404: Profile not found

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 == 'S' ? 'A' : 'a')
          : this.fruits
      })
    },
  },
})
```

Suppose the application is running on "http://localhost:8080". What will be rendered if the user types 'S' (uppercase) in the input box?

Options :

A. ✖ abiu
ackee

B. ✔ Apple
Acrola

C. ✖ Apple
abiu
Acrola
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 ‘s’ (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 == 'S' ? 'A' : 'a')
          : this.fruits
      })
    },
  },
})
```

Options :

A. ✔ abiu
ackee

B. ✖ Apple
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 = await resolver1();
 const p2 = await resolver2();
 console.log(p1);
 console.log(p2);
}
Start();
```

Options :

A. ✖ Resolver2 promise is done
Resolver1 promise is done
mad1
mad2

B. ✔ Resolver1 promise is done
Resolver2 promise is done
mad1
mad2

C. ✖ Resolver2 promise is done
Resolver1 promise is done
mad2
mad1

D. ✖ Resolver1 promise is done
Resolver2 promise is done
mad2
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 :

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

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 statements is 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 : ‘same-origin’” 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 : 152 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Which of the following URLs has the same origin as

"https://www.iitm.ac.in:8080/home.html"?

Options :

A. ✔ https://www.iitm.ac.in:8080/departments.html

B. ✖ https://www.iitm.ac.in:5000/home.html

C. ✖ http://www.iitm.ac.in:8080/home.html

D. ✖ http://onlinedegree.iitm.ac.in:8080/home.html

Question Number : 153 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. ✔ ‘false’, ‘Present’

C. ✖ ‘false’, ‘Not Present’

D. ✖ ‘iitm’, ‘Present’

Question Number : 154 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', 'Virat Kohli')
    },
  },
}

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

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 : 155 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: profile},
      { path: '*', component: error },
    ],
  },
]

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

B. ✔ User ID: 1
Name: Rohit Sharma

C. ✖ User ID: 1
404: Profile not found

D. ✖ None of these

Question Number : 156 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) } })
```

C. ✖

```
code1: actions
code2: context.students.forEach(student=>{
                    if(student.marks>=90){
                    context.toppers.push(student) } })
```

D. ✔

```
code1: mutations
code2: state.students.forEach(student=>{
                    if(student.marks>=90){
                    state.toppers.push(student) } })
```

Question Number : 157 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Which of the following statement(s) is/are 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. ✔ All REST API CRUD endpoints should always return 200 as status code.

D. ✔ All browsers follow cross-origin resource policy by default.

Question Number : 158 Question Type : MSQ

Correct Marks : 2

Question Label : Multiple Select Question

Consider the following API (app.py).

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


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

# profile resource
@app.route('/profile')
@cross_origin()
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(){
    throw new DivisionException("Division by 7 is not allowed");
  }
  public static void main(String[] args) {
    try {
      divideby7();
      System.out.print("Completed successfully");
    }
    catch(DivisionException de) {
    }
    catch(Exception e) {
    }
  }
}
```

Options :

A. ✔ Compilation error

B. ✖ This program generates the output:
`Division by 7 is not allowed`

C. ✖ This program generates the output:
`Completed successfully`
`Division by 7 is not allowed`

D. ✖ This program compiles successfully but does not generate any output.

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) {
    Map<String, Integer> m = new HashMap<String, Integer>();
    m.put("neeraj", 2000);
    m.put("vasanth", 2011);
    m.put("ganesh", 1997);
    m.put("karun", 2018);
    m.put("vignesh", 2009);
    ***-----------------***
        CODE BLOCK
    ***-----------------***
  }
}
```

Choose the correct CODE BLOCK to print the key that is mapped to the lowest value in Map<String, Integer> m.

Options :

A. ✖
```
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);
```

B. ✖
```
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);
```

```
int year = 10000;
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);
```

C. ✖

```
int year = 10000;
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);
```

D. ✔

Question Number : 162 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Consider the following code, and predict the output.

```java
import java.util.*;
class Test {
  public static void main(String[] args) {
    List<Integer> marks1 = new ArrayList<>();
    marks1.add(10);
    marks1.add(20);

    List<Integer> marks2 = new ArrayList<>();
    marks2.add(15);
    marks2.add(25);

    Map<String, Integer> am = new TreeMap<>();
    Map<String, List<Integer>> hm = new HashMap<>();
    hm.put("Sona", marks1);
    hm.put("Rio", marks2);

    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);
    }
    System.out.println(am);
  }
}
```

What will the output be?

Options :

A. ✔ {Rio=20, Sona=15}

B. ✖ {Sona=15, Rio=20}

C. ✖ {Sona=[10, 20], Rio=[15, 25]}

D. ✖ {Rio=[15, 25], Sona=[10, 20]}

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.

```
//MathUtility.java

package mathutil;
public class MathUtility{
    long getFactorial(int n) { // returns n! }
    protected long add(long n1,long n2) { // returns n1+n2 }
}

//Test1.java

package test;
import mathutil.*;
class Calculator extends MathUtility{
    long FactorialSum(int num,int i) {
        long fact = this.getFactorial(i);          // LINE 1
        long sum = this.add(num, fact);            // LINE 2
        return sum;
    }
}

class Test1{
    public static void main(String args[]) {
        Calculator c = new Calculator();
        long val = c.add(5,6);                     // LINE 3
        System.out.println("Factorial Sum: "+ c.FactorialSum(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 & LINE 3 will lead to compilation error.

C. ✖ only LINE 1 will lead to compilation error.

D. ✖ The code will compile successfully.

Question Number : 164 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the following code.

