Depth Of ML

GATE DA AIOT : All India Open Test

Exam ID: 104

Name: _____

Date: _____

Direction for Questions: 1 to 14

To submit your Mock Test : Go to last question and click on Finish and click on Finish again.

Question Type: MSQ

Marks for correct answer : 2
Negative Marks : 0.0

Question: 1 of 65

QID: 170 Marks: 2

Which of the following is/are true ? (select all that are correct)

- [ ] **A.** Bagging is primarily intended to reduce overfitting
- [ ] **B.** Bagging is primarily intended to reduce underfitting
- [ ] **C.** Pruning in decision trees is primarily intended to reduce overfitting
- [ ] **D.** Pruning in decision trees is primarily intended to reduce underfitting

Question: 2 of 65

QID: 127 Marks: 2

Which of the followings is/are ALWAYS true for any random variable X in real space taking positive and negative values ? (select all that are true) (E denotes expectation of a random variable)

- [ ] **A.** $E(X) <= E(|X|)$
- [ ] **B.** $E(X - E(X))^2 <= E(X - E(|X|))^2$
- [ ] **C.** $\mathrm{Var}(X) >= \mathrm{Var}(|X|)$
- [ ] **D.** Standard deviation of X is ALWAYS less than variance of X

Question: 3 of 65 QID: 166 Marks: 2

Which of the following is/are true for principal component analysis ? (Select all that are correct)

- [ ] **A.** Principal component Analysis finds a subspace that MAXIMIZES variance of the projected data in that subspace
- [ ] **B.** Principal component Analysis finds a subspace that MINIMIZES variance of projected data in that subspace
- [ ] **C.** Principal component Analysis finds a subspace that MINIMIZES the sum of the absolute distance between original data point and of projected data in that subspace
- [ ] **D.** Principal component Analysis finds a subspace that MAXIMIZES the sum of the absolute distance between original data point and of projected data in that subspace

Question: 4 of 65 QID: 118 Marks: 2

Suppose A and B are two independent events with probabilities $P(A) \neq 0$ and $P(B) \neq 0$. Let $\widetilde{A}$ and $\widetilde{B}$ be their complements respectively. Which one of the following statements is/are ALWAYS TRUE ? (select all that are correct)

- [ ] **A.** $P(A \cap B) = P(A)P(B)$
- [ ] **B.** $P(A \cup B) <= P(A) + P(B)$
- [ ] **C.** $P(\widetilde{A} \mid B) = P(\widetilde{A})$
- [ ] **D.** $P(\widetilde{A} \cap \widetilde{B}) = P(\widetilde{A})P(\widetilde{B})$

Question: 5 of 65 QID: 147 Marks: 2

Which of the following is/are ALWAYS true ? (select all that are correct). ($P(A/B)$ is the conditional expectation of event A conditioned on event B)

- [ ] **A.** If $P(A/B) = P(A)$, then events A and B are necessarily independent.
- [ ] **B.** For three events A, B and C with non zero probability. If $P(C/A) > P(C/B)$ then $P(A/C) > P(B/C)$
- [ ] **C.** For any two events A and B, If $P(A \cap B) >= 0.1$ then $P(A) >= 0.1$
- [ ] **D.** Forany two random variables X and Y having probability density functions represented by f_x and f_y respectively. If their joint probability density function is represented by multiplication of their individual probability density functions f_x and f_y , then X and Y are necessarily independent.

Question: 6 of 65 QID: 168 Marks: 2

Which of the following is/are true with respect to SVM algorithm. (select all that are correct)

- [ ] **A.** If we remove some of the non support vectors from training data and learn SVM problem on remaining data, then the optimal objective value might change.
- [ ] **B.** The optimal hyperplane in the SVM problem is orthogonal to the support vectors.
- [ ] **C.** Support vectors are points in the training data that determines the optimal hyperplane.
- [ ] **D.** None of the above

Question: 7 of 65 QID: 132 Marks: 2

Which statements accurately characterise operational databases and data warehouses? Choose all that are correct:

- [ ] **A.** Unlike operational databases, which aim to remain small, data warehouses are anticipated to expand significantly.
- [ ] **B.** Both operational databases and data warehouses prioritise speed, with delays being unacceptable.
- [ ] **C.** Operational databases typically store a smaller amount of data compared to data warehouses.
- [ ] **D.** Generally, Operational databases are geared towards supporting daily transactional activities, while data warehouses aim to facilitate business intelligence, reporting, and analysis.

Question: 8 of 65 QID: 112 Marks: 2

Suppose that A is an $m * n$ matrix with entries in R and consider a system of linear equations $Ax = b$. Which of the following statements is/are correct? Select all that apply.

