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Best of luck!

PAST PAPER

Question No : 1 of 26 Marks: 1 (Budgeted Time 1 Min)

$7x$ is an algebraic term in which 7 is a _____ and x is a _____.

Answer (Please select your correct option)

- term, expression
- coefficient, variable
- variable, coefficient
- numerical, alphabet



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Question No : 2 of 26 Marks: 1 (Budgeted Time 1 Min)

$9x^2 + 3x + 4$ is _____.

Answer (Please select your correct option)

- an equation
- a term
- an algebraic expression
- quadratic equation

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Question No : 3 of 26 Marks: 1 (Budgeted Time 1 Min)

Which of the following is the coefficient matrix for the system $\begin{aligned} x_1 - 2x_2 + x_3 &= 0 \\ 2x_2 - 7x_3 &= 8 \\ -4x_1 + 3x_2 + 9x_3 &= -6 \end{aligned}$?

Answer (Please select your correct option)

- $\begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -7 \\ \cdots & \cdots & \cdots \end{bmatrix}$ ⇦
- $\begin{bmatrix} 1 & -2 & 0 \\ 0 & 2 & 8 \\ \cdots & \cdots & \cdots \end{bmatrix}$
- $\begin{bmatrix} 1 & 1 & 0 \\ 0 & -7 & 8 \\ \cdots & \cdots & \cdots \end{bmatrix}$
- $\begin{bmatrix} 1 & 0 & -4 \\ -2 & 2 & 3 \\ \cdots & \cdots & \cdots \end{bmatrix}$

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Question No : 4 of 26 Marks: 1 (Budgeted Time 1 Min)

Two simultaneous linear equations in two variables have no solution if their corresponding lines are _____.

Answer (Please select your correct option)

- parallel and distinct
- intersecting
- coincident
- perpendicular

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Question No : 5 of 26 Marks: 1 (Budgeted Time 1 Min)

If reduced echelon form of a linear system is $\begin{bmatrix} 1 & 0 & 5 & 5 \\ 0 & 1 & 1 & 6 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ when free variable $x_3 = 0$, then which of the following is true for it?

Answer (Please select your correct option)

- The particular solution is $(0, 5, 6)$.
- The particular solution is $(6, 5, 0)$.
- The particular solution is $(5, 6, 0)$.
- The particular solution is $(0, 6, 5)$.



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Question No : 6 of 26 Marks: 1 (Budgeted Time 1 Min)

If A is an $m \times n$ matrix and $Ax = b$ has a solution then which of the following is true?

Answer (Please select your correct option)

- A has a pivot position in every row.
- $\det(A) = 0$.
- Echelon form of A has at least one row of zeros.
- $b \notin Span\{a_1, a_2, \ldots, a_n\}$.



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Question No : 7 of 26 Marks: 1 (Budgeted Time 1 Min)

If a homogeneous system $Ax = 0$ has a trivial solution, then which of the following is (are) the value(s) of the vector x ?

Answer (Please select your correct option)

- −1
- 0
- 1
- 2

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Question No : 8 of 26 Marks: 1 (Budgeted Time 1 Min)

If $T: R^n \to R^m$ be a linear transformation defined by $T(\vec{x}) = A\vec{x}$ (for all $\vec{x} \in R^n$), then which of the following is true for A ?

Answer (Please select your correct option)

- A is a singular matrix.
- A is a square matrix.
- A is a unique matrix. ⇦
- A is not a unique matrix.

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Question No : 9 of 26 Marks: 1 (Budgeted Time 1 Min)

Which of the following is true for the linear operator L defined by $L\left(\begin{bmatrix} a_1 \\ a_2 \end{bmatrix}\right) = \begin{bmatrix} a_1 \\ -a_2 \end{bmatrix}$?

Answer (Please select your correct option)

- It is an enlargement by a negative scale factor.
- It is a shear.
- It is a reflection about $X-axis$.
- It is a reflection about $Y-axis$.



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Question No : 10 of 26 Marks: 1 (Budgeted Time 1 Min)

If T be a transformation , then which of the following is true for its linearity ?

