MLF

Section Id :	64065382674
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	12
Number of Questions to be attempted :	12
Section Marks :	40
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Section Maximum Duration :	0
Section Minimum Duration :	0
Section Time In :	Minutes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653181494
Question Shuffling Allowed :	No

Question Number : 64 Question Id : 6406531173369 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : MACHINE LEARNING FOUNDATIONS (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 TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406533954652. ✔ YES

6406533954653. ✖ NO

Sub-Section Number :	2
Sub-Section Id :	640653181495
Question Shuffling Allowed :	Yes

Question Number : 65 Question Id : 6406531173370 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following represents the Taylor's series expansions up to the fourth degree term of $f(x) = \frac{1}{x}$ around $x = 1$?

Options :

6406533954654. ✖ $1 + (x-1) - (x-1)^2 + (x-1)^3 - (x-1)^4$

6406533954655. ✖ $1 - (x+1) + (x+1)^2 - (x+1)^3 + (x+1)^4$

6406533954656. ✔ $1 - (x-1) + (x-1)^2 - (x-1)^3 + (x-1)^4$

6406533954657. ✖ $1 + (x-1) + (x-1)^2 + (x-1)^3 + (x-1)^4$

Question Number : 66 Question Id : 6406531173372 Question Type : MCQ
Correct Marks : 3

Question Label : Multiple Choice Question

Consider the Hermitian matrix

$$A = \begin{bmatrix} 3 & i \\ -i & 5 \end{bmatrix}$$

Which of the following are the eigenvalues of A?

Options :

6406533954662. ✖ 3 and 5

6406533954663. ✔ $4 + \sqrt{2}$ and $4 - \sqrt{2}$

6406533954664. ✖ $4 + i$ and $4 - i$

6406533954665. ✖ 2 and 6

Question Number : 67 Question Id : 6406531173373 Question Type : MCQ
Correct Marks : 3

Question Label : Multiple Choice Question

Consider the complex matrix:

$$A = \begin{bmatrix} 1 & 2+i \\ 0 & 3 \end{bmatrix}$$

Using Schur's theorem, which of the following is the correct upper triangular form of A after a similarity transformation?

Options :

6406533954666. ✖ $\begin{bmatrix} 1 & 2+i \\ 0 & 3 \end{bmatrix}$

6406533954667. ✖ $\begin{bmatrix} 3 & 0 \\ 0 & 1 \end{bmatrix}$

6406533954668. ✖ $\begin{bmatrix} 1 & 0 \\ 2+i & 3 \end{bmatrix}$

6406533954669. ✔ $\begin{bmatrix} 1 & x \\ 0 & 3 \end{bmatrix}$, for some complex x

Sub-Section Number : 3
Sub-Section Id : 640653181496
Question Shuffling Allowed : Yes

Question Number : 68 Question Id : 6406531173371 Question Type : MCQ
Correct Marks : 2
Question Label : Multiple Choice Question

Let A be a complex square matrix. What is the relationship between the eigenvalues of A and its conjugate transpose A^*?

Options :

6406533954658. ✔ The eigenvalues of A^* are the complex conjugates of the eigenvalues of A.

6406533954659. ✖ The eigenvalues of A^* are the same as the eigenvalues of A.

6406533954660. ✖ The eigenvalues of A^* are the reciprocals of the eigenvalues of A.

6406533954661. ✖ The eigenvalues of A^* correspond to the square roots of the eigenvalues of A.

Sub-Section Number : 4
Sub-Section Id : 640653181497

Question Shuffling Allowed : Yes

Question Number : 69 Question Id : 6406531173374 Question Type : MSQ
Correct Marks : 3 Max. Selectable Options : 0
Question Label : Multiple Select Question
Consider a matrix

$$A = \begin{bmatrix} 1 & 1 & i \\ 1 & -1 & -i \\ -i & -i & 1 \end{bmatrix}.$$

Which of the following options is/are true?

Options :

6406533954670. ✖ A is a unitary matrix.

6406533954671. ✖ $A = A^*$

6406533954672. ✔ Every eigenvalue of A is real.

6406533954673. ✔ The determinant of A is zero.