- [ ] **A.** If rank(A) = m and n>m then the system Ax=b has infinitely many solutions.
- [ ] **B.** If N(A) = {0}, then m < n.
- [ ] **C.** If rank(A) = n, then Ax = b has a unique solution.
- [ ] **D.** If rank(A) = m and n>= m, then Ax = b has at least one solution

Question: 9 of 65 QID: 106 Marks: 2

Let A be an n×n matrix with characteristic polynomial $-\lambda(\lambda-1)^2(\lambda-2)^3$ and it is known that A is a Symmetric matrix. Which of the followings can not be true

(Select all that apply)

- [ ] **A.** Rank(A) = 1
- [ ] **B.** Rank(A) = 3
- [ ] **C.** Rank(A) = 5
- [ ] **D.** Rank(A) = 6

Question: 10 of 65 QID: 157 Marks: 2

Which of the following statements about dijkstra shortest path search algorithm and A* graph search algorithm is/are TRUE ? (select all that are correct)

- [ ] **A.** For graph having positive edge weights, Dijkstra algorithm will always return shortest path.
- [ ] **B.** A* algorithm will always return shortest path irrespective of the heuristic function of the nodes
- [ ] **C.** For graph having positive edge weights, A* algorithm will alway return shortest path if heuristic function for every node in a graph is consistent.
- [ ] **D.** The choice of heuristic function won't affect the output cost of the path returned by A* algorithm

Question: 11 of 65 QID: 129 Marks: 2

For a One-to-one relationship in an ER model, which of the following statements accurately describe(s) the process of converting this relationship to a relational instance? (Select all applicable options)

- [ ] **A.** If both entities require mandatory participation, then we require 2 relations.
- [ ] **B.** If both entities require mandatory participation, then only 1 relation is needed.
- [ ] **C.** If only one of the entities requires mandatory participation, then we need 2 relations.
- [ ] **D.** If participation is optional for both entities, then 2 relations are necessary.

Question: 12 of 65 QID: 116 Marks: 2

Which of the following statements are true for all $n \times n$ matrices A, B:

- [ ] **A.** $(A^T)^T = A$
- [ ] **B.** $|A^T| = |A|$
- [ ] **C.** $(AB)^T = A^T B^T$
- [ ] **D.** $(A+B)^T = A^T + B^T$

Question: 13 of 65 QID: 159 Marks: 2

Which of the following statements is/are true ? (Select all that are true)

- [ ] **A.** Iterative deepening depth first search (IDDFS) algorithm will generally take more time then breadth first search.
- [ ] **B.** Iterative deepening depth first search (IDDFS) algorithm will generally take more space (memory) then breadth first search.
- [ ] **C.** In the scenarios when it is known that the target node is only few depth away from the search node, Iterative deepening depth first search (IDDFS) is faster algorithm then the depth first search on an average.
- [ ] **D.** In the scenarios when it is known that the target node is only few depth away from the search node, depth first search is faster algorithm then Iterative deepening depth first search (IDDFS) on an average.

Question: 14 of 65 QID: 124 Marks: 2

Which of the following statements are correct. (Select all that apply)

- [ ] **A.** In a graph with positive edge weights, the Bellman-Ford algorithm and Dijkstra's algorithm may create different shortest-path trees, even though they always give the same shortest-path weights
- [ ] **B.** Dijkstra's algorithm may run indefinitely if the graph has edges with negative weights.
- [ ] **C.** If a graph has a negative weighted edge and not a negative weighted cycle, Bellman-Ford algorithm will work correctly.
- [ ] **D.** Dijkstra's and Bellman-Ford are both greedy algorithms.

Direction for Questions: 15 to 18

To submit your Mock Test : Go to last question and click on Finish and click on Finish again.

Question Type: MSQ

Marks for correct answer : 1
Negative Marks : 0.0

To submit your mock test :
Go to last question and click on Finish and click on Finish again.