Answer (Please select your correct option)

- $T(c\vec{u} \text{ g} d\vec{v}) = c\ T(\vec{u})\ \text{g}\ d\ T(\vec{v})$; where 'c' and 'd' are scalars
- $T(c\vec{u} + d\vec{v}) = c\ T(\vec{u}) + d\ T(\vec{v})$; where 'c' and 'd' are scalars
- $T(c\vec{u} \times d\vec{v}) = c\ T(\vec{u}) \times d\ T(\vec{v})$; where 'c' and 'd' are scalars
- $T(c\vec{u} + d\vec{v}) = d\ T(\vec{u}) + c\ T(\vec{v})$; where 'c' and 'd' are scalars

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Question No : 11 of 26 Marks: 1 (Budgeted Time 1 Min)

If $A=\begin{bmatrix}2 & 1\\ 4 & 3\end{bmatrix}$ and $B=\begin{bmatrix}1+1 & 2-1\\ 2+2 & 4-1\end{bmatrix}$, then which of the following is true for A and B ?

Answer (Please select your correct option)

- A and B are equal matrices.
- A is the transpose of B.
- B is the transpose of A.
- B is the multiplicative inverse of A.

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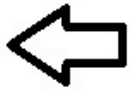
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Question No : 12 of 26 Marks: 1 (Budgeted Time 1 Min)

What is the maximum possible number of pivots in a 6×6 matrix ?

Answer (Please select your correct option)

- 2
- 4
- 6
- 0



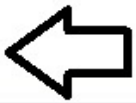
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Question No : 13 of 26 Marks: 1 (Budgeted Time 1 Min)

If $A=\begin{bmatrix} P \\ Q \end{bmatrix}$ and $B=\begin{bmatrix} R & S \end{bmatrix}$ (where P , Q , R and S are square sub-matrices of same size) , then which of the following is possible ?

Answer (Please select your correct option)

- The product AB is defined but BA is not defined.
- The product AB is not defined but BA is defined.
- The product AB and BA both are not defined.
- The product AB and BA both are defined.



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Question No : 14 of 26 Marks: 1 (Budgeted Time 1 Min)

Which of the following is true for the matrix $A = \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ O & A_{22} & A_{23} \\ O & O & A_{33} \end{bmatrix}$; where A_{11} , A_{22} and A_{33} are square sub-matrices , and 'O' is a zero sub-matrix ?

Answer (Please select your correct option)

- It is a block upper triangular matrix.
- It is a block lower triangular matrix.
- It is diagonal-constant matrix.
- It is a Null matrix.

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Question No : 15 of 26 Marks: 1 (Budgeted Time 1 Min)

If a matrix A is factorized into lower and upper triangular matrices , then which of the following is true for the matrix ?

Answer (Please select your correct option)

- It is called an LU -procedure.
- It is called an LU -decomposition.
- It is called an LU -matrices.
- It is called an LU -algorithm.

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Question No : 16 of 26 Marks: 1 (Budgeted Time 1 Min)

If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, then which of the following is the minor of entry a_{21} ?

Answer (Please select your correct option)

- 2
- 3
- 4
- 5



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Question No : 17 of 26 Marks: 1 (Budgeted Time 1 Min)

Which of the following is true for the coefficient matrix in the Cramer's Rule ?

Answer (Please select your correct option)

- It must be invertible .
- It must be singular .
- It may or may not be invertible .
- It may or may not be non - singular .

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Question No : 18 of 26 Marks: 1 (Budgeted Time 1 Min)

If a set W be a subspace of a vector space V, then which of the following is NOT true for it ?

Answer (Please select your correct option)

- It must be closed under the scalar multiplication .
- It may or may not be closed under the operation of addition .
- It must have an additive inverse of each element .
- It must be commutative under the operation of addition .

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Question No : 19 of 26 Marks: 1 (Budgeted Time 1 Min)

If the set $V = \{0, 1, 2, 3\}$, then which of the following is true for it ?

option 3 or 4

Answer (Please select your correct option)

- It is closed under operation of addition .
- It is a vector space .
- It is commutative under operation of addition .
- It has an additive inverse of each element .

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Question No : 20 of 26 Marks: 1 (Budgeted Time 1 Min)

If $c_1\vec{v}_1 + c_2\vec{v}_2 + c_3\vec{v}_3 + \ldots + c_p\vec{v}_p = 0$, and vectors $\vec{v}_1, \vec{v}_2, \vec{v}_3, \ldots, \vec{v}_p$ all are linearly independent then which of the following is true ?

if dependent
then option 2

Answer (Please select your correct option)

- $c_1 = c_2 = c_3 = \ldots = c_p = 0$
- $c_1 \neq c_2 \neq c_3 \neq \ldots \neq c_p \neq 0$
- $c_1 \neq c_2 = c_3 = \ldots = c_p \neq 0$
- $c_1 \neq c_2 = c_3 = \ldots = c_p = 0$

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Question No : 21 of 26 Marks: 2 (Budgeted Time 4 Min)

If a matrix A is decomposed into $L = \begin{bmatrix} 2 & 0 \\ 3 & -1 \end{bmatrix}$ and $U = \begin{bmatrix} 1 & -7 \\ 0 & 1 \end{bmatrix}$ by LU factorization , then find A.

