6406533522855.
$$\checkmark$$
 $\frac{e^{-2}(2)^5}{5!}$

Question Number: 161 Question Id: 6406531043211 Question Type: MCQ

Correct Marks: 4

Question Label: Multiple Choice Question

Metros on a certain station arrives uniformly after every 10 minutes. If a person arrives at the metro station at random, then what is the probability that he has to wait at least 4 minutes?

Options:

$$\frac{6}{10}$$
 6406533522857. \checkmark $\frac{6}{10}$

$$\frac{1}{3}$$
6406533522859. **

Sem2 Maths2

Section Id: 64065375502

Section Number: 5

Section type: Online

Mandatory or Optional: Mandatory

Number of Questions: 17

Number of Questions to be attempted: 17
Section Marks: 50

Display Number Panel : Yes

Section Negative Marks: 0

Group All Questions: No

Enable Mark as Answered Mark for Review and

Clear Response :

Section Maximum Duration: 0
Section Minimum Duration: 0

Section Time In: Minutes

Maximum Instruction Time: 0
Sub-Section Number: 1

Sub-Section Id: 640653160691

Question Shuffling Allowed: No

Question Number: 162 Question Id: 6406531043213 Question Type: MCQ

Correct Marks: 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "FOUNDATION LEVEL: SEMESTER II:

MATHEMATICS FOR DATA SCIENCE II (COMPUTER BASED EXAM)"

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

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

Options:

6406533522864. **✓** YES 6406533522865. **¾** NO

Sub-Section Number: 2

Sub-Section Id: 640653160692

Question Shuffling Allowed: Yes

Question Number: 163 Question Id: 6406531043223 Question Type: MCQ

Correct Marks: 2

Question Label: Multiple Choice Question

Consider the subspace $W = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} \middle| a+b=c, c+d=b-a \right\}$ of $M_{2\times 2}(\mathbb{R})$.

Find the dimension of W.

Options:

$$6406533522885. * dim(W) = 1$$

$$6406533522886. \checkmark \dim(W) = 2$$

6406533522887. *
$$\dim(W) = 3$$

$$6406533522888. * \dim(W) = 4$$

Sub-Section Number: 3

Sub-Section Id: 640653160693

Question Number: 164 Question Id: 6406531043214 Question Type: MSQ

Correct Marks: 3 Max. Selectable Options: 0

Question Label: Multiple Select Question

Let $A \in M_{4\times 4}(\mathbb{R})$ be a matrix with determinant -2. Which of the following operations transform A to a matrix B with determinant 10. Choose all the correct options:

Options:

6406533522866. ✓ Add second row to fourth row and multiply second row with -5.

6406533522867. **※** Multiply matrix A with −5.

6406533522868. ✓ Interchange first and third row and multiply fourth row with 5.

6406533522869. ✓ Multiply second row of A with 5 and multiply third row with -1.

Question Number: 165 Question Id: 6406531043218 Question Type: MSQ

Correct Marks: 3 Max. Selectable Options: 0

Question Label: Multiple Select Question

Assume the usual vector addition and scalar multiplication for all the options below. Choose the correct option(s) from the following statements.

Options:

6406533522875. \checkmark The set of vectors $\{(x, y, z) \in \mathbb{R}^3 \mid x + y = z\}$ forms a vector space.

Let $A \in M_{5\times 3}(\mathbb{R})$ be a matrix such that the columns of A are linearly independent. The set of all solutions of the homogeneous system

6406533522876. \checkmark Ax = 0 is a vector space of dimension 0.

The set of all $n \times n$ matrices with rank strictly less than n forms a 6406533522877. ** vector space.

6406533522878. * The set of all $n \times n$ invertible matrices forms a vector space.

Question Number: 166 Question Id: 6406531043239 Question Type: MSQ

Correct Marks: 3 Max. Selectable Options: 0

Question Label: Multiple Select Question

Let f be a scalar-valued multivariable function defined on a domain $D \subset \mathbb{R}^2$. Choose all the correct statements from the following statements regarding the directional derivative f_u of f in the direction of the unit vector u.

Options:

If the partial derivatives of f exist at a point (a, b), then $f_u(a, b)$ 6406533522917. ** exists for all unit vectors u.