Question Number : 70 Question Id : 6406531173375 Question Type : MSQ
Correct Marks : 3 Max. Selectable Options : 0
Question Label : Multiple Select Question
Which of the following statements is/are **True** regarding **Schur's Theorem**?
Options :
6406533954674. ✔ Every square matrix is unitarily similar to an upper triangular matrix.
6406533954675. ✔ The diagonal entries of the Schur form of a matrix are its eigenvalues.
6406533954676. ✖ A square matrix with repeated eigenvalues cannot always be unitarily similar to an upper triangular matrix.
6406533954677. ✔ Schur's Theorem holds only for square matrices, as it requires unitary similarity and the presence of eigenvalues.

Question Number : 71 Question Id : 6406531173376 Question Type : MSQ
Correct Marks : 3 Max. Selectable Options : 0
Question Label : Multiple Select Question
Let A be an $n \times n$ positive definite matrix with singular values $\sigma_1, \sigma_2, ..., \sigma_n$.
Which of the following is **true**?

Options :

6406533954678. ✔ $\sigma_i \geq 0$ for all i.

6406533954679. ✖ A has at least one zero singular value.

6406533954680. ✖ The eigenvalues of A must be negative.

6406533954681. ✔ If $\sigma_i = 0$ for all i, then A is the zero matrix

Sub-Section Number : 5
Sub-Section Id : 640653181498
Question Shuffling Allowed : Yes

Question Number : 72 Question Id : 6406531173377 Question Type : SA
Correct Marks : 3
Question Label : Short Answer Question

For the function:

$$f(x, y) = x^2 + 3y^2 - 4xy + 5$$

Using the initial values $x_0 = 2$ and $y_0 = 3$, perform one iteration of gradient descent with a learning rate of 0.1.

What is the value of $f(x, y)$ after this iteration? Enter the answer correct to two decimal places.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Range
Text Areas : PlainText
Possible Answers :
2.41 to 2.47

Question Number : 73 Question Id : 6406531173378 Question Type : SA
Correct Marks : 3
Question Label : Short Answer Question

If the minimum value of the function $f(x) = e^{x^2-8x+15}$ is e^{α}, then find the value of α.

Response Type : Numeric
Evaluation Required For SA : Yes
Show Word Count : Yes
Answers Type : Equal

Text Areas : PlainText

Possible Answers :

-1

Sub-Section Number :	6
Sub-Section Id :	640653181499
Question Shuffling Allowed :	No

Question Id : 6406531173379 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers : (74 to 76)

Question Label : Comprehension

Consider the following dataset of three points in $\mathbb{R}^2$:

$$\left\{\begin{pmatrix}2\\4\end{pmatrix}, \begin{pmatrix}3\\6\end{pmatrix}, \begin{pmatrix}5\\10\end{pmatrix}\right\}$$

Suppose we want to project this dataset onto a one-dimensional subspace using Principal Component Analysis (PCA).

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 74 Question Id : 6406531173380 Question Type : MCQ

Correct Marks : 2

Question Label : Multiple Choice Question

Compute the sample covariance matrix C for the given dataset.

Options :

6406533954684. ✖ $C = \frac{1}{3}\begin{pmatrix}6 & 12\\12 & 24\end{pmatrix}$

6406533954685. ✖ $C = \begin{pmatrix}0 & 0\\0 & 0\end{pmatrix}$

6406533954686. ✔ $C = \frac{1}{9}\begin{pmatrix}14 & 28\\28 & 56\end{pmatrix}$

6406533954687. ✖ $C = \frac{1}{9}\begin{pmatrix}10 & 20\\20 & 40\end{pmatrix}$

Question Number : 75 Question Id : 6406531173381 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

What is the principal direction chosen for PCA?

Options :

6406533954688. ✖ $\frac{1}{\sqrt{5}}\begin{pmatrix}2\\1\end{pmatrix}$

6406533954689. ✔ $\frac{1}{\sqrt{5}}\begin{pmatrix}1\\2\end{pmatrix}$

6406533954690. ✖ $\begin{pmatrix}1\\0\end{pmatrix}$

6406533954691. ✖ $\begin{pmatrix}0\\1\end{pmatrix}$

Question Number : 76 Question Id : 6406531173382 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Compute the projections $\tilde{x}_1, \tilde{x}_2, \tilde{x}_3$ of the data points onto the first principal component. Which of the following is correct?

