```
{
    "Identity": "3",
    "Name": "user_1",
    "E-mail": "user_1@gmail.com"
}
```


6406531166917. ✔


```
{
    "Id": 3,
    "name": "user_1"
}
```


6406531166918. ✖


```
{
    "Id": "3",
    "name": "user_1"
}
```


6406531166919. ✖


```
{
    "name": "user_1",
    "email": "user_1@gmail.com"
}
```


MLF

Section Id :	64065322151
Section Number :	7
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	12
Number of Questions to be attempted :	12
Section Marks :	50
Display Number Panel :	Yes
Group All Questions :	No

Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065350499
Question Shuffling Allowed :	No

Question Number : 115 Question Id : 640653351622 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "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 :

6406531166920. ✔ Yes

6406531166921. ✖ No

Sub-Section Number :	2
Sub-Section Id :	64065350500
Question Shuffling Allowed :	Yes

Question Number : 116 Question Id : 640653351628 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

$$\text{The matrix } A = \begin{bmatrix} 4 & 1 & -1 \\ 1 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix} \text{ is}$$

Options :

6406531166940. ✔ positive definite

6406531166941. ✖ positive semi-definite

6406531166942. ✖ negative definite

6406531166943. ✖ negative semi-definite

Sub-Section Number : 3

Sub-Section Id : 64065350501

Question Shuffling Allowed : Yes

Question Number : 117 Question Id : 640653351627 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Choice Question

The singular value decomposition of matrix $A = \begin{bmatrix} 1 & -1 & 3 \\ 3 & 3 & 1 \end{bmatrix}$ is

Options :

6406531166936. ✔ $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 4 & 0 & 0 \\ 0 & \sqrt{6} & 0 \end{bmatrix} \begin{bmatrix} \frac{\sqrt{3}}{\sqrt{6}} & 0 & \frac{\sqrt{3}}{\sqrt{6}} \\ \frac{-\sqrt{2}}{\sqrt{6}} & \frac{-\sqrt{2}}{\sqrt{6}} & \frac{\sqrt{2}}{\sqrt{6}} \\ \frac{-\sqrt{1}}{\sqrt{6}} & \frac{-2}{\sqrt{6}} & \frac{1}{\sqrt{6}} \end{bmatrix}$

6406531166937. ✖ $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 4 & 0 & 0 \\ 0 & \sqrt{8} & 0 \end{bmatrix} \begin{bmatrix} \frac{\sqrt{3}}{\sqrt{6}} & 0 & \frac{\sqrt{3}}{\sqrt{6}} \\ \frac{-\sqrt{2}}{\sqrt{6}} & \frac{-\sqrt{2}}{\sqrt{6}} & \frac{\sqrt{2}}{\sqrt{6}} \\ \frac{-\sqrt{1}}{\sqrt{6}} & \frac{-2}{\sqrt{6}} & \frac{1}{\sqrt{6}} \end{bmatrix}$

6406531166938. ✖

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 5 & 0 & 0 \\ 0 & \sqrt{6} & 0 \end{bmatrix} \begin{bmatrix} \frac{\sqrt{3}}{\sqrt{6}} & 0 & \frac{\sqrt{3}}{\sqrt{6}} \\ \frac{-\sqrt{2}}{\sqrt{6}} & \frac{-\sqrt{2}}{\sqrt{6}} & \frac{\sqrt{2}}{\sqrt{6}} \\ \frac{-\sqrt{1}}{\sqrt{6}} & \frac{-2}{\sqrt{6}} & \frac{1}{\sqrt{6}} \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} 5 & 0 & 0 \\ 0 & \sqrt{8} & 0 \end{bmatrix} \begin{bmatrix} \frac{\sqrt{3}}{\sqrt{6}} & 0 & \frac{\sqrt{3}}{\sqrt{6}} \\ \frac{-\sqrt{2}}{\sqrt{6}} & \frac{-\sqrt{2}}{\sqrt{6}} & \frac{\sqrt{2}}{\sqrt{6}} \\ \frac{-\sqrt{1}}{\sqrt{6}} & \frac{-2}{\sqrt{6}} & \frac{1}{\sqrt{6}} \end{bmatrix}$$

6406531166939. ✖

Sub-Section Number : 4

Sub-Section Id : 64065350502

Question Shuffling Allowed : Yes

Question Number : 118 Question Id : 640653351623 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Select Question

If $v_1, v_2, \cdots, v_{n-1}, v_n \in R^n$ are orthonormal vectors, then which of the following statements is/are true?

Options :

6406531166922. ✔ $v_i^T v_j = 0,\ 1 \leq i \leq n,\ 1 \leq j \leq n,$ and $i \neq j.$

6406531166923. ✔ $v_i^T v_i = 1,\ 1 \leq i \leq n.$

6406531166924. ✔ Matrix formed by the vectors $v_1, v_2, v_3, \cdots, v_n$ is always orthogonal.

6406531166925. ✖ Matrix formed by the vectors $v_1, v_2, v_3, \cdots, v_n$ is always symmetric.