If f_u exists at a point (a, b) for all unit vectors u, then the partial 6406533522918. \checkmark derivatives of f exist at (a, b).

If ∇f exists at a point (a,b), then the tangent plane to the graph of f exists at that point.

6406533522919. **

If there exists a point $(a,b) \in D$ such that $\nabla f(a,b) = 0$ and ∇f is continuous in a neighbourhood around (a, b), then $f_u = 0$, for all unit vectors

6406533522920.

Question Number: 167 Question Id: 6406531043250 Question Type: MSQ

Correct Marks: 3 Max. Selectable Options: 0

Question Label: Multiple Select Question

Consider the function $f: \mathbb{R}^2 \to \mathbb{R}$ defined as follows:

$$f(x,y) = \begin{cases} (x^2 + y)\sin\left(\frac{1}{x^2 + y^2}\right), & \text{for } (x,y) \neq (0,0) \\ 0, & \text{for } (x,y) = (0,0) \end{cases}$$

Choose all the correct statements from the following.

Options:

6406533522931. \checkmark The function f is continuous at (0,0).

There is a direction along which the directional derivative of f does 6406533522932. \checkmark not exist at (0,0).

There are infinitely many unit direction vectors along which the 6406533522933. * directional derivative of f exists at (0,0).

The tangent hyperplane to f at (0,0) exists. 6406533522934. **

4 **Sub-Section Number:**

Sub-Section Id: 640653160694

Question Shuffling Allowed: No Question Id: 6406531043215 Question Type: COMPREHENSION Sub Question Shuffling Allowed: No Group Comprehension Questions: No Question Pattern Type: NonMatrix

Question Numbers: (168 to 169)

Question Label: Comprehension

Let
$$A = \begin{bmatrix} 2 & -1 & 1 \\ k & -2 & 2 \\ 5 & 1 & 6 \end{bmatrix}$$
 where $k \in \mathbb{R}$. Answer the given subquestions

Sub questions

Question Number: 168 Question Id: 6406531043216 Question Type: SA

Correct Marks: 1.5

Question Label: Short Answer Question

Find the value of k for which the system

Ax = 0 has infinitely many solutions.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes Answers Type: Equal Text Areas: PlainText Possible Answers:

4

Question Number: 169 Question Id: 6406531043217 Question Type: MCQ

Correct Marks: 1.5

Question Label: Multiple Choice Question

If
$$k = 3$$
 and $b = \begin{bmatrix} 1 \\ \alpha \\ -1 \end{bmatrix}$, then which of the

following option is true?

Options:

If $\alpha = 2$, then the system Ax = b will

6406533522871. have a unique solution.

If $\alpha = 1$, then the system Ax = b will have infinitely many solutions.

6406533522872. **

If $\alpha = -3$, then the rank of the augmented matrix [A|b] is not equal to rank of A.

6406533522873.

If $\alpha = 1$, then b does not belong to the column space of A.

6406533522874. **

Question Id: 6406531043219 Question Type: COMPREHENSION Sub Question Shuffling Allowed: No Group Comprehension Questions: No Question Pattern Type: NonMatrix

Question Numbers : (170 to 172)

Question Label: Comprehension

Let
$$A = \begin{bmatrix} -2 & k \\ 1 & 3 \\ k-1 & 0 \end{bmatrix}$$
 where $k \in \mathbb{R}$.

Answer the given subquestions as true or false:

Sub questions

Question Number: 170 Question Id: 6406531043220 Question Type: MCQ

Correct Marks: 1

Question Label : Multiple Choice Question

There are infinitly many values of k for

which the rows of A span \mathbb{R}^2 .

Options:

6406533522879. ✔ TRUE

6406533522880. * FALSE

Question Number: 171 Question Id: 6406531043221 Question Type: MCQ

Correct Marks: 1

Question Label : Multiple Choice Question

There exists $k \in \mathbb{R}$ such that rank of

A is 1.

Options:

6406533522881. * TRUE

6406533522882. V FALSE

Question Number: 172 Question Id: 6406531043222 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question

When k = 1, the column vectors span the

xy- plane in \mathbb{R}^3 .