Options :

6406533954692. ✔ $\tilde{x}_1 = \begin{pmatrix}2\\4\end{pmatrix}, \quad \tilde{x}_2 = \begin{pmatrix}3\\6\end{pmatrix}, \quad \tilde{x}_3 = \begin{pmatrix}5\\10\end{pmatrix}$

6406533954693. ✖ $\tilde{x}_1 = \begin{pmatrix}1/\sqrt{5}\\2/\sqrt{5}\end{pmatrix}, \quad \tilde{x}_2 = \begin{pmatrix}2/\sqrt{5}\\4/\sqrt{5}\end{pmatrix}, \quad \tilde{x}_3 = \begin{pmatrix}4/\sqrt{5}\\8/\sqrt{5}\end{pmatrix}$

6406533954694. ✖ $\tilde{x}_1 = \begin{pmatrix}-2\\-4\end{pmatrix}, \quad \tilde{x}_2 = \begin{pmatrix}-3\\-6\end{pmatrix}, \quad \tilde{x}_3 = \begin{pmatrix}-5\\-10\end{pmatrix}$

6406533954695. ✖ $\tilde{x}_1 = \begin{pmatrix}2/\sqrt{5}\\4/\sqrt{5}\end{pmatrix}, \quad \tilde{x}_2 = \begin{pmatrix}3/\sqrt{5}\\6/\sqrt{5}\end{pmatrix}, \quad \tilde{x}_3 = \begin{pmatrix}5/\sqrt{5}\\10/\sqrt{5}\end{pmatrix}$

Sub-Section Number :	7
Sub-Section Id :	640653181500
Question Shuffling Allowed :	No

Question Id : 6406531173383 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix

Question Numbers : (77 to 78)

Question Label : Comprehension

Consider the matrix

$$M = \begin{pmatrix} 2 & 1 & 0 \\ 1 & -2 & 0 \end{pmatrix}$$

Let the singular value decomposition (SVD) form of M be written as $M = Q_1 \Sigma Q_2^T$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 77 Question Id : 6406531173384 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following options is/are true for Q_1?

Options :

6406533954696. ✖ $Q_1 = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$

6406533954697. ✖ $Q_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$

6406533954698. ✖ $Q_1 = \frac{1}{\sqrt{2}} \begin{pmatrix} 1 & 1 \\ -1 & -1 \end{pmatrix}$

6406533954699. ✔ $Q_1 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Question Number : 78 Question Id : 6406531173385 Question Type : MCQ

Correct Marks : 3

Question Label : Multiple Choice Question

Which of the following options is/are true for Q_2^T?

Options :

6406533954700. ✖ $Q_2^T = \frac{1}{\sqrt{6}} \begin{pmatrix} 3 & -1 & 1 \\ 0 & \sqrt{3} & \sqrt{3} \\ -\sqrt{2} & 1 & \sqrt{2} \end{pmatrix}$

6406533954701. ✖ $Q_2^T = \begin{pmatrix} 3 & -1 & 1 \\ 0 & \sqrt{3} & \sqrt{3} \\ -\sqrt{2} & -\sqrt{2} & -\sqrt{2} \end{pmatrix}$

6406533954702. ✖ $Q_2^T = \frac{1}{\sqrt{6}} \begin{pmatrix} 3 & -1 & 1 \\ 0 & \sqrt{3} & \sqrt{3} \\ \sqrt{2} & -\sqrt{2} & \sqrt{2} \end{pmatrix}$

6406533954703. ✔ $Q_2^T = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

Java

Section Id :	64065382675
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	16
Number of Questions to be attempted :	16
Section Marks :	100
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	No
Section Maximum Duration :	0
Section Minimum Duration :	0
Section Time In :	Minutes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653181501
Question Shuffling Allowed :	No

Question Number : 79 Question Id : 6406531173386 Question Type : MCQ

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "DIPLOMA LEVEL : PROGRAMMING CONCEPTS USING JAVA (COMPUTER BASED EXAM)"

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