

**MTH501- Linear Algebra**  
**MCQS MIDTERM EXAMINATION**  
~“LIBRIANSMINE”~

**Question No: 1 (Marks: 1) - Please choose one**

If for a linear transformation the equation  $T(x) = 0$  has only the trivial solution then T is

▶ **One-to-one**

▶ Onto

**Question No: 2 (Marks: 1) - Please choose one**

Which one of the following is an elementary matrix?

▶  $\begin{bmatrix} 1 & 0 \\ 0 & -3 \end{bmatrix}$

$\begin{bmatrix} 1 & 0 & 1 \\ 0 & -3 & -3 \end{bmatrix}$

▶

$\begin{bmatrix} 1 & 0 \\ 2 & -3 \end{bmatrix}$

▶

$\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$

▶

**Question No: 3 ( Marks: 1 ) - Please choose one**

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

Let  $kA$  and let k be a scalar .A formula that relates  $\det kA$  to k and  $\det A$  is

▶  $\det kA = k \det A$

▶  $\det kA = \det (k+A)$

▶  **$\det kA = k^2 \det A$**

▶  $\det A = k \cdot \det A$

**Question No: 4 ( Marks: 1 ) - Please choose one**

The equation  $x = p + t v$  describes a line

- ▶ through v parallel to p
- ▶ **through p parallel to v**
- ▶ through origin parallel to p

**Question No: 5 ( Marks: 1 ) - Please choose one**

Determine which of the following sets of vectors are linearly dependent.

$$v_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \quad v_2 = \begin{bmatrix} 6 \\ 2 \end{bmatrix}$$

▶

$$v_1 = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}, \quad v_2 = \begin{bmatrix} 6 \\ 2 \\ 1 \end{bmatrix}$$

▶

$$v_1 = \begin{bmatrix} 5 \\ 2 \\ 3 \end{bmatrix}, \quad v_2 = \begin{bmatrix} 10 \\ 4 \\ 6 \end{bmatrix}$$

▶ (lec 8 ) hint\* vector v1 is a multiple of v2

**Question No: 6 ( Marks: 1 ) - Please choose one**

Every linear transformation is a matrix transformation

- ▶ **True**
- ▶ False

**Question No: 7 ( Marks: 1 ) - Please choose one**

A null space is a vector space.

- ▶ True
- ▶ False

**Question No: 8 ( Marks: 1 ) - Please choose one**

If two row interchanges are made in succession, then the new determinant

- ▶ equals to the old determinant
- ▶ equals to -1 times the old determinant

**Question No: 9 ( Marks: 1 ) - Please choose one**

The determinant of A is the product of the pivots in any echelon form U of A , multiplied by  $(-1)^r$  , Where r is

- ▶ the number of rows of A
- ▶ the number of row interchanges made during row reduction from A to U
- ▶ the number of rows of U
- ▶ the number of row interchanges made during row reduction U to A

**Question No: 10 ( Marks: 1 ) - Please choose one**

If A is invertible, then  $\det(A)\det(A^{-1})=1$ .

- ▶ True
- ▶ False

**Question No: 11 ( Marks: 1 ) - Please choose one**

A square matrix  $A = [a_{ij}]$  is lower triangular if and only if  $a_{ij} = 0$  for

- ▶  $i > j$
- ▶  $i < j$
- ▶  $i \leq j$

▶  $i = j$

**Question No: 12 ( Marks: 1 ) - Please choose one**

The product of upper triangular matrices is

- ▶ lower triangular matrix
- ▶ upper triangular matrix
- ▶ diagonal matrix

**Question No: 13 ( Marks: 1 ) - Please choose one**

The matrix multiplication is associative

- ▶ True
- ▶ False

**Question No: 14 ( Marks: 1 ) - Please choose one**

We can add the matrices of \_\_\_\_\_.

- ▶ same order
- ▶ same number of columns.
- ▶ same number of rows
- ▶ different order

**Question No: 15 ( Marks: 1 ) - Please choose one**

By solving system of equations with iterative method, we stop the process when the entries in two successive iterations are \_\_\_\_\_.