Answer (Please click here to Add Answer)



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Question No : 22 of 26 Marks: 2 (Budgeted Time 4 Min)

If $A = \begin{bmatrix} 4 & 2 & 3 \\ 1 & 3 & 2 \end{bmatrix}$, then determine whether $\vec{u} = \begin{bmatrix} 1 \\ 4 \\ 5 \end{bmatrix}$ is in $Nul\ A$ or not ?

Answer (Please click here to Add Answer)

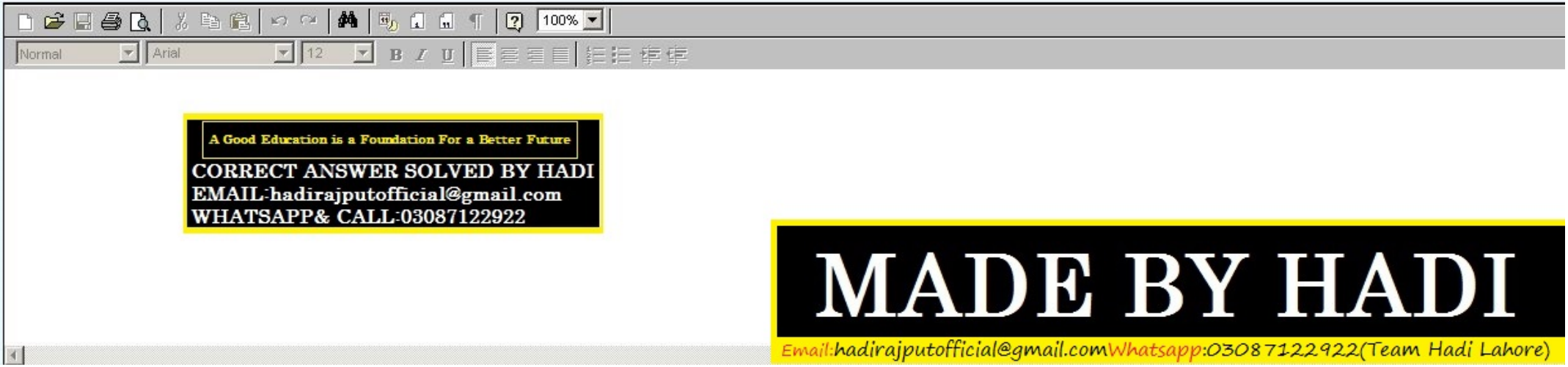
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Question No : 23 of 26 Marks: 3 (Budgeted Time 6 Min)

Let W be the set of all vectors of the form $\begin{bmatrix} 3a \\ 2a \\ a \end{bmatrix}$. Find a vector $\vec{v}$ in R^3 such that $W = Span\{\vec{v}\}$.

Answer (Please click here to Add Answer)



Question No : 24 of 26 Marks: 3 (Budgeted Time 6 Min)

Construct partitions of the following matrix into three 2×2 blocks :

$$B = \begin{bmatrix} 1 & 2 & 3 & 4 & 1 & 3 \\ 3 & 4 & 5 & 6 & 3 & 4 \end{bmatrix}$$

Answer (Please click here to Add Answer)

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Question No : 25 of 26 Marks: 5 (Budgeted Time 10 Min)

Show that the coefficient matrix of the following linear system is strictly diagonally dominant. Also calculate the second iteration using Gauss – Seidel method if the first iteration is $(x_1^{(1)}, x_2^{(1)}, x_3^{(1)}) = (1.3, 1.04, 0.936)$.

$$10x_1 + 2x_2 + x_3 = 13$$
$$2x_1 + 10x_2 + x_3 = 13$$
$$2x_1 + x_2 + 10x_3 = 13$$

Answer (Please click here to Add Answer)

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Question No : 26 of 26 Marks: 5 (Budgeted Time 10 Min)

Show that $\begin{vmatrix} a+h & a-h & d \\ b+k & b-k & e \\ c+l & c-l & f \end{vmatrix} = 2 \begin{vmatrix} a & a-h & d \\ b & b-k & e \\ c & c-l & f \end{vmatrix}$.

Answer (Please click here to Add Answer)

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