Question: 15 of 65 QID: 125 Marks: 1

Which of the followings is/are ALWAYS true ? (select all that are correct)

- **A.** For every random variable $X,\ E\left(X^2\right) >= E(X)^2$
- **B.** For any two random variables X and Y on same sample space if $P(X > Y) > P(Y > X)$, then $E(X) > E(Y)$
- **C.** For any two random variables X and Y on same sample space if $E(X) > E(Y)$, then $P(X > Y) > P(Y > X)$
- **D.** For any two events A and B on same sample space having non zero probabilities, If the complement of event A is denoted by $\tilde{A}$, then if $P(A/B) = \frac{1}{2}$ then, $P\left(\tilde{A}/B\right) = \frac{1}{2}$

Question: 16 of 65 QID: 160 Marks: 1

Which of the following is/are tautology ? (Select all that are correct)

- **A.** $a \vee b \rightarrow b \wedge c$
- **B.** $a \wedge b \rightarrow b \vee c$
- **C.** $a \vee b \rightarrow (b \rightarrow c)$
- **D.** None of these

Question: 17 of 65 QID: 165 Marks: 1

Which of the following techniques could be considered for dimensionality reduction in machine learning problems ? (Select all that are correct)

- **A.** Principal Component Analysis
- **B.** Linear Discriminant Analysis
- **C.** L1 Regularization in Least Square Linear Regression algorithm
- **D.** None of these

Question: 18 of 65 QID: 155 Marks: 1

Which one of the following statement is/are ALWAYS TRUE ? (select all that are true)

- **A.** If the function is continuous at some point then it is automatically differentiable at that point
- **B.** If the function is differentiable at some point then it is automatically continuous at that point
- **C.** If the function is differentiable at some point then it may or maynot be continuous at that point
- **D.** If the function is continuous at some point then it may or maynot be differentiable at that point

Direction for Questions: 19 to 25

To submit your Mock Test : Go to last question and click on Finish and click on Finish again.

Question Type: NAT

Marks for correct answer : 2
Negative Marks : 0.0

Please click on submit to save your typed answer

To submit your mock test :
Go to last question and click on Finish and click on Finish again.

Question: 19 of 65 QID: 122 Marks: 2

If you have a queue with enqueue(), dequeue(), and print() functions, where print() displays the front element without removing it, and the initial queue content is 1, 2, 3, 4, 5, 6, 7 (with 1 at the head),

How many calls to enqueue(), dequeue(), or print() are required to print the number 7 (The state of the final queue should not change)? Ensure that only enqueue(), dequeue(), and print() function calls are used, and no other operations are allowed.

Question: 20 of 65 QID: 133 Marks: 2

It is estimated that 30% of people from a certain city are corona positive. A certain test is developed to detect whether a person is corona positive or not. The test claims that it can detect 95% of corona positive patients, and the probability for a false positive (a non-corona positive patient detected as positive) is 5% . Now if the test detects person as covid positive, what is the probability that the person is actualy positive ?

(Write an answer till two decimal places in the form of 0.X where X is a two digit number after calculation WITHOUT rounding up/down)

Question: 21 of 65 QID: 171 Marks: 2

Consider the following dataset showing the result whether a person has passed or failed the exam based on various factors. Suppose the factors are conditionally independent to each other. We want to classify a new instance with

Confident=Yes, Studied=Yes, and Sick=No.

Which class Naïve Bayes classifier would output on the following training data ?

(Answer either "Fail" or "Pass" in the blank).

Confident	Studied	Sick	Result
Yes	No	No	Fail
Yes	No	Yes	Pass
No	Yes	Yes	Fail
No	Yes	No	Pass
Yes	Yes	Yes	Pass

Question: 22 of 65 QID: 152 Marks: 2

Calculate the limit. $\lim_{x\to\infty} 4(x-\sqrt{x^2-x+2})$.

(Answer an integer WITHOUT any decimal places).

Question: 23 of 65 QID: 115 Marks: 2

A fair coin is tossed repeatedly until 2 consecutive heads occurs. Calculate expected number of coin tosses for the experiment.

(Write your answer as integer ONLY WITHOUT any decimal place).

Question: 24 of 65 QID: 137 Marks: 2

In the K nearest Binary classifier, we have two labels 0 and 1. Suppose we are given any k, and any test point x.
Let $z_1, ..., z_k$ be the k closest neighbours of x in the training data.

Assume that for all $i = 1, ..., k$, the probability that the label of z_i is not equal to the label of x is $p = 0.2$.

Also, for any $i \neq j$, the events that the label of $z_i$is not equal to the label of x and the label of z_j is not equal to the label of x are independent.

What is the probability that the 3-nearest neighbour classifier makes a mistake on x?

(Answer till 4 decimal places)

Question: 25 of 65

QID: 135 Marks: 2

Consider a social network database, about people and their relationships.

The database has two relations:

Person(pid, name)
Relationship(pid1, rel, pid2)

Here Person.pid is a key, and Relationship.pid1 and Relationship.pid2 are foreign keys. rel is a string representing the relation type, and can be 'friend' or 'enemy'.

Note that the relationship is not necessarily symmetric: if Anju is friend with Bintu, this does not imply that Bintu is friend with Anju.