Options:

6406533522883. V TRUE

6406533522884. * FALSE

Question Id: 6406531043224 Question Type: COMPREHENSION Sub Question Shuffling Allowed: No Group Comprehension Questions: No Question Pattern Type: NonMatrix

Question Numbers : (173 to 175)

Question Label: Comprehension

Let $T: \mathbb{R}^3 \to \mathbb{R}^3$ be a linear transformation and $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 0 & -1 \\ 1 & 3 & 0 \end{bmatrix}$ is

the matrix representation of T with respect to the standard ordered

basis for both the domain and the codomain. Based on this information, answer the given subquestions

Sub questions

Question Number: 173 Question Id: 6406531043225 Question Type: MCQ

Correct Marks : 1

Question Label: Multiple Choice Question

Choose the correct definition for T.

Options:

6406533522889.
$$\checkmark$$
 $T(x, y, z) = (2x + 3y - z, x - z, x + 3y).$

6406533522890.
$$T(x, y, z) = (2x + y + z, 3x + 3z, -x - y).$$

6406533522891. *
$$T(x, y, z) = (2x + 3y + z, x - z, x + 3y).$$

Question Number: 174 Question Id: 6406531043226 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

If B is the matrix representation of T with respect to the ordered basis $\{(-1, -1, 0), (0, -2, 3), (1, 3, 1)\}$ for both the domain and the codomain, find the rank of B.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

2

Question Number: 175 Question Id: 6406531043227 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

Find the determinant of *B*. **Response Type**: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes Answers Type: Equal Text Areas: PlainText Possible Answers:

0

Question Id : 6406531043235 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers : (176 to 178)

Question Label: Comprehension

For a domain $D \subset \mathbb{R}^2$, let $f: D \to \mathbb{R}$ be the scalar valued function defined by the formula

$$f(x,y) = \frac{1}{x^2 + y^2}$$
, for all $(x,y) \in D$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number: 176 Question Id: 6406531043236 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question

Which of the following is the largest possible set that would be a valid domain D for the given function f?

Options:

6406533522905. * R²

6406533522906. \checkmark $\{(x,y) \in \mathbb{R}^2 \mid x^2 + y^2 \neq 0\}$

6406533522907. ***** $\{(x,y) \in \mathbb{R}^2 \mid x^2 + y^2 \neq 1\}$

6406533522908. ***** $\{(x,y) \in \mathbb{R}^2 \mid x^2 + y^2 < 1\}$

Question Number: 177 Question Id: 6406531043237 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question

For $D = \{(x, y) \in \mathbb{R}^2 \mid x^2 + y^2 < \frac{1}{2}\}$, what is the range of f?

Options:

6406533522909. ***** R

6406533522910. * (0,2)

6406533522911. ✔ (2, ∞)

6406533522912. * $(0, \frac{1}{2})$

Question Number: 178 Question Id: 6406531043238 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question

For which of the following choices of D is the

function f injective?

Options:

6406533522913. \checkmark $\{(0,y) \mid y > 0\}$

6406533522914. *****
$$\{(x,-1) \mid x>-1\}$$

6406533522915. *****
$$\{(1, y) \mid y < 1\}$$

6406533522916. *****
$$\{(0,y) \mid y \neq 0\}$$

Question Id : 6406531043240 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers: (179 to 180)

Question Label: Comprehension

Let $f: \mathbb{R}^2 \to \mathbb{R}$ be the function defined as follows:

$$f(x,y) = \begin{cases} x^m y \sin\left(\frac{1}{x}\right) & \text{if } x \neq 0\\ k & \text{if } x = 0 \end{cases}$$

where $k \in \mathbb{R}$ and m is a positive integer.

Based on the above data, answer the given subquestions.

Sub questions

Question Number: 179 Question Id: 6406531043241 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

Find the value of k for which f is

continuous at (0,0).

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

0

Question Number: 180 Question Id: 6406531043242 Question Type: SA

Correct Marks: 2

Question Label: Short Answer Question

Using the value of k obtained in the previous question, find the minimum value of the integer m for which $f_x(0,1)$ (the partial derivative of f in the variable x at the point (0,1)) exists.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

2

Question Id: 6406531043243 Question Type: COMPREHENSION Sub Question Shuffling Allowed: No Group Comprehension Questions: No Question Pattern Type: NonMatrix

Question Numbers: (181 to 182)

Question Label: Comprehension

Let $f: \mathbb{R}^2 \to \mathbb{R}$ be the function defined by

$$f(x,y) = \sin^2(x) + \cos^2(y) + 4y$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number: 181 Question Id: 6406531043244 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

For $c \in \mathbb{R}$, if $\nabla f(c,c) = (a,b)$, then find the

value of a + b.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

4

Question Number: 182 Question Id: 6406531043245 Question Type: MSQ

Correct Marks: 2 Max. Selectable Options: 0

Question Label: Multiple Select Question

Choose the options for which $f_u(x, y) = 0$.

