

MCQ1: Let w

and v be vector spaces. A function

$T: V \rightarrow W$ is called a linear transformation from v to w if for all $x \in V$ and scalar K

I. $T(Kx) = KT(x)$

II. $T(x+Kx) = T(x) + KT(x)$

III. $T(Kx) = K(T(x))$

Answer: I and II

FBQ1: Let $T: U \rightarrow V$ be a linear transformation, defined $T(u) = 0$ for all $u \in U$. Then we call T a _____

Answer: Null zero transformation

FBQ2: If U and V are two vector spaces over a field F and $T: U \rightarrow V$ is a bijection linear transformation. Then we say U and V are _____

Answer: Isomorphic

FBQ3: Another name for linear transformation is _____

Answer: Vector space homomorphism

FBQ4: The rank of a linear transformation T is defined to be _____

Answer: Dimension $R(T)$

FBQ5: Suppose U is a vector space over a field F , and T is an identity transformation, then the function $T: U \rightarrow U$ will be defined by _____

Answer: $T(u) = u$

FBQ6: A homomorphism theorem states that if v and w are vector spaces over a field F and $T: V \rightarrow W$ is a linear transformation. Then $V/\text{Ker } T$ _____

Answer: $R(T)$

FBQ7: The nullity of $T =$ _____

Answer: Dimension of $\text{ker } T$

FBQ8: A linear transformation $T: U \rightarrow U$ is called _____ if each $v \in V$, there exists $u \in U$ such that $Tu = v$.

Answer: Subjective

FBQ9: Two finite dimensional vectors U and V are isomorphic if and only if _____

Answer: Dimension of $U =$ Dimension of V

FBQ10: Let U, V be vector spaces over a field F of dimension m and n respectively, then $L(U, V)$ is a vector of dimension _____

Answer: M_n

FBQ11: $L(R^2, \mathbb{R})$ is a real vector space of dimension _____

Answer: 2

FBQ12: Let U be a vector space over F , then the space $L(U, F)$ is called the _____ of U

Answer: Dual space

FBQ13: A transformation on $T: U \rightarrow F$ is called _____

Answer: Linear function

FBQ14: The basis $f_1, f_2, \dots, f_m$ of V is called the _____ of the basis $e_1, e_2, \dots, e_m$ of V

Answer: Dual basis

FBQ15: A polynomial $P(x) = a_0 + a_1x + \dots + a_{n-1}x^{n-1} + x^n$ is called _____

Answer: Monic polynomial

FBQ16: A sequence is a sequence in which each successive terms of the sequence are in equal ratio.

Answer: geometric progression

FBQ17: For $T \in \mathcal{A}(V)$, the unique monic polynomial P of the smallest degree such that $PT=0$ is called _____

Answer: Minimal polynomial

FBQ18: The division algorithm states that given $f(x)$ and $p(x)$, there exist polynomial $g(x)$ and $h(x)$ such that _____ $hx=0$

Answer: $F(x) = p(x)g(x) + h(x)$

FBQ19: For any vector space V , the minimal polynomials for the identity transformation and the zero transformation are $x-1$ and _____

Answer: X

FBQ20: Every vector space is isomorphic to its _____

Answer: Second dual

FBQ21: The degree of the polynomial (x^2-1) is _____

Answer: 4

FBQ22: The matrices are said to be equal if they are of the _____

Answer: Same order and element

FBQ23: A square matrix A such that $A^t = A$ is called a _____

Answer: Symmetric matrix

FBQ24: A square matrix A such that $A^t = -A$ is called a _____

Answer: Anti-symmetric matrix

FBQ25: A matrix obtained by replacing each of its entry by complex conjugate is called _____.

Answer: Conjugate matrix

FBQ26: In conjugate matrix, $A = A^*$ if only if A is a called _____

Answer: Real matrix

FBQ27: Given a matrix $A \in M_{m \times n}$, the matrix formed by taking conjugate of matrix A is called _____

Answer: Conjugate transpose of A

FBQ28: A square matrix A for which $A^* = A$ is called _____

Answer: Hermitian matrix

FBQ29: A square matrix A for which $A^* = -A$ is called _____

Answer: Skew- Hermitian matrix

FBQ30: The conjugate of 1123 is _____

Answer: Its self

FBQ31: For a real matrix A, A is Hermitian if A is _____.

Answer: Symmetric

FBQ32: For a real matrix A, A is skew-Hermitian if A is _____.

Answer: Skew- symmetric

FBQ33: A matrix whose entries along the diagonal are non-zero is called _____.

Answer: Diagonal matrix

FBQ34: A square matrix $A \in M_n$ is said to be _____ if there exists $B \in M_n$ such that $B = BA = A^{-1}$

Answer: Invertible

FBQ35: The integer $\rho(A) = \text{rank}(A)$ is called _____ of A, and is denoted by $\rho(A)$.