Person table has following tuples
$\{(1, Anju), (2, Bintu), (3, Daksh), (4, Greg), (5, Kim)\}$

Relationship table has following tuples:

$\{(1, friend, 3), (3, friend, 5), (4, enemy, 1), (3, friend, 1), (5, friend, 2), (2, enemy, 3)\}$

How many rows will be returned by the following query:

```
SELECT  DISTINCT Person.name
FROM Person
LEFT JOIN Relationship
ON Person.pid = Relationship.pid1
WHERE rel = 'friend' ;
```

Direction for Questions: 26 to 27

To submit your Mock Test : Go to last question and click on Finish and click on Finish again.

Question Type: NAT

Marks for correct answer : 1
Negative Marks : 0.0

Please click on submit to save your typed answer

To submit your mock test :
Go to last question and click on Finish and click on Finish again.

Question: 26 of 65

QID: 149 Marks: 1

Compute $\lim_{x \to \infty} \frac{8(x+13)^2}{2x^2 + \frac{1}{x}}$. (Answer an integer without any decimal places).

Question: 27 of 65 QID: 107 Marks: 1

Let A be a 4×6 matrix whose nullspace is spanned by $\begin{bmatrix} 3 \\ 1 \\ 0 \\ 1 \\ 2 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} 2 \\ -2 \\ 3 \\ -1 \\ -1 \\ 2 \end{bmatrix}$.

Find the rank of A.

Direction for Questions: 28 to 41

To submit your Mock Test : Go to last question and click on Finish and click on Finish again.

Question Type: MCQ

Marks for correct Answer : 2
Negative Marks : 2/3

To submit your mock test :
Go to last question and click on Finish and click on Finish again.

Question: 28 of 65 QID: 134 Marks: 2

Consider the following table named animal in a relational database. Primary key of this table is “nickname”

The SQLquery below is executed on this database.

animal

nickname	species	weightlb	age	gender
Dumbo	Elephant	6300	45	m
Pum	Elephant	7900	15	f
Flippy	Dolphin	5000	23	m
Birdy	Owl	5	4	m
Lea	Lion	240	7	f

```
SELECT species
FROM
        (SELECT species,
           SUM(CASE WHEN gender = 'm' THEN weightlb ELSE '0' END) AS wmales,
           SUM(CASE WHEN gender = 'f' THEN weightlb ELSE '0' END) AS wfemales
FROM animal
GROUP BY species)
WHERE wmales>wfemales;
```

What will be the output of the above query?

- **A.** Elephant, Dolphin, Owl, Lion
- **B.** Owl, Dolphin, Lion
- **C.** Owl, Dolphin
- **D.** Elephant, Dolphin, Lion

Question: 29 of 65 QID: 148 Marks: 2

Given two quantities:

A is maximum value of $[1/(4+y^2)]$

B is $\frac{1}{4}$

Select the statement which is correct:

- **A.** A > B
- **B.** B>A
- **C.** A=B
- **D.** Relationship can not be determined by given information

Question: 30 of 65 QID: 158 Marks: 2

Let b be the branching factor of a search tree. If the optimal depth of a goal state is d. How many times the initial node (root node) would be expanded by iterative deepening depth first search (IDDFS) algorithm before reaching the goal state ?

- **A.** $O(d)$
- **B.** $O(bd)$
- **C.** $O(b^d)$
- **D.** $O(d^b)$

Question: 31 of 65 QID: 141 Marks: 2

Two pipes P and Q, when opened alone can fill the tank in 20 and 30 hours respectively. If both pipes are opened together, then in how many hours will the tank be filled?

- **A.** 10 hours
- **B.** 12 hours
- **C.** 15 hours
- **D.** 18 hours

Question: 32 of 65 QID: 117 Marks: 2

What are the time complexities of the following two functions?

```
def func1(n):
  if n<=1:
    print(n)
    return n
  else:
    return 3*func1(n-1)


def func2(n):
  print(n)
  if n<=1:
    return n
  else:
    return func2(n-1) + func2(n-1)
```

A. Both functions have a time complexity of $O(n)$

B. func1 has a time complexity of $O(n)$ and func2 has a time complexity of $O(2^n)$

C. func1 has a time complexity of $O(2^n)$ and func2 has a time complexity of $O(n)$

D. Both functions have a time complexity of $O(2^n)$

Question: 33 of 65 QID: 156 Marks: 2

The Taylor series expansion of $f(x) = \ln(1+x^2)$ about $x = 0$ is :

A. $\sum_{n=1}^{\infty}(-1)^n\frac{x^n}{n}$

B. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{x^{2n}}{n}$

C. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{x^{2n+1}}{n+1}$

D. $\sum_{n=1}^{\infty}(-1)^{n+1}\frac{x^{n+1}}{n+1}$

Question: 34 of 65 QID: 150 Marks: 2

Bindu's bike tires have a radius of 30 cm. She rides her bike far enough that the tires rotate exactly five times. How far does Bindu's bike travel?