```
class ArrayOper{
  public <T extends Student> void display(T[] arr){
    for(T e : arr)
      //print e
  }
  public <T extends Number> double findAvg(T[] elements){
    // returns average of the array elements
  }
}
```

What is class ArrayOper converted to, after type erasure?

Options :

A. ✖
```
class ArrayOper{
  public void display(Object[] arr){
    for(Object e : arr)
      //print e
  }
  public double findAvg(Double[] elements){
    // returns average of the array elements
  }
}
```

B. ✖

```
class ArrayOper{
  public void display(Object[] arr){
    for(Object e : arr)
      //print e
  }
  public double findAvg(Number[] elements){
    // returns average of the array elements
  }
}
```

C. ✖

```
class ArrayOper{
  public void display(Student[] arr){
    for(Student e : arr)
      //print e
  }
  public double findAvg(Double[] elements){
    // returns average of the array elements
  }
}
```

D. ✔

```
class ArrayOper{
  public void display(Student[] arr){
    for(Student e : arr)
      //print e
  }
  public double findAvg(Number[] elements){
    // returns average of the array elements
  }
}
```

Question Number : 165 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

The purpose of the Java code given below is to clone a student object, and to update certain values in the clone. Consider the code, and answer the question that follows.

```java
import java.util.*;

class Student implements Cloneable{
    int rollnumber;
    ArrayList<Integer> marks = new ArrayList<Integer>();
    public Student(int r, ArrayList<Integer> m){
        rollnumber = r;
        marks = (ArrayList<Integer>)m.clone();
    }
    public int total(){
        int sum = 0;
        for (int i=0; i<marks.size(); i++) {
            sum += marks.get(i);
        }
        return sum;
    }
    public void setRoll(int r) {
        rollnumber = r;
    }
    public void setNewMarks(int index, int m) {
        marks.remove(index);
        marks.add(m);
    }
    public Student clone() throws CloneNotSupportedException{
        return new Student(rollnumber,marks);
    }
}

public class StudentMarks{
    public static void main(String[] args){
        ArrayList<Integer> sm = new ArrayList<Integer>();
        sm.add(100);                //Marks in one subject
        sm.add(90);                 //Marks in second subject
        sm.add(80);                 //Marks in second subject
        Student s1 = new Student(10, sm);
        try{
            Student s2 = s1.clone();
            s2.setRoll(15);
            s2.setNewMarks(1,50);
            System.out.println(s1.total());
            System.out.println(s2.total());

          }
          catch(CloneNotSupportedException e){
              System.out.println("Cloning is not supported");
          }
      }
  }
```

What will the output be?

Options :

A. ✖ Cloning is not supported

B. ✔ 270

230

C. ✖ 230

230

D. ✖ 270

270

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 double getAvg(double a, double b){
        return (a + b) / 2;
    }
}
class FClass{
    public static void main(String[] args){
        Map<String, Double> exam1 = new TreeMap<String, Double>();
        Map<String, Double> exam2 = new TreeMap<String, Double>();
        Map<String, Double> finalScore = new TreeMap<String, Double>();

        exam1.put("finance", 6.5);
        exam1.put("hr", 8.0);
        exam1.put("law", 7.0);

        exam2.put("hr", 7.0);
        exam2.put("finance", 5.0);
        exam2.put("economics", 7.5);

        for (Map.Entry<String, Double> e : exam1.entrySet())
            finalScore.put(e.getKey(), e.getValue());

        for (Map.Entry<String, Double> e : exam2.entrySet())
            finalScore.merge(e.getKey(), e.getValue(), Calculator::getAvg);

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

What will the output be?

Options :

A. ✖ economics : 7.5, finance : 6.5, hr : 8.0, law : 7.0,

B. ✔ economics : 7.5, finance : 5.75, hr : 7.5, law : 7.0,

C. ✖ economics : 7.5, finance : 5.0, hr : 7.0, law : 7.0,

D. ✖ economics : 7.5, finance : 6.5, finance : 5.0, hr : 8.0, hr : 7.0, law : 7.0,

Question Number : 167 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the code given below.

```
class WorkPlace{
    private int roomno;
    private String building;
    public WorkPlace(int r, String b){
        assert r > 0: "roomno = " + r;                      //assert-1
        roomno = r;
        assert building.length() == 4: "building = " + b;   //assert-2
        building = b;
    }
}
class Department{
    private String name;
    public Department(String n){
        assert n.length() == 2: "dname = " + n;             //assert-3
        name = n;
    }
}
class Employee{
    private int EID;
    private String name;
    private Department dept;
    private WorkPlace wp;
    public Employee(int eid, String n, String d, int rn, String b){
        assert eid > 0: "EID = " + eid;                     //assert-4
        EID = eid;
        name = n;
        dept = new Department(d);
        wp = new WorkPlace(rn, b);
    }
}
class FClass{
    public static void main(String[] args){
        Employee od = new Employee(10, "Donald", "HRM", -10, "BLD1");
    }
}
```

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