- ▶ repeat(same)
- ▶ large difference
- ▶ different

**Question No: 16 ( Marks: 1 ) - Please choose one**

Jacobi's Method is \_\_\_\_\_ converges to solution than Gauss Siedal Method.

- ▶ slow
- ▶ fast
- ▶ better

**Question No: 17 ( Marks: 1 ) - Please choose one**

A system of linear equations is said to be homogeneous if it can be written in the form \_\_\_\_\_.

- ▶  $AX = B$
- ▶  $AX = 0$
- ▶  $AB = X$
- ▶  $X = A^{-1}$

**Question No: 18 (Marks: 1) - Please choose one**

The row reduction algorithm applies only to augmented matrices for a linear system.

- ▶ True
- ▶ **False**

**Question No: 19 (Marks: 1) - Please choose one**

Whenever a system has no free variable, the solution set contains many solutions.

- ▶ True
- ▶ **False**

**Question No: 20 (Marks: 1) - Please choose one**

Which of the following is not a linear equation?

- ▶  $x_1 + 4x_2 + 1 = x_3$
- ▶  $x_1 = 1$
- ▶  $x_1 + 4x_2 - \sqrt{2}x_3 = \sqrt{4}$
- ▶  $x_1 + 4x_1x_2 - \sqrt{2}x_3 = \sqrt{4}$

**Question No: 21 (Marks: 1) - Please choose one**

If A is a  $2 \times 2$  matrix, the area of the parallelogram determined by the columns of A is

- ▶ **det A**
- ▶ adj A

**Question No: 22 (Marks: 1) - Please choose one**

Cramer's rule leads easily to a general formula for

- ▶ the inverse of  $n \times n$  matrix  $A$
- ▶ the adjugate of an matrix  $A$
- ▶ the determinant of an matrix  $A$

**Question No: 23 ( Marks: 1 ) - Please choose one**

The transpose of a lower triangular matrix is

- ▶ Lower triangular matrix
- ▶ Upper triangular matrix
- ▶ Diagonal matrix

**Question No: 24 ( Marks: 1 ) - Please choose one**

The transpose of an upper triangular matrix is

- ▶ Lower triangular matrix
- ▶ Upper triangular matrix
- ▶ Diagonal matrix

**Question No: 25 ( Marks: 1 ) - Please choose one**

Let  $A$  be a square matrix of order  $3 \times 3$  with  $\det(A) = 21$ , then  
 $\det(2A)$

- ▶ 168
- ▶ 186
- ▶ 21
- ▶ 126

**Question No: 26 ( Marks: 1 ) - Please choose one**

A basis is a linearly independent set that is as large as possible.

- ▶ True
- ▶ False

**Question No: 27 ( Marks: 1 ) - Please choose one**

Let  $A$  be an  $n \times n$  matrix. If for each  $b$  in the equation  $Ax=b$  has a solution then

- ▶ A has pivot position in only one row.
- ▶ Columns of A span
- ▶ Rows of A span

**Question No: 28 (Marks: 1) - Please choose one**

If the columns of A are linearly independent, then

- **Columns of A span  $\mathbb{R}^n$**
- Rows of A span  $\mathbb{R}^n$
- A has a pivot only in one row

**Question No: 29 (Marks: 1) - Please choose one**

The determinant of a triangular matrix is the sum of the entries of the main diagonal.

- True
- **False** product

**Question No:30 (Marks: 1) - Please choose one**

If  $A^T$  is not invertible, then A is not invertible.

- **True**
- False

**Question No: 31 (Marks: 1) - Please choose one**

Col A is all of  $\mathbb{R}^m$  if and only if

- ▶ the equation  $Ax = 0$  has a solution for each  $b$  in  $\mathbb{R}^m$
- ▶ **the equation  $Ax = b$  has a solution for each  $b$  in  $\mathbb{R}^m$**
- ▶ the equation  $Ax = b$  has a solution for a fixed  $b$  in  $\mathbb{R}^m$ .