A. 60πcm
B. 30πcm
C. 900πcm
D. 300πcm

Question: 35 of 65 QID: 154 Marks: 2

Let. $f(x) = \begin{cases} \frac{1}{|x|} : & |x| \geq 1 \\ ax^2 + b : & |x| < 1 \end{cases}$ be continuous and differentiable every where. Then a and b are:

A. $a = \frac{-1}{2}, b = \frac{3}{2}$
B. $a = \frac{1}{2}, b = \frac{-3}{2}$
C. $a = \frac{1}{2}, b = \frac{3}{2}$
D. $a = \frac{1}{3}, b = \frac{1}{2}$

Question: 36 of 65 QID: 120 Marks: 2

What do the variables a and b refer to, respectively, after the following code executes?

```
lst = "depth of machine learning".split()
it1 = iter(lst)
it2 = iter(lst)
next(it1), next(it2), next(it2)
a, b = next(it1), next(it2)
```

A. of and $learning$
B. $machine$ and $learning$
C. $depth$ and $learning$
D. of and $machine$

Question: 37 of 65 QID: 151 Marks: 2

People are always less happy to accept scientific data they feel contradicts their preconceived beliefs. No surprise here; no human likes to be wrong. But science isn't supposed to care about preconceived notions. Science, at least good science, tells us about the world as it is, and not as some wish it to be. Sometimes what science finds is consistent with a particular religion's wishes. But usually it is not.

Question: What can be inferred about good science? Select from the given options.

A. A good science is well received by the educated people.
B. A good science is based on concrete results obtained through testing the hypothesis.
C. A good science and religion are same.
D. A good science will always prove the general populace wrong.

Question: 38 of 65 QID: 163 Marks: 2

Let $X \in \mathbb{R}^{m \times n}, w \in \mathbb{R}^n$, and $Y \in \mathbb{R}^m$. Consider mean squared error $L(w) = \|Xw - Y\|_2^2$. What is the formula for $\nabla_w L(w)$? (Gradient of function L with respect to vector w).

A. $2Y^T \left(X^\top Xw - Y\right)$
B. $2X^T \left(X^\top Xw - Y\right)$
C. $2Y^T (Xw - Y)$
D. $2X^T (Xw - Y)$

Question: 39 of 65 QID: 146 Marks: 2

Given the following list of numbers

3, a, 1, 9, b, 3

We know the following two things
1. arithmetic mean of the list of numbers is 4
2. a & b are integers

If A = median of the numbers in list & B = mean of the numbers in list

Choose the option that is correct :

- **A.** A> B
- **B.** B>A
- **C.** A=B
- **D.** Relationship can not be determined by given information

Question: 40 of 65 QID: 110 Marks: 2

Suppose $e1$ and $e2$ are linearly independent. They are also eigenvectors of a matrix. Corresponding eigenvalues $\lambda 1$ and $\lambda 2$ are not known. What can be said about $\lambda 1$ and $\lambda 2$?

- **A.** $\lambda 1 = \lambda 2$
- **B.** $\lambda 1 \neq \lambda 2$
- **C.** $\lambda 1$ may or may not be equal to $\lambda 2$
- **D.** Information is insufficient.

Question: 41 of 65 QID: 167 Marks: 2

Suppose you are given an input data points $X_1, X_2 ... X_n$, $X_i \in R^{5X1}$. And mean of these points is 0, i.e. $\sum X_i = 0$. Let eigen values of the matrix $\sum X_i X_i^T$ are 9,6,5,3,2 respectively. How much percentage of variance is captured by the subspace spanned by the first two principal components ?

- **A.** 30
- **B.** 40
- **C.** 60
- **D.** 80

Direction for Questions: 42 to 65

To submit your Mock Test :Go to last question and click on Finish and click on Finish again.

Question Type: MCQ

Marks for correct Answer: 1
Negative marks : 1/3

To submit your mock test :
Go to last question and click on Finish and click on Finish again.