```
java -ea:...  -da:Department 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

Consider the following code.

```
class TransactionException extends Exception{
    public TransactionException(String str){
        super(str);
    }
}
class MinBalanceException extends Exception{
    public MinBalanceException(String str){
        super(str);
    }
}
class Customer{
    private String name;
    private double balance;
    public Customer(String name, double balance) {
        this.name = name;
        this.balance = balance;
    }
    public void withDraw(double amount) {
        System.out.print(this.name+"! ");
        if(this.balance<500) {
            try {
                throw new MinBalanceException("You have low balance.");
            }
            catch (MinBalanceException e) {
                System.out.println(e.getMessage());
            }
        }
        else {
            if(this.balance-amount<500 || amount>this.balance) {
                try {
                    throw new TransactionException("This transaction
                                                    is not allowed.");
                }
                catch(TransactionException e) {
                    System.out.println(e.getMessage());
                }
            }
            else {
                System.out.println("Your transaction is successful.");
                System.out.println("Your available balance is "+
                                                    (this.balance-amount));
            }
        }
    }
}

public class BankException {
    public static void main(String[] args) {
        Customer customer1=new Customer("John", 500);
        customer1.withDraw(500);
        Customer customer2=new Customer("Jock", 1500);
        customer2.withDraw(500);
        Customer customer3=new Customer("Virat", 400);
        customer3.withDraw(300);
    }
}
```

Choose the correct option.

Options :

A. ✖ This program generates the output:

```
John! This transaction is not allowed.
Jock! Your transaction is successful.
Your available balance is 1000.0
Virat! You have low balance.
This transaction is not allowed.
```

B. ✖ Compilation error, because you cannot create more than one user defined exception in a program.

C. ✖ This program terminates abnormally due to unhandled exception(s).

D. ✔ This program generates the output:

```
John! This transaction is not allowed.
Jock! Your transaction is successful.
Your available balance is 1000.0
Virat! You have low balance.
```

Question Number : 169 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Consider the following code.

```
import java.util.*;
public class TreeTest {
    public static void main(String[] args) {
        ArrayList<String> list=new ArrayList<String>();
        list.add("Banana");
        list.add("Orange");
        list.add("Apple");
        list.add("Grapes");
        HashSet<String> set1=new HashSet<String>(list);
        TreeSet<String> set2=new TreeSet<String>(set1);
        set2.addAll(set1);
        System.out.println(set2);
    }
}
```

Choose the correct option.

Options :

A. ✖ This program generates the output:
[Apple, Banana, Grapes, Orange, Apple, Banana, Grapes, Orange]

B. ✔ This program generates the output:
[Apple, Banana, Grapes, Orange]

C. ✖ This program terminates abnormally due to unhandled exception(s).

D. ✖ This program generates the output:
[]

Question Number : 170 Question Type : MSQ

Correct Marks : 3

Question Label : Multiple Select Question

Consider the code given below, that prints the maximum sum of a set of pairs of values, and the maximum product of another set of pairs of values. Based on the code, answer the question that follows.

```
abstract class ArithmeticOp{
    public abstract int answer();
}
class Sum extends ArithmeticOp{
    //instance variables and constructors here
    //Definition of public int answer() here
}
class Product extends ArithmeticOp{
    //instance variables and constructors here
    //Definition of public int answer() here
}
public class Operation{
    //LINE-1
    {
        int max = arr[0].answer();
        for(int i = 0; i < arr.length; i++){
            if(arr[i].answer() > max){
                max = arr[i].answer();
            }
        }
        return max;
    }
    public static void main(String[] args)  {
        Product[] p = {/* 5 Product objects */} ;
        Sum[] s = {/* 5 Sum objects */};
        int max_sum = maxValue(p);
        int max_prod = maxValue(s);
        System.out.println("Maximum Sum: "+max_sum);
        System.out.println("Maximum Product: "+max_prod);
    }
}
```

Identify the header(s) for function `maxValue(T[] arr)` (at `LINE-1`) such that the code prints the maximum sum and the maximum product.

Options :

A. ✖ `public static <T> int maxValue(T[] arr)`

B. ✖ `public static int maxValue(T[] arr)`

C. ✔ `public static <T extends ArithmeticOp> int maxValue(T[] arr)`

D. ✔ `public static int maxValue(ArithmeticOp[] arr)`

Question Number : 171 Question Type : MCQ

Correct Marks : 5

Question Label : Multiple Choice Question

Consider the following code.

```
import java.util.*;
class Address {
  String place;
  public Address(String p){
    place  = p;
  }
}
class Factory implements Cloneable{
  Address ad;
  String FName;
  public Factory(String n, Address a) {
    FName = n;
    ad = a;
  }
  public Factory clone() throws CloneNotSupportedException{
    Factory f = (Factory) super.clone();
    return f;
  }
  public String toString(){
    return FName + ":" + ad.place;
  }
}
public class Test{
  public static void main(String[] args){
    Factory f1 = new Factory("Steel", new Address( "Chennai"));
    try{
      Factory f2 = f1.clone();
      f2.FName = "Wool";
      f2.ad.place = "Delhi";
      System.out.println(f1 + ", " + f2);
    }
    catch(CloneNotSupportedException e){
      System.out.println("Cloning not supported");
    }
  }
}
```

What will the output be?