Options:

6406533522924.
$$\checkmark u = (1,0), (x,y) = (\frac{\pi}{2},0).$$

6406533522925. $u = (0,1), (x,y) = (0,\frac{\pi}{4}).$

6406533522926. \checkmark $u = \left(-\frac{4}{\sqrt{17}}, \frac{1}{\sqrt{17}}\right), \quad (x, y) = \left(\frac{\pi}{4}, \frac{\pi}{2}\right).$

6406533522927. \checkmark $u = \left(\frac{3}{\sqrt{10}}, -\frac{1}{\sqrt{10}}\right), \quad (x, y) = \left(\frac{\pi}{4}, \frac{\pi}{4}\right).$

Question Id : 6406531043246 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers: (183 to 185)

Question Label: Comprehension

Consider the scalar-valued function $f(x,y) = x \sin y + y \cos x$ defined on \mathbb{R}^2 . Let (a,3,b) be a point that lies on the tangent line to the graph of f at (0,0) in the direction of steepest ascent.

Based on the above data, answer the given subquestions.

Sub questions

Question Number: 183 Question Id: 6406531043247 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

Find the directional derivative of f at the

point (0,0) in the direction of steepest ascent.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

1

Question Number: 184 Question Id: 6406531043248 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

Find the value of a.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

0

Question Number: 185 Question Id: 6406531043249 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

Find the value of *b*.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

3

Question Id: 6406531043255 Question Type: COMPREHENSION Sub Question Shuffling Allowed: No Group Comprehension Questions: No Question Pattern Type: NonMatrix

Question Numbers : (186 to 187)Question Label : Comprehension

Consider the function $f(x,y) = \cos(\pi(x^2 + y^2))$ defined on \mathbb{R}^2 .

Based on the above data, answer the given subquestions.

Sub questions

Question Number: 186 Question Id: 6406531043256 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question

How many critical points does the function *f* have?

Options:

6406533522944. * 0

6406533522945. * 1

6406533522946. * 2

6406533522947. **✓** Infinitely many

Question Number: 187 Question Id: 6406531043257 Question Type: MCQ

Correct Marks: 2

Question Label: Multiple Choice Question

What can we conclude from the Hessian test for the function f at (0, 0)?

Options:

6406533522948. **(**0, 0) is not a critical point.

6406533522949. ✓ The Hessian test is inconclusive.

6406533522950. * The Hessian test can be used to conclude that (0, 0) is a local maximum.

6406533522951. * The Hessian test can be used to conclude that (0, 0) is a local minimum.

6406533522952. * The Hessian test can be used to conclude that (0, 0) is a saddle point.

Sub-Section Number: 5

Sub-Section Id: 640653160695

Question Shuffling Allowed: No

Question Id: 6406531043228 Question Type: COMPREHENSION Sub Question Shuffling Allowed: No Group Comprehension Questions: No Question Pattern Type: NonMatrix

Question Numbers: (188 to 189)

Question Label: Comprehension

Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation with range space of T given by $W = span\{(1,3,1), (2,0,-1), (-2,2,2)\}$. Based on the above

information, answer the given subquestions:

Sub questions

Question Number: 188 Question Id: 6406531043229 Question Type: MSQ

Correct Marks: 3 Max. Selectable Options: 0

Question Label: Multiple Select Question

Let A be the matrix representation of

T with respect to some ordered basis

for both the domain and the codomain.

Which of the following options is correct:

Options:

The columns of A are always linearly

6406533522894. ✓ independent.

6406533522895. * The rows of A may not be linearly dependent.

6406533522896. \checkmark The nullity of A is 0.

6406533522897. \checkmark The range of A forms a plane in \mathbb{R}^3 .