Question: 42 of 65 QID: 161 Marks: 1

Let $p, q,$ and r be the propositions and the expression $(p \to q) \to r$ be a contradiction. Then the expression $(r \to p) \to q$ is :

- **A.** A tautology
- **B.** A contradiction.
- **C.** Always TRUE when p is FALSE
- **D.** Always TRUE when q is TRUE

Question: 43 of 65 QID: 162 Marks: 1

Let $f(x_1, x_2, x_3) = x_1x_2 - x_2^3 + x_1x_3$. What is $\nabla_{x_1,x_2,x_3} f$? (Gradient of f with respect to x_1, x_2 and x_3 ?

- A. $x_2 - 3x_2^2 + x_1$
- B. $[x_2 + x_3, x_1 - 3x_2^2, x_1]^T$
- C. $x_2 + x_3$
- D. $[x_2, -3x_2^2, x_1]^T$

Question: 44 of 65 QID: 123 Marks: 1

Consider a scenario where we are debugging a quicksort implementation designed to arrange an array in ascending order. Upon completing the first partition step, the array's contents are as follows:

3, 9, 1, 14, 17, 24, 27, 20.

Which of the following statements accurately describes the outcome of the partition step?

Pseudo-code for QUICKSORT

```
QUICKSORT (A , p, r)
        if p < r
                q = PARTITION (A, p, r)
                QUICKSORT (A , p, q-1)
                QUICKSORT (A , q+1, r)
```

- A. The pivot could have been either 14 or 17
- B. The pivot could have been 14 but not 17
- C. The pivot could have been 17 but not 14
- D. Neither 14 nor 17 could have been the pivot

Question: 45 of 65 QID: 142 Marks: 1

Missing number in the given sequence 343, 1331, __ 4913 is?

- A. 3375
- B. 2744
- C. 2197
- D. 4096

Question: 46 of 65 QID: 126 Marks: 1

Consider m x n integer matrix, stored as a list of list, with the following two properties:

Each row is sorted in non-decreasing order.
The first integer of each row is greater than the last integer of the previous row.

For example:

$$\begin{bmatrix} 3 & 5 & 10 & 11 \\ 14 & 18 & 23 & 25 \\ 34 & 36 & 45 & 50 \end{bmatrix}$$

Consider an algorithm such that given an integer "target", it returns true if the "target" is in matrix or false otherwise.

What is the tightest bound on worst case time complexity of the best possible algorithm for the above problem?

You can assume that random access of array elements are possible i.e. any element of array can be accessed in $O(1)$ time.

- A. $O(m+n)$
- B. $O(log(m)+log(n))$
- C. $O(m \times log(n))$
- D. $O(m \times n)$

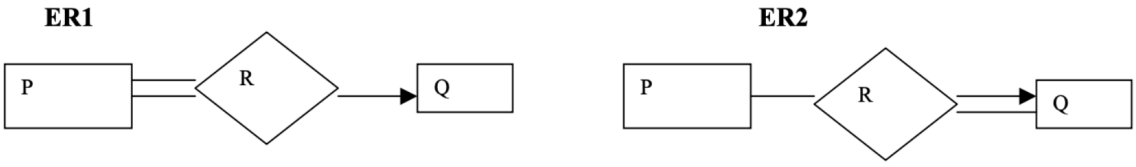
Question: 47 of 65 QID: 114 Marks: 1

Suppose A & B are matrices are of size 10×5 and 5×10 respectively. If $C = AB$, is C invertible?

- A. Yes C is invertible
- B. Depends on B
- C. Depends on A
- D. C will never be invertible

Question: 48 of 65 QID: 130 Marks: 1

Consider the following two ER diagrams - ER1 and ER2 (single line represents partial/optional participation and double line indicates total/mandatory participation)



The statement that the number of entities in entity set P must be greater than or equal to the number of entities in entity set Q holds for:

- A. ER1 but not ER2
- B. ER2 but not ER1
- C. Both ER1 and ER2
- D. Neither ER1 nor ER2

Question: 49 of 65 QID: 131 Marks: 1

Which of the following statements best describes data independence in a database system?

- A. Every piece of information in the database should be represented in one and only way, specifically by values in column positions within rows of tables.
- B. For any theoretically updatable views, the system must ensure they are updatable.
- C. Changes to physical storage representations or access methods must not require modifications to application programs.
- D. Modifications to tables that don't alter existing data stored in them and should not require changes made to application programs.

Question: 50 of 65 QID: 164 Marks: 1

In developing a regression model, where the categorical variable representing a certain class comprises FOUR distinct categories, what is the MINIMUM requisite number of dummy variables that are needed to be integrated in the model for the one hot conversion of that class ?