Options :

A. ✖ `Steel:Chennai, Wool:Delhi`

B. ✔ `Steel:Delhi, Wool:Delhi`

C. ✖ `Wool:Delhi, Wool:Delhi`

D. ✖ Cloning not supported

Question Number : 172 Question Type : MCQ

Correct Marks : 5

Question Label : Multiple Choice Question

Consider the following code.

```
import java.util.*;
public class Test {
    public boolean property(String p) {
        if(p.contains(","))
            return true;
        return false;
    }
    public void validate(TreeMap<String, Integer> pMap) {
        Set<String> set= pMap.keySet();
        Iterator<String> it=set.iterator();
        while(it.hasNext()) {
            if(property(it.next()))
                it.remove();
        }
        System.out.println(pMap);
    }

    public static void main(String[] args) {
        TreeMap<String,Integer> player=new TreeMap<String, Integer>();
        player.put("Sac,hin", 54);
        player.put("Sehwag", 52);
        player.put("Dhoni,", 40);
        player.put(",Shikar", 26);
        player.put("Rohit", 38);
        player.put("Rahul", 32);
        Test obj=new Test();
        obj.validate(player);
    }
}
```

Choose the correct option.

Options :

A. ✔ This program generates the output:
`{Rahul=32, Rohit=38, Sehwag=52}`

B. ✖ This program generates the output:
`{,Shikar=26, Dhoni,=40, Sac,hin=54}`

C. ✖ This program terminates abnormally due to unhandled exception(s).

D. ✖ This program generates the output:
`{Sehwag=52, Rohit=38, Rahul=32}`

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 Test5{
    public static void main(String args[]) {
        OrderedPair<Double> op1 = new OrderedPair<Double>(3.141,2.718);
        OrderedPair<Integer> op2 = new OrderedPair<Integer>(5,6);
        OrderedPair<Integer> op3 = new OrderedPair<Integer>(3,2);
        OrderedPair<Double> op4 = new OrderedPair<Double>(9.833,55.626);

        op2.isMinPair(op3);
        op1.isMinPair(op4);
    }
}
```

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+2)
                .map(n -> n * n)
                .limit(5)
                .count();
        //CODE BLOCK ends here
        System.out.println(c);
    }
}
```

Options :

A. ✖
```
double c = Stream.iterate(1, n -> n+2)
                .map(n -> n * n)
                .filter(n -> n <= 9)
                .count();
```

B. ✔
```
double c = Stream.iterate(1, n -> n <= 9, n -> n + 2)
                .map(n -> n * n)
                .count();
```

C. ✔

```
double c = Stream.iterate(1, n -> n + 2)
                .map(n -> n * n)
                .takeWhile(n -> n <= 81)
                .count();
```

```
double c = Stream.iterate(1, n -> n + 2)
                .map(n -> n * n * n)
                .dropWhile(n -> n <= 81)
                .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 SECTION AT 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

G = (V,E) is an undirected simple graph in which each edge has a distinct weight, and *e* is a particular edge of *G*. Which of the following statements is/are **true** about the minimum spanning trees (MSTs) of *G* ?

I. If *e* is the lightest weight edge of some cycle in *G*, then every MST of *G* includes *e*

II. If *e* is the heaviest weight edge of some cycle in *G*, then every MST of *G* excludes *e*

Options :

A. ✖ Only I

B. ✔ Only II

C. ✖ Both I and II

D. ✖ None of these

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 max heap [30, 20, 25, 5, 15, 23, 10, 3, 2] then the resulting max heap would be_____.

```
delete_max()
insert(24)
```

Options :

A. ✖ [25, 24, 23, 20, 15, 2, 10, 5, 3]

B. ✖ [25, 24, 23, 20, 15, 10, 2, 3, 5]

C. ✖ [25, 24, 23, 20, 15, 10, 5, 3, 2]

D. ✔ [25, 24, 23, 20, 15, 2, 10, 3, 5]

Question Number : 178 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Suppose we have a Max 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. ✔ $O(log\ n)$

B. ✖ $O(1)$

C. ✖ $O(n)$

D. ✖ $O(n\ log\ n)$

Question Number : 179 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

While inserting the elements 60, 30, 50, 55, 80, 90, 65, 70 and 10 in an empty binary search tree (BST) in the sequence shown, the elements at maximum depth are_____.

Options :

A. ✖ 10, 90

B. ✔ 55, 70

C. ✖ 55, 90

D. ✖ 70, 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,b), (a,d), (b,c), (e,f)

B. ✔ (a,e), (a,b), (a,d), (c,d), (e,f)

C. ✔ (a,b), (a,e), (c,d), (c,e), (e,f)

D. ✔ (a,e), (a,b), (c,e), (a,d), (e,f)

E. ✖ (a,e), (a,b), (c,d), (b,c), (e,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 :

A. ✔ It can detect negative weight cycles in the graph.

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.

D. ✖ The formula to compute the shortest path from vertex `i` to `j` in Floyd-Warshall algorithm is

$$SP^k[i,j] = min[SP^{k-1}[i,k] + SP^{k-1}[j,k], SP^{k-1}[i,j]]$$

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 :

A. ✔

Character	A	B	C	D	E	F
Huffman code	00000	00001	0001	001	01	1

B. ✖

Character	A	B	C	D	E	F
Huffman code	000	0010	1011	01	00	11

C. ✖

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

D. ✔

Character	A	B	C	D	E	F
Huffman code	000	0010	0011	01	10	11

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 given Dijkstra's algorithm, in what order nodes will mark as `True` in the `visited` dictionary?