**Question No: 32 (Marks: 1) - Please choose one**

$$A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix} \quad B = \begin{bmatrix} B_1 \\ B_2 \end{bmatrix}$$

If \_\_\_\_\_ and \_\_\_\_\_, then the partitions of A and B

- ▶ are not conformable for block multiplication
- ▶ **are conformable for AB block multiplication**
- ▶ are not conformable for BA block multiplication

**Question No: 33 (Marks: 1) - Please choose one**

Two vectors are linearly dependent if and only if they lie

- ▶ on a line parallel to x-axis
- ▶ on the same line through origin
- ▶ on a line parallel to y-axis

**Question No: 34 ( Marks: 1 ) - Please choose one**

$$\begin{aligned}x_1 - 2x_2 + x_3 &= 8 \\2x_2 - 7x_3 &= 0 \\-4x_1 + 3x_2 + 9x_3 &= -6\end{aligned}$$

Given the system

the augmented matrix for the system is

$$\begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -7 \\ -4 & 3 & 9 \end{bmatrix}$$

▶

$$\begin{bmatrix} 1 & -2 & 1 & 0 \\ 0 & 2 & -7 & 8 \\ -4 & 3 & 9 & -6 \end{bmatrix}$$

▶

$$\begin{bmatrix} 1 & -2 & 1 \\ 0 & 2 & -8 \\ -4 & 5 & 9 \end{bmatrix}$$

▶

$$\begin{bmatrix} 1 & -2 & 1 & 8 \\ 0 & 2 & -7 & 0 \\ -4 & 3 & 9 & -6 \end{bmatrix}$$

▶



**Question No: 35 ( Marks: 1 ) - Please choose one**

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Consider the linear transformation  $T$  such that  $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$  is the matrix of linear transformation

then  $T \begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix}$  is

▶  $\begin{bmatrix} 10 \\ 4 \\ 2 \end{bmatrix}$

▶  $\begin{bmatrix} 1 \\ 0 \\ 9 \end{bmatrix}$

▶  $\begin{bmatrix} 10 \\ 4 \\ 1 \end{bmatrix}$

▶  $\begin{bmatrix} 1 \\ 2 \\ 3 \\ 2 \end{bmatrix}$

▶

**Question No: 36 ( Marks: 1 ) - Please choose one**

$$\begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = 5 \quad \begin{vmatrix} a & b & c \\ 3d & 3e & 3f \\ g & h & i \end{vmatrix}$$

If \_\_\_\_\_ then \_\_\_\_\_ will be

- ▶ 15
- ▶ 45
- ▶ 135
- ▶ 60

**Question No: 37 ( Marks: 1 ) - Please choose one**

For an  $n \times n$  matrix  $(A^t)^t =$

- ▶  $A^t$
- ▶ **A**
- ▶  $A^{-1}$
- ▶  $(A^{-1})^{-1}$

**Question No: 38 (Marks: 1) - Please choose one**

Each Linear Transformation T from  $R^n$  to  $R^m$  is equivalent to multiplication by a matrix A of order

- ▶  **$m \times n$**  ☹
- ▶  $n \times m$
- ▶  $n \times n$
- ▶  $m \times m$

**Question No: 39 ( Marks: 1 ) - Please choose one**

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$$

Reduced echelon form of the matrix \_\_\_\_\_ is

- ▶  $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \end{bmatrix}$

$$\begin{bmatrix} 1 & 0 & 3 \\ 0 & 0 & 1 \end{bmatrix}$$



$$\begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 2 \end{bmatrix}$$



$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$



**Question No: 40 ( Marks: 1 ) - Please choose one**

How many subspaces  $\mathbb{R}^2$  have?

- **only two: {0} and  $\mathbb{R}^2$**
- Only four: {0} x- axis and y -axis and  $\mathbb{R}$
- Infinitely many.
- None of the above.