Question Number: 189 Question Id: 6406531043230 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question

The transformation *T* is

Options:

6406533522898. * bijective

6406533522899. ✓ injective but not surjective

6406533522900. * surjective but not injective

6406533522901. [☀] neither injective nor surjective

Question Id : 6406531043231 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers: (190 to 192)

Question Label: Comprehension

Let $P_W : \mathbb{R}^3 \to \mathbb{R}^3$ be the projection (with respect to the standard inner product on \mathbb{R}^3) on the subspace $W = \{(x, y, z) \mid 2x + y - 3z = 0\}$.

Based on the above information, answer the given subquestions

Sub questions

Question Number: 190 Question Id: 6406531043232 Question Type: SA

Correct Marks: 1.5

Question Label : Short Answer Question

If $P_W(1, -2, 0) = (a, b, c)$, find a + b + c.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

-1

Question Number: 191 Question Id: 6406531043233 Question Type: SA

Correct Marks: 1.5

Question Label: Short Answer Question

If (α, β, γ) is a vector in the kernel of P_W , find

 $\alpha + \beta + \gamma$.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

0

Question Number: 192 Question Id: 6406531043234 Question Type: SA

Correct Marks: 1

Question Label: Short Answer Question

What is the dimension of the orthogonal

complement W^{\perp} ?

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes
Answers Type: Equal
Text Areas: PlainText
Possible Answers:

1

Question Id : 6406531043251 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers : (193 to 195)

Question Label : Comprehension

Consider the graph of the scalar-valued function $f(x,y) = x^2$ defined on \mathbb{R}^2 . The point on the graph which is closest to a fixed point (x_0, y_0, z_0) can be found by minimizing the function defined by computing the square of the distance between (x_0, y_0, z_0) and a generic point (x, y, f(x, y)) on the graph.

Based on the above data, answer the given subquestions.

Sub questions

Question Number: 193 Question Id: 6406531043252 Question Type: MCQ

Correct Marks: 1

Question Label : Multiple Choice Question

Which of the following functions

expresses the square of the distance

between the point (0, 1, -1) and a

generic point on the graph of f.

Options:

6406533522935. *
$$\phi(x,y) = x^4 - x^2 + y^2 - 2y + 2$$

6406533522936.
$$\checkmark \phi(x,y) = x^4 + 3x^2 + y^2 - 2y + 2$$

6406533522937. *
$$\phi(x,y) = x^4 + 3x^2 + y^2 + 2y + 2$$

6406533522938.
$$\phi(x,y) = x^4 - x^2 + y^2 - 2y$$

Question Number: 194 Question Id: 6406531043253 Question Type: SA

Correct Marks: 2

Question Label: Short Answer Question

Using the function given, calculate the minimum distance between (0, 1, -1)

and the graph of f.

Response Type: Numeric

Evaluation Required For SA: Yes

Show Word Count: Yes Answers Type: Equal Text Areas: PlainText Possible Answers:

1

Question Number: 195 Question Id: 6406531043254 Question Type: MCQ

Correct Marks: 1

Question Label: Multiple Choice Question Which of the following statements is true about ϕ , the function which is the square of the distance between (0,1,-1) and the graph of f?

Options:

There is a unique point on the graph of f

6406533522940. * that maximizes the function ϕ .

6406533522941. **

There are more than one, but finitely many points on the graph of f that maximize the function ϕ .

There are infinitely many points on the graph of f that maximize the function ϕ .

There is no point on the graph of f that maximizes the function ϕ .

6406533522943.

Sem2 Statistics2

No

Section Id: 64065375503

Section Number:

Section type: Online

Mandatory or Optional: Mandatory

Number of Questions :12Number of Questions to be attempted :12Section Marks :40Display Number Panel :Yes

Section Negative Marks: 0

Group All Questions: No

Enable Mark as Answered Mark for Review and

Clear Response : 0
Section Maximum Duration : 0

Section Minimum Duration: 0

Section Time In: Minutes

Maximum Instruction Time: 0
Sub-Section Number: 1

Sub-Section Id: 640653160696

Question Shuffling Allowed: No

Question Number: 196 Question Id: 6406531043258 Question Type: MCQ

Correct Marks: 0

Question Label: Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "FOUNDATION LEVEL: SEMESTER II: STATISTICS FOR DATA SCIENCE II (COMPUTER BASED EXAM)"