```
def dijkstralist(WList,s):
    infinity = 1 + len(WList.keys())*max([d for u in WList.keys() for (v,d) in WList[u]])
    (visited,distance) = ({},{})
    for v in WList.keys():
        (visited[v],distance[v]) = (False,infinity)
    distance[s] = 0
    for u in WList.keys():
        nextd = min([distance[v] for v in WList.keys() if not visited[v]])
        nextvlist = [v for v in WList.keys() if (not visited[v]) and distance[v] == nextd]
        if nextvlist == []:
            break
        nextv = min(nextvlist)
        visited[nextv] = True
        for (v,d) in WList[nextv]:
            if not visited[v]:
                distance[v] = min(distance[v],distance[nextv]+d)
    return(distance)
```

Options :

A. ✖ a d b c h e f g

B. ✔ a d h b c e f g

C. ✖ a d h c b e f g

D. ✖ a d h b c f e 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`.

B. ✔ 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 both insertion and deletion in AVL tree is $O(n)$.

D. ✖ If the height of an AVL tree is `h`, the maximum number of nodes will be $2^h + 1$.

E. ✔ The complexity of searching in an AVL tree is $O(log\ n)$.

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	5	2	1	7	1	13	7	3	6	2	6
end	8	5	3	12	2	15	8	4	7	7	9

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

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 `15` 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 :

105

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.

```python
class Node:
    def __init__(self, value = None):
        self.value = value
        self.left = None
        self.right = None
```

```python
def traversal(t):
    if t != None:
        print(t.value, end = ' ')
        traversal(t.left)
        traversal(t.right)
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. ✖ `5 2 1 3 4 8 6 7 9`

B. ✖ `5 2 1 4 3 7 6 8 9`

C. ✔ `5 2 1 4 3 8 6 7 9`

D. ✖ `1 3 4 2 7 6 9 8 5`

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 the given `traversal` function, where `n` is the number of nodes?

Options :

A. ✔ $O(n)$ whether the tree is balanced or unbalanced.

B. ✖ $O(n)$ if the tree is balanced, $O(n \log n)$ otherwise.

C. ✖ $O(n \log n)$ 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.

```python
def match(str1, str2):
    result = ''
    n1, n2 = len(str1), len(str2)
    i, j = 0, 0
    while i < n1 and j < n2:
        if str1[i] != str2[j]:
            break
        result += str1[i]
        i, j = i + 1, j + 1
    return result

def mystery(arr, low, high):
    if low == high:
        return arr[low]
    if high > low:
        mid = (low + high) // 2
        str1 = mystery(arr, low, mid)
        str2 = mystery(arr, mid + 1, high)
        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 the 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 append the string `"added"` to the end of the file `/home/ubuntu/file1.txt` located in the current directory.

Options :

A. ✔ `echo added >> home/ubuntu/file1.txt`

B. ✖ `echo added > home/ubuntu/file1.txt`

C. ✖ `echo added | home/ubuntu/file1.txt`

D. ✖ `echo added || home/ubuntu/file1.txt`

Question Number : 193 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

What is the output of the following bash script?

```
#!/bin/bash
a=2
b=12
c=6
if [ $a -eq 2 ] && [ $b -gt 5 ] || [$c -eq 10 ]
then
 echo $b/$c
else
 echo $c/$a
fi
```

Options :

A. ✖ 3

B. ✖ 2

C. ✖ 6/2

D. ✔ 12/6

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 `13321`.

```
#!/bin/bash

read line
rline=`echo $line | rev` # rev command will reverses the input string
if [[ $line != $rline ]]; then
  exec bash -c "echo It is not a palindrome"
fi
echo It is a palindrome
```

Options :

A. ✖
```
It is a palindrome
```

B. ✔
```
It is not a palindrome
```

C. ✖
```
It is not a palindrome
It is a palindrome
```

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 -n | head -n 10
```

Note: `-n` option in the sort command is used for numerical sorting, 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/\(.*\)n,/\1N/g' file1.txt | awk 'BEGIN{FS=",";}{print$2","$1}'
```

Options :

A. ✖