**Question No: 41 ( Marks: 1 ) - Please choose one**

Which statement about the set S is false where  $S = \{(1, 1, 3), (2, 3, 7), (2, 2, 6)\}$

- The set S contain an element which is solution of the equation  $5x - y - z = 0$
- **The Set S is linearly independent.**
- The set S contain two elements which are multiple of each other.
- The Set S is linearly dependent.

**Question No: 42 ( Marks: 1 ) - Please choose one**

**Basis is a spanning set that is as small as possible.**

- **True**
- False

**Question No: 43 (Marks: 1) - Please choose one**

For any  $3 \times 3$  matrix A where  $\det(A) = 3$ , then  $\det(2A) = \underline{\hspace{2cm}}$ .

- 24**
- 20
- 15
- 6

**Question No: 44 (Marks: 1) - Please choose one**

Which of the following is the coefficient matrix?

$$x_1 - 2x_2 + x_3 = 0$$

$$+2x_2 - 7x_3 = 8$$

$$-4x_1 + 3x_2 + 9x_3 = -6$$

for the system?

- Parallel and distinct
- **Intersecting** (one solution)
- Coincident
- Perpendicular

**Question No: 45 (Marks: 1) - Please choose one**

If a system of linear equations is inconsistent then it has \_\_\_\_\_

- Infinite solutions
- Finite solutions
- Unique solution
- **No solution**

**Question No: 46 (Marks: 1) - Please choose one**

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

- ...
- ...
- ...
- ...

**Question No: 47 (Marks: 1) - Please choose one**

Which of the following is true for the matrix?

$$\begin{pmatrix} 1 & 3 & 2 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}?$$

- It is an identity matrix
- It is in reduced echelon form
- **It is in echelon form**
- It is a rectangular matrix

**Question No: 48 (Marks: 1) - Please choose one**

Which of the following is the simplified form of  $-1 \begin{bmatrix} -1 & 2 \end{bmatrix} + \begin{bmatrix} 2 & 3 \end{bmatrix}$ ?

- ...
- ...
- ...
- ...

**Question No: 49 (Marks: 1) - Please choose one**

If  $v_1=(2,2,2)$ ,  $v_2=(0,0,3)$ , and  $v_3=(0,1,1)$  span  $\mathbb{R}^3$ , then which of the following is true for any arbitrary  $\vec{b} = (b_1, b_2, b_3) \in \mathbb{R}^3$  ?

- $(0,1,1) = k_1(b_1, b_2, b_3) + k_2(2,2,2) + k_3(0,0,3)$
- **$(b_1, b_2, b_3) = k_1(2,2,2) + k_2(0,0,3) + k_3(0,1,1)$**
- $(0,0,3) = k_1(2,2,2) + k_2(b_1, b_2, b_3) + k_3(0,1,1)$
- $(0,1,1) = k_1(2,2,2) + k_2(0,0,3) + k_3(b_1, b_2, b_3)$

**Question No: 50 (Marks: 1) - Please choose one**

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

- -1
- **0**
- 1
- 2

**Question No: 51 (Marks: 1) - Please choose one**

$\vec{v}_1 = (2,1)$ ,  $\vec{v}_2 = (3,4)$  and  $\vec{v}_3 = (7,8)$  Which of the following is true?

- $\{v_1, v_2, v_3\}$  is linearly dependent
- **$\{v_1, v_2, v_3\}$  is linearly independent** (set of vectors does not contain zero vector )
- The vector equation has trivial solution
- $\vec{v}_1 = \frac{2}{3}\vec{v}_2$

**Question No: 52 (Marks: 1) - Please choose one**

Since every linear transformation  $T : R^n \rightarrow R^m$  is actually a matrix transformation, then which of the following is the alternate notation for the transformation?