- **A.** 8
- **B.** 5
- **C.** 3
- **D.** 4

Question: 51 of 65 QID: 128 Marks: 1

Consider a relation R with five attributes: A, B, C, D, and E. Attribute C never appears on the right-hand side of any non-trivial functional dependency applying to R. Assume that at least one non-trivial functional dependency exists. How many different possibilities are there for what a candidate key for R can be?

- **A.** 1
- **B.** 10
- **C.** 15
- **D.** 16

Question: 52 of 65 QID: 140 Marks: 1

The freedom fighters, _____ the nationals of India owed their lives, were commemorated by people on Independence Day.

- **A.** whom
- **B.** that
- **C.** to whom
- **D.** to which

Question: 53 of 65 QID: 143 Marks: 1

The ratio of boys to girls in a class is 5 to 3. Among the options given below, an acceptable value for total number of students in the class is:

- **A.** 64
- **B.** 35
- **C.** 21
- **D.** 18

Question: 54 of 65 QID: 108 Marks: 1

A fair dice (numbered from 1 to 6 on faces) is tossed till number 5 appears on the face first time. The probability that number of required tosses are even is ?

- **A.** $\frac{2}{3}$
- **B.** $\frac{1}{3}$
- **C.** $\frac{5}{11}$
- **D.** $\frac{6}{11}$

Question: 55 of 65 QID: 144 Marks: 1

A sum of money is to be distributed among P, Q, R, and S in the proportion 5 : 4 : 3 : 2, respectively. If R gets ₹ 1000 more than S, what is the share of Q (in ₹)?

- **A.** 1000
- **B.** 2000
- **C.** 3000
- **D.** 4000

Question: 56 of 65 QID: 136 Marks: 1

Let X_1 and X_2 are independent Bernoulli random variable with parameter p. (i.e. $P(X_i = 1) = p$ and $P(X_i = 0) = 1 - p$). Find $E\left[X_1^3 * X_2^2\right]$? (E denotes the expectation of random variable)

- A. $p^3 * (1-p)^2$
- B. p^2
- C. p^5
- D. $p^2 * (1-p)^3$

Question: 57 of 65 QID: 145 Marks: 1

If $a(x+2) + b(x+2) = 60$ and $a + b = 12$, then x is equal to

- A. 3
- B. 5
- C. 1
- D. 7

Question: 58 of 65 QID: 113 Marks: 1

A fair dice (numbered from 1 to 6 on faces) is rolled twice. The probability that an odd number on the first roll will follow an even number on the second roll is ?

- A. $\frac{1}{2}$
- B. $\frac{1}{6}$
- C. $\frac{1}{4}$
- D. $\frac{1}{3}$

Question: 59 of 65 QID: 153 Marks: 1

The function $|x|/x$ is :

- A. Is continuous and differentiable for all values in $(-\infty, +\infty)$
- B. Is continuous and but not differentiable for all values in $(-\infty, +\infty)$
- C. Is not continuous but it is differentiable for all values in $(-\infty, +\infty)$
- D. It is neither continuous nor differentiable for all values in $(-\infty, +\infty)$

Question: 60 of 65 QID: 109 Marks: 1

Given Ax=b where A is a $m * n$ matrix and b is a vector in R^m. It is known that the system has a unique non-trivial solution. What can be said about the rank of A?

- A. Rank of A < n
- B. Rank of A = n
- C. Rank of A > n
- D. Rank of A <= n-1

Question: 61 of 65 QID: 121 Marks: 1

Which of the following listed algorithms are in strictly worsening order (i.e., fastest to slowest) of asymptotic runtime complexity?

- A. binary search, linear search, merge sort, insertion sort
- B. binary search, merge sort, linear search, insertion sort
- C. merge sort, linear search, insertion sort, binary search
- D. merge sort, binary search, linear search, insertion sort

Question: 62 of 65 QID: 139 Marks: 1

Which statement regarding gradient descent (GD) is true?

- A. During training, it is recommended not to update the bias (also known as offset or intercept) term using GD
- B. Lowering the learning rate, while keeping all other hyperparameters constant, guarantees reaching a global optima
- C. Running GD on full datasets with a large number of samples can incur significant computational costs.
- D. An advantage of GD over Stochastic GD is that GD converges with just a single update step

Question: 63 of 65 QID: 111 Marks: 1

A fair dice (numbered from 1 to 6 on faces) is tossed three times. The probability that the number appears on the third toss is the sum of the numbers appeared in first two tosses is ?