```
abc,def
ghij,klm
,No
```

B. ✖

```
def,abc
klm,ghij
,on
```

C. ✔

```
def,abc
klm,ghij
,No
```

D. ✖

```
abc,def
ghij,klm
No,
```

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 :

A. ✖ The ip address of the client that made the least number of requests from midnight to 6 am.

B. ✖ The ip address of the client that made the least number of requests from 6 am to midnight.

C. ✔ 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 frep
-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—>b; 2—>a; 3—>e; 4—>d; 5—>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 the license plate number i.e. exactly in the format `xxyyxx-yyyy`, where each `x` denotes an alphabet(capital or small letter) and each `y` denotes a digit and there is a hyphen(`-`) in between as given in the pattern string, for example "TN01BS-9876" is a valid license plate 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 license plate number anywhere in the file `file1.txt`.

Options :

A. ✖ `grep "[[:alpha:]]\{2\}[[:digit:]]\{2\}[[:alpha:]]\{2\}[-]\?[[:alnum:]].*" file1.txt`

B. ✔ `egrep "[[:alpha:]]{2}[[:digit:]]{2}[[:alpha:]]{2}[-][[:digit:]]{4}" file1.txt`

C. ✖ `egrep "[[:alnum:]]{6}[-]?[[:digit:]]{4}" file1.txt`

D. ✔ `grep "[[:alpha:]]\{2\}[[:digit:]]\{2\}[[:alpha:]]\{2\}[-][[:digit:]][[:digit:]]\{3\}" 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..30}; do
  if [[ $((i%8)) == 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 :

27

Question Number : 207 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

Consider the below information,

```
$ wc -l file
8 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 :

12

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
af2f43fefe6d0c519889947fffb011d7
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 :

A. ✔

```
count=0
for file in *; do
  while read line; do
    pat="^BSCCS30.*"
    if [[ $line =~ $pat ]]; then
      ((count++))
      break
    fi
  done < $file
done
echo $count
```

B. ✖

```
count=0
for file in *; do
  while read line; do
    pat="^BSCCS30.*"
    if [[ $line =~ $pat ]]; then
      ((count++))
    fi
  done < $file
done
echo $count
```

C. ✖

```
count=0
for file in *; do
  grep "^BSCCS30.*" $file > /dev/null
  if [[ $? == 0 ]]; then
    ((count++))
    break
  fi
done
echo $count
```

D. ✔

```
count=0
for file in *; do
  grep "^BSCCS30.*" $file > /dev/null
  if [[ $? == 0 ]]; then
    ((count++))
  fi
done
echo $count
```

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 representated 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

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 given statements 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 lists.

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** must be 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** ['c'] is 6.

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** = [4, 5, 3, 1, 9, 4, 6, 5, 9] and **B** = **doSomething(A)**.

```
Procedure doSomething(A)
    outList = [first(A)]
    foreach X  in rest(A) {
        if (X ≠ first(A)) {
            outList = outList ++ [X]
        }
    }
    return (outList)
End doSomething
```

Choose the correct option.

Options :

A. ✔ **B** = [4, 5, 3, 1, 9, 6, 5, 9]

B. ✖ **B** = [4, 5, 3, 1, 9, 6]

C. ✖ **B** = [3, 1, 6]

D. ✖ **B** = [5, 3, 1, 9, 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** ≠ **j**, if the combination of **i** and **j** tastes good, then **M**[**i**][**j**] = 1, otherwise 0. **leastSuitable**(**M**) returns the list of drinks which are least suitable for

mixing with the maximum number of drinks. Choose the correct code fragment

```
Procedure leastSuitable(M)
    min = 10000
    minList = [ ]
    foreach i in rows(M) {
        k = 0
        ********************
        *     Fill the code     *
        ********************
    }
    return (minList)
End leastSuitable
```

Options :

```
foreach j in columns(M) {
    k = k + M[i][j]
}
if (k == min) {
    minList = minList ++ [i]
}
if (k > min) {
    min = k
    minList = [i]
}
```

A. ✖

```
foreach j in columns(M) {
    k = k + M[i][j]
}
if (k == min) {
    minList = minList ++ [i]
}
if (k < min) {
    min = k
    minList = [i]
}
```

B. ✔

C. ✖

```
foreach j in columns(M) {
    k = k + M[i][j]
}
if (k == min) {
    minList = [i]
}
if (k > min) {
    min = k
    minList = minList ++ [i]
}
```

D. ✖

```
foreach j in columns(M) {
    k = k + M[i][j]
}
if (k == min) {
    minList = [i]
}
if (k < min) {
    min = k
    minList = minList ++ [i]
}
```

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 L2 {
        foreach j in L1 {
            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(L2) − length(L1) = length(L)**