- $A\vec{x} \rightarrow \vec{x}$
- $A\vec{x} \rightarrow T(\vec{x})$
- $\vec{x} \rightarrow A\vec{x}$
- $T(\vec{x}) \rightarrow A\vec{x}$

**Question No: 53 (Marks: 1) - Please choose one**

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

- $T(c\vec{u} + d\vec{v}) = cT(\vec{u}) + dT(\vec{v})$  where 'c' and 'd' are scalars
- $T(c\vec{u} + d\vec{v}) = cT(\vec{u}) + dT(\vec{v})$  where 'c' and 'd' are scalars **lec 9-> exmple 7-> property 2**
- $T(c\vec{u}x + d\vec{v}) = cT(\vec{u})x + dT(\vec{v})$  where 'c' and 'd' are scalars
- $T(c\vec{u} + d\vec{v}) = dT(\vec{u}) + cT(\vec{v})$  where 'c' and 'd' are scalars

**Question No: 54 (Marks: 1) - Please choose one**

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?

- **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

**Question No: 55 (Marks: 1) - Please choose one**

Which of the following is true for the matrix

$$A = \begin{bmatrix} 1 & 0 \\ 0 & -5 \end{bmatrix} ?$$

- Identity matrix
- **Elementary matrix**
- Rectangular matrix
- Singular matrix

**Question No: 56 (Marks: 1) - Please choose one**

$$A = \begin{bmatrix} 1 & 2 & 0 & 0 & 0 & 0 \\ -1 & 3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 2 & 1 & 0 & 0 \\ 0 & 0 & 3 & 5 & 0 & 0 \\ 0 & 0 & 0 & 0 & 3 & -2 \\ 0 & 0 & 0 & 0 & 2 & 1 \end{bmatrix}$$

If the matrix is partitioned into square sub-matrices, then Which of the following is true for matrix A?

- **Block diagonal matrix**
- Block upper triangular matrix
- Diagonal-constant matrix
- Partitioning is not possible in the matrix A

**Question No: 57 (Marks: 1) - Please choose one**

If A is a matrix of order m x n, then which of the following is true for LU factorization of A?

- **The order of L is m x m and the order of U is m x n**
- The order of L is m x p and the order of U is p x n
- The order of both L and U is m x m
- The order of both L and U is m x n

**Question No: 58 (Marks: 1) - Please choose one**

If  $A\vec{x} = \vec{b}$  and factorization of A is LU, then Which of the following pair of equations can be used to solve  $LU\vec{x} = \vec{b}$  for the value of 'x'?

- $U\vec{x} = \vec{y}$  and  $L\vec{y} = \vec{b}$
- **$L\vec{x} = \vec{y}$  and  $U\vec{y} = \vec{b}$**
- $U\vec{b} = \vec{y}$  and  $L\vec{y} = \vec{x}$
- $L\vec{b} = \vec{y}$  and  $U\vec{y} = \vec{x}$

**Question No:59 (Marks: 1) - Please choose one**

If a system of equations is solved using the Jacobi's method, then which of the following is NOT true about the matrix M that is derived from the coefficient matrix?

- All of its entries below the diagonal must be zero
- All of its entries above the diagonal must be zero
- **It may or may not be invertible**

- It is a non-singular matrix

**Question No: 60 (Marks: 1) - Please choose one**

If  $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ , then which of the following is

- $ad+bc$
- **$ad-bc$**
- $bc+ad$
- $bc-ad$

**Question No: 61 (Marks: 1) - Please choose one**

If  $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 4 & 0 \\ 3 & 5 & 6 \end{bmatrix}$  then which of the following is the value of  $\det(A)$ ?

- 3
- 10
- 12
- **24**

**Question No: 62 (Marks: 1) - Please choose one**

If  $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & -k & 0 \\ 1 & 0 & 0 \end{bmatrix}$  then which of the following is the value of  $\det(A)$ ?

- **k**
- $k-1$
- 1
- $k+1$

**Question No: 63 (Marks: 1) - Please choose one**



Let  $A = \begin{bmatrix} 2 & 3 & 4 & 5 \\ 4 & 3 & 1 & 2 \\ 1 & 2 & 5 & 3 \end{bmatrix}$  and the null space of A is a subspace of  $E^k$ , then which of the following

is value of k?

- 1
- 2
- 3
- 4

**Last 20 mcqs are from current paper of 2013**

**good luck**

**libriasnmine**