- A. $\frac{1}{3}$
- B. $\frac{15}{216}$
- C. $\frac{15}{120}$
- D. $\frac{2}{3}$

Question: 64 of 65 QID: 119 Marks: 1

Consider the following Python function where m and n are assumed to be positive integers. Which of the following functions is being computed by the “secret” function?

```
def secret(n, m):
    p = 0
    e = 0
    while e < m:
        p = p + n
        e = e + 1
    return p
```

- A. $n \times m$
- B. $n + m$
- C. n^m
- D. n^n

Question: 65 of 65 QID: 138 Marks: 1

In K Nearest neighbour classifier, if we increase the k to a very high value. Which of the following problems the classifier can suffer from

- **A.** Overfitting
- **B.** Underfitting
- **C.** Both
- **D.** None (it doesn't depend on k)

--- END OF QUESTION PAPER ---

Answer Key

No	Question Type	QID	Correct Answer
Question - 1	Multiple Correct	170	A., C
Question - 2	Multiple Correct	127	A., B., C
Question - 3	Multiple Correct	166	A
Question - 4	Multiple Correct	118	A., B., C., D
Question - 5	Multiple Correct	147	C., D
Question - 6	Multiple Correct	168	A., C
Question - 7	Multiple Correct	132	A., C., D
Question - 8	Multiple Correct	112	A., D
Question - 9	Multiple Correct	106	A., B., D
Question - 10	Multiple Correct	157	A., C
Question - 11	Multiple Correct	129	B., C
Question - 12	Multiple Correct	116	A., B., D
Question - 13	Multiple Correct	159	A., C
Question - 14	Multiple Correct	124	A., C
Question - 15	Multiple Correct	125	A., D
Question - 16	Multiple Correct	160	B
Question - 17	Multiple Correct	165	A., B., C
Question - 18	Multiple Correct	155	B., D
Question - 19	Fill in the Blank	122	15
Question - 20	Fill in the Blank	133	0.89
Question - 21	Fill in the Blank	171	Pass
Question - 22	Fill in the Blank	152	2
Question - 23	Fill in the Blank	115	6
Question - 24	Fill in the Blank	137	0.1040
Question - 25	Fill in the Blank	135	3
Question - 26	Fill in the Blank	149	4
Question - 27	Fill in the Blank	107	4
Question - 28	Multiple Choice (Radiobutton)	134	C
Question - 29	Multiple Choice (Radiobutton)	148	C
Question - 30	Multiple Choice (Radiobutton)	158	A
Question - 31	Multiple Choice (Radiobutton)	141	B
Question - 32	Multiple Choice (Radiobutton)	117	B
Question - 33	Multiple Choice (Radiobutton)	156	B
Question - 34	Multiple Choice (Radiobutton)	150	D
Question - 35	Multiple Choice (Radiobutton)	154	A
Question - 36	Multiple Choice (Radiobutton)	120	D
Question - 37	Multiple Choice (Radiobutton)	151	B
Question - 38	Multiple Choice (Radiobutton)	163	D
Question - 39	Multiple Choice (Radiobutton)	146	B
Question - 40	Multiple Choice (Radiobutton)	110	B
Question - 41	Multiple Choice (Radiobutton)	167	C
Question - 42	Multiple Choice (Radiobutton)	161	D

No	Question Type	QID	Correct Answer
Question - 43	Multiple Choice (Radiobutton)	162	B
Question - 44	Multiple Choice (Radiobutton)	123	A
Question - 45	Multiple Choice (Radiobutton)	142	C
Question - 46	Multiple Choice (Radiobutton)	126	B
Question - 47	Multiple Choice (Radiobutton)	114	D
Question - 48	Multiple Choice (Radiobutton)	130	B
Question - 49	Multiple Choice (Radiobutton)	131	C
Question - 50	Multiple Choice (Radiobutton)	164	C
Question - 51	Multiple Choice (Radiobutton)	128	C
Question - 52	Multiple Choice (Radiobutton)	140	C
Question - 53	Multiple Choice (Radiobutton)	143	A
Question - 54	Multiple Choice (Radiobutton)	108	C
Question - 55	Multiple Choice (Radiobutton)	144	D
Question - 56	Multiple Choice (Radiobutton)	136	B
Question - 57	Multiple Choice (Radiobutton)	145	A
Question - 58	Multiple Choice (Radiobutton)	113	C
Question - 59	Multiple Choice (Radiobutton)	153	D
Question - 60	Multiple Choice (Radiobutton)	109	B
Question - 61	Multiple Choice (Radiobutton)	121	A
Question - 62	Multiple Choice (Radiobutton)	139	C
Question - 63	Multiple Choice (Radiobutton)	111	B
Question - 64	Multiple Choice (Radiobutton)	119	A
Question - 65	Multiple Choice (Radiobutton)	138	B

--- END OF ANSWER KEY ---