B. ✖ **length(L2) > length(L1)**

C. ✔ **length(L2) ≥ length(L)**

D. ✖ **length(L1) ≤ 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.

```
Procedure countSomething(M, i, j)
    count = 0
    foreach k in rows(M) {
        if (M[i][k] == 1 and M[k][j] == 1) {
            count = count + 1
        }
    }
    return (count)
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, 5) 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 :

1

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, 5) 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 :

1

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 = 0
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 maximum 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**[**i**][**j**] represent at the end of the execution?

Options :

A. ✖ Price of item **i** of category **j** across all bills

B. ✖ Price of item **j** of category **i** across all bills

C. ✖ List of prices of item **i** of category **j** across all bills

D. ✔ List of prices of item **j** of category **i** 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 = 100000, 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 $S[i][j] = 0$ then $S[j][i] = 0$

D. ✔ For all i, j with $i \neq j$, if $S[i][j] = 1$ then $S[j][i] = 1$

E. ✖ For all i, j with $i \neq j$, if $S[i][j] = 1$ 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 different shops.

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 different shops.

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 3×4 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 maximum value of *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 :

3

Question Number : 235 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

The minimum value of *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 $\langle \cdot, \cdot \rangle : V \times V \to \mathbb{R}$ 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:

$$\langle ., . \rangle : V \times V \to \mathbb{R}$$
$$\langle (x_1, y_1), (x_2, y_2) \rangle = x_1 x_2 + 4 y_1 y_2.$$

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 $S = \{(1, 1, 1), (-2, 1, 1), (1, -2, -2)\}$. Which of the following options are true for S?

Options :

A. ✔ The cardinality of S is the dimension of $\mathbb{R}^3$.

B. ✔ S is a linearly dependent set.

C. ✔ S spans a subspace of $\mathbb{R}^3$ (with respect to usual addition and scalar multiplication).

D. ✔ S is not 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 not 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 given subquestions are true or false.

Sub questions

Question Number : 238 Question Type : MCQ

Correct Marks : 4

Question Label : Multiple Choice Question

If A is similar to B, then A^T and B^T are similar matrices (i.e., A^T is similar to B^T).

Options :

A. ✔ True.

B. ✖ False.

Question Number : 239 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Any two $n \times n$ 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 3×3 matrices, which are similar to each other. Suppose the homogeneous system of linear equations $Ax = 0$ has infinitely many solutions, then the homogeneous system of linear equations $Bx = 0$ also has infinitely many solutions.

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 $x - z$, $x + y + z$ and $z - x$ respectively. This can be thought of as a linear transformation

$$T : \mathbb{R}^3 \to \mathbb{R}^3$$

defined by

$$T(x, y, z) = (x - z, x + y + z, z - x) \quad .$$

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. ✖ $Span\{(t, 0, t), (0, 2t, t) \mid t \in \mathbb{R}\}$

B. ✔ $Span\{(t, -2t, t) \mid t \in \mathbb{R}\}$

C. ✖ $Span\{(2t, t, t) \mid t \in \mathbb{R}\}$

D. ✖ $Span\{(2t, t, 0), (0, t, t) \mid t \in \mathbb{R}\}$

Question Number : 243 Question Type : SA

Correct Marks : 2

Question Label : Short Answer Question

Find out $nullity(T)$

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 $rank(T)$

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

$\{(1,1,0),(1,0,1),(0,1,1)\}$

for the domain and the standard basis of $\mathbb{R}^3$ for the co-domain?

Options :

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

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

C. ✔ $\begin{bmatrix} 1 & 0 & -1 \\ 2 & 2 & 2 \\ -1 & 0 & 1 \end{bmatrix}$

D. ✖ $\begin{bmatrix} 1 & 1 & -1 \\ 0 & 2 & 0 \\ -1 & 2 & 1 \end{bmatrix}$

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 SECTION AT 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. $P(|\overline{X} - \mu| > \delta) \leq \frac{\sigma^2}{n\delta^2}$
5. $\int_a^b x^n \, dx = \left.\frac{x^n}{n+1}\right|_a^b$
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. Bernoulli(p) is Binomial(n, p)
10. $P(E) = \iint_{Supp(E)} f_{XY}(x, y) \, dx \, dy$
11. $P(a < X < b) = F_X(b) - F_X(a)$
12. $L(x_1, \ldots, x_{10}) = \prod_{i=1}^{10} f_X(x_i; p)$
13. $\iint_{Supp} f_{XY}(x, y) \, dx \, dy = 1$
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 ($F_X(x)$)	$E[X]$	$\mathrm{Var}(X)$
Uniform(A) $A = \{a, a+1, \ldots, b\}$	$\frac{1}{n}, \quad x = k$ $n = b - a + 1$ $k = a, a+1, \ldots, b$	$\begin{cases} 0 & x < 0 \\ \frac{k-a+1}{n} & k \le x < k+1 \\ & k = a, a+1, \ldots, b-1, b \\ 1 & x \ge n \end{cases}$	$\frac{a+b}{2}$	$\frac{n^2-1}{12}$
Bernoulli(p)	$\begin{cases} p & x = 1 \\ 1-p & x = 0 \end{cases}$	$\begin{cases} 0 & x < 0 \\ 1-p & 0 \le x < 1 \\ 1 & x \ge 1 \end{cases}$	p	$p(1-p)$