Question Number : 119 Question Id : 640653351624 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Select Question

Which of the following is/are eigenvectors of the matrix $A = \begin{bmatrix} 5 & 1+i \\ -1+i & 6 \end{bmatrix}$?
Note: This is a MSQ question.

Options :

6406531166926. ✔ $\begin{bmatrix} 1 \\ \frac{-1+i}{2} \end{bmatrix}, \begin{bmatrix} 1 \\ 1-i \end{bmatrix}$

6406531166927. ✖ $\begin{bmatrix} 1 \\ \frac{-1+2i}{2} \end{bmatrix}, \begin{bmatrix} 1 \\ 1-i \end{bmatrix}$

6406531166928. ✔ $\begin{bmatrix} 1+i \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1-i \end{bmatrix}$

6406531166929. ✖ $\begin{bmatrix} 1 \\ \frac{-1-2i}{2} \end{bmatrix}, \begin{bmatrix} 1 \\ 1-i \end{bmatrix}$

Question Number : 120 Question Id : 640653351625 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Select Question

Let A be a $n \times n$ Hermitian matrix. Suppose $A = UDU^*$, all the diagonal entries of a diagonal matrix D are 1. Then which of the following statements is/are true about hermitian matrix A?

Options :

6406531166930. ✔ A is the identity matrix.

6406531166931. ✖ A can be a matrix other than identity matrix.

6406531166932. ✔ Any vector in $v \in C^n$ is an eignevector of A with eigenvalue of 1.

6406531166933. ✖ Not all vectors in $v \in C^n$ will be eigen vectors of A.

6406531166934. ✔ $A = D$

Question Number : 121 Question Id : 640653351629 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Multiple Select Question

Which of the following statements are correct?

Options :

6406531166944. ✔ Every positive definite matrix is invertible.

6406531166945. ✔ A diagonal matrix with positive entries is positive definite.

6406531166946. ✔ A symmetric with positive determinant is not necessarily positive definite.

6406531166947. ✔ If matrix S is positive definite then S^{-1} may also be positive definite.

Sub-Section Number :	5
Sub-Section Id :	64065350503
Question Shuffling Allowed :	Yes

Question Number : 122 Question Id : 640653351626 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Let matrix $A = \begin{bmatrix} -1 \\ 2 \\ 2 \end{bmatrix}$. Suppose the eigenvalues of AA^T are a, b, c respectively. Then the value of $a + b + c$ is.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

9

Question Number : 123 Question Id : 640653351634 Question Type : SA Calculator : None

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

Correct Marks : 4

Question Label : Short Answer Question

We need to find the optimal value of the objective function $f(x, y, z) = log(xyz) + xyz$. We start with $X_0 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$. If $X_1 = \begin{bmatrix} i \\ j \\ k \end{bmatrix}$ using the gradient descent algorithm and using $\eta = 1$, then what is the absolute value of $|i + j + k|$? Enter the answer up to 2 decimals accuracy.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

7.5 to 8.5

Question Number : 124 Question Id : 640653351635 Question Type : SA Calculator : None

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

Correct Marks : 4

Question Label : Short Answer Question

It is known that for some function, $f(0) = 1$, $f'(x) = -cos(x)e^{sin(x)}$, and $f''(x) = sin(x)e^{sin(x)} + (cos(x))^2 e^{sin(x)}$. What is the value of $f(1)$ using taylor series expansion. Use second order approximation (up to $f''(x)$) starting with $x = 0$ and $nd = 1$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.4 to 0.6

Question Number : 125 Question Id : 640653351636 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

We need to find the cheapest cylindrical container to hold 1000m^3 of water. The cost of top and bottom circular base is twice that of material used for side of cylinder. Suppose if 1m^2 area of side cost 1000 rupees. Top and bottom base costs 2000 rupees each, then what is the value of radius of cylinder such that we get minimum cost?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

3.1 to 3.8

Sub-Section Number :	6
Sub-Section Id :	64065350504
Question Shuffling Allowed :	No

Question Id : 640653351630 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (126 to 128)

Question Label : Comprehension

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

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

Sub questions

Question Number : 126 Question Id : 640653351631 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Calculate the mean vector of the data points x_1, x_2, x_3 and write the summation of all elements of mean vector obtained.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

3

Question Number : 127 Question Id : 640653351632 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Let $C = \frac{1}{3}\sum_{i=1}^{3}(x_i - \bar{x})(x_i - \bar{x})^T$
for the data points x_1, x_2, x_3 is calculated.
Find the trace of C.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

1.3 to 1.5

Question Number : 128 Question Id : 640653351633 Question Type : SA Calculator : None

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

Correct Marks : 4

Question Label : Short Answer Question

Project data points x_1, x_2, x_3 onto a one dimensional space using PCA. Let z_1, z_2, z_3 denotes the projection of x_1, x_2, x_3 respectively. Calculate the summation of all elements of z_2

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0

Java

Section Id : 64065322152