Binomial(n, p)	${}^nC_k p^k (1-p)^{n-k}$, $k = 0, 1, \ldots, n$	$\begin{cases} 0 & x < 0 \\ \sum_{i=0}^{k} {}^nC_i p^i (1-p)^{n-i} & k \le x < k+1 \\ & k = 0, 1, \ldots, n \\ 1 & x \ge n \end{cases}$	np	$np(1-p)$
Geometric(p)	$(1-p)^{k-1} p$, $k = 1, \ldots, \infty$	$\begin{cases} 0 & x < 0 \\ 1-(1-p)^k & k \le x < k+1 \\ & k = 1, \ldots, \infty \end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$
Poisson(λ)	$\frac{e^{-\lambda}\lambda^k}{k!}$, $k = 0, 1, \ldots, \infty$	$\begin{cases} 0 & x < 0 \\ e^{-\lambda} \sum_{i=0}^{k} \frac{\lambda^i}{i!} & k \le x < k+1 \\ & k = 0, 1, \ldots, \infty \end{cases}$	λ	λ

Continuous random variables:

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

1. **Markov's inequality:** Let X be a discrete random variable taking non-negative values with a finite mean μ. Then,
$$P(X \ge c) \le \frac{\mu}{c}$$
2. **Chebyshev's inequality:** Let X be a discrete random variable with a finite mean μ and a finite variance σ^2. Then,
$$P(\mid X - \mu \mid \ge k\sigma) \le \frac{1}{k^2}$$
3. **Weak Law of Large numbers:** Let $X_1, X_2, \ldots, X_n \sim$ iid X with $E[X] = \mu, \mathrm{Var}(X) = \sigma^2$.
Define sample mean $\overline{X} = \frac{X_1 + X_2 + \ldots + X_n}{n}$. Then,
$$P(|\overline{X} - \mu| > \delta) \le \frac{\sigma^2}{n\delta^2}$$
4. **Using CLT to approximate probability:** Let $X_1, X_2, \ldots, X_n \sim$ iid X with $E[X] = \mu, \mathrm{Var}(X) = \sigma^2$.
Define $Y = X_1 + X_2 + \ldots + X_n$. Then,
$$\frac{Y - n\mu}{\sqrt{n}\sigma} \approx \mathrm{Normal}(0,1).$$
5. **Bias of an estimator:** $\mathrm{Bias}(\hat{\theta}, \theta) = E[\hat{\theta}] - \theta$.
6. **Method of moments:** Sample moments, $M_k(X_1, X_2, \ldots, X_n) = \frac{1}{n}\sum_{i=1}^{n} X_i^k$
7. **Likelihood of i.i.d. samples:** Likelihood of a sampling $x_1, x_2, \ldots, x_n$, denoted
$$L(x_1, \ldots, x_n) = \prod_{i=1}^{n} f_X(x_i; \theta_1, \theta_2, \ldots)$$
8. **Maximum likelihood (ML) estimation:**
$$\theta_1^*, \theta_2^*, \ldots = \arg\max_{\theta_1^*, \theta_2^*, \ldots} \prod_{i=1}^{n} f_X(x_i; \theta_1, \theta_2, \ldots)$$

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 $P(\min(X, Y) = 1)$ equals

Options :

A. ✖ $-e^{-2}$

B. ✔ $2e^{-1} - 3e^{-2}$

C. ✖ e^{-2}

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 $M_X(\lambda) = e^{18\lambda^2}$ and $X_1, X_2, \ldots, X_9$ are 9 i.i.d. samples with distribution X. Let Y be a random variable defined as $Y = X_1 + X_2 + \cdots + X_9$. Which of the following options are true?

Options :

A. ✖ $X \sim \text{Normal}(0, 18)$.

B. ✔ $X \sim \text{Normal}(0, 36)$.

C. ✖ The moment generating function of Y is given by $M_Y(\lambda) = 9e^{18\lambda^2}$.

D. ✔ The moment generating function of Y is given by $M_Y(\lambda) = e^{162\lambda^2}$.

Question Number : 251 Question Type : MSQ

Correct Marks : 5

Question Label : Multiple Select Question

Suppose $X_1, X_2, \ldots, X_{10} \sim$ i.i.d. Poisson(λ). Let $\hat{\lambda}_1 = \frac{1}{10}\sum_{i=1}^{9}\frac{X_i + X_{i+1}}{2}$ and $\hat{\lambda}_2 = \frac{1}{9}\sum_{i=1}^{9}\frac{X_i + X_{i+1}}{2}$ be two estimators of λ. Which of the following statements are correct?

Options :

A. ✔ $\hat{\lambda}_2$ is an unbiased estimator of λ.

B. ✖ $\hat{\lambda}_1$ is an unbiased estimator of λ.

C. ✖ Both $\hat{\lambda}_1$ and $\hat{\lambda}_2$ are biased estimators of λ.

D. ✔ The variance of $\hat{\lambda}_2$ is $\frac{17\lambda}{162}$.

E. ✔ The bias of $\hat{\lambda}_1$ is $\frac{-\lambda}{10}$.

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 μ and variance σ^2. Suppose the expected value and the variance of the sample mean is 100 and 0.25, respectively. Find the value of $\mu - 20\sigma$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

20

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: 3, 1, 4, 5, 8, 6, 5, 2, 7, 9. Find the maximum likelihood estimate of p. 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 :

0.2

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, 13

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

$$f_{XY}(x,y) = \begin{cases} c & \text{if } 0 \le y \le x \le 1 \\ 0 & \text{otherwise} \end{cases}$$

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.

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 more 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 256 & 255.

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 100 containers (identical in shape and size) and can safely carry 2300 kg. The average weight of the containers is 25 kg with standard deviation of 15 kg. What is the approximate probability that 100 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 :

0.90 to 0.91

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 $P(Y \leq X)$. 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 : 262 Question Type : SA

Correct Marks : 3

Question Label : Short Answer Question

Find $P\left(Y \leq \frac{X}{2} | Y \leq X\right)$. Enter the answer correct to two decimal places.

Hint:

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 θ 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 θ for the samples 1, 2, 2, 3, 0, 2, 1, 0, 2, 3 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 :

0.4

Question Number : 268 Question Type : SA

Correct Marks : 4

Question Label : Short Answer Question

Find the maximum likelihood estimate of θ for the samples 1, 0, 3, 2, 0. 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