Answer: Rank

FBQ36: A matrix obtained by subjecting I_n to an elementary row or column operation is called _____

Answer: Elementary matrix

FBQ37: A $m \times n$ matrix A with the following properties (i) The non-zero rows come before the row (ii) In each non-zero row, the first non-zero entry is 1. (iii) The first non-zero entry in every non-zero row (after the first row) is to the right of the first non-zero entry in the preceeding row is called _____.

Answer: Row-reduction echelon matrix

FBQ38: If E is a row-reduction echelon form of A. Then, the rank of A is _____

Answer: 1

Answer: Number of non-zero rows of E

FBQ39: Consider a matrix $A = \begin{pmatrix} 2 & 5 & 1 & 3 \end{pmatrix}$, its determinant is _____

Answer: 1

FBQ40: The determinant rank of $m \times n$ matrix A is equal to the _____

Answer: Rank of A

FBQ41: The rank of $A = \begin{pmatrix} 1 & 4 & 2 & 5 \end{pmatrix}$ is _____

Answer: 2

FBQ42: If $A = \begin{pmatrix} 1 & 2 & 6 & 5 & 4 & 1 & 7 & 3 & 2 \end{pmatrix}$, then, the determinant of A is _____

Answer: -13

FBQ43: If A is a linear transformation represented by a matrix A and there is a vector $X \in \mathbb{R}^n$, $X \neq 0$ such that $AX = \lambda X$, for some scalar λ , then λ is called _____

Answer: Eigen value

FBQ44: For an eigenvalue λ of T, the non-zero subspace W_λ is called the _____ of T associated with eigenvalue.

Answer: Eigen value

FBQ45: The eigenvalue for the linear operator $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ such that $Tx = 2x$, $Ty = 2y$, $Tz = 2z$ is _____

Answer: 2

FBQ46: A linear transformation $T: V \rightarrow V$ on a finite dimensional vector V is said to be _____ if there exist a basis $B = \{v_1, v_2, \dots, v_n\}$ of V such that the matrix of T with respect to the basis B is diagonal.

Answer: Diagonalisable

FBQ47: The _____ of a matrix A over F is the monic polynomial $p(t)$ such that (i) $PA = 0$ and (ii) if $q(t)$ is non-zero polynomial over F such that $\deg q < \deg p$, then $qA \neq 0$.

Answer: Minimal polynomial

FBQ48: The determinant of $A = \begin{pmatrix} \sin \theta & -\cos \theta \\ \cos \theta & \sin \theta \end{pmatrix}$ is _____

Answer: 1

FBQ49: If $A = \begin{pmatrix} 1 & 0 & 2 & 0 \end{pmatrix}$, then $\text{Pr}A$ is _____

Answer: 2

FBQ50: If $B = -iiii$, where i is a complex value, then $|B|^2$ is _____

Answer: 4

MCQ1: Let w and v be vector spaces. A function $T: V \rightarrow W$ is called a linear transformation from v to w if for all $x, y \in V$ and scalar K $T(x+y) = Tx + T(y)$ $TKx = KT(x)$

Answer: I and II

MCQ2: Which of the following is linear
 Answer: F: $R \rightarrow R$ defined in by $fx=2x$

MCQ3: Which of the following is not a linear transformation?
 Answer: None of the options

MCQ4: Given a linear transformation $T: U \rightarrow V$, which of the following is true?
 Answer: All of the options

MCQ5: Which of the following is true for this linear transformation $T: U \rightarrow V$ is one-to-one if and only if $\ker T = \{0\}$ onto if and only if $R(T) = V$
 Answer: I and II

MCQ6: Two finite-dimensional vectors space U and V are isomorphic if and only if
 Answer: $\dim U = \dim V$

MCQ7: In the rank unity theorem, $\dim V - \text{nullity}(ST) = \dim V - \text{nullity}(T) - \dim R((T) \cap \ker S)$ which implies
 Answer: $\text{Nullity}(ST) = \text{nullity}(T) + \dim(R(T) \cap \ker S)$

MCQ8: The minimal polynomial of a matrix A over F is the monic polynomial $P(t)$ such that $I.P(A) = 0$. If $q(t)$ is a non-zero polynomial over F such that $\deg q \leq \deg p$, $q(A) \neq 0$. Which of the following is property of minimal polynomial?
 Answer: I and II

MCQ9: If the characteristic polynomial $T: R_4 \rightarrow R_4$ is $(t+1)^2(t-2)^2$, then the minimal polynomial could be
 Answer: $(t+1)(t+2)$

MCQ10: What is the characteristic polynomial of A if $A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$
 Answer: $t^3 - 7t^2 + 19t - 19$

MCQ11: Let $A = \begin{pmatrix} 3 & 2 \\ 10 & 2 \end{pmatrix}$, then the characteristic polynomial of A is
 Answer: $t^2 - 3t + 2$

MCQ12: Let $T: V \rightarrow V$ be a linear transformation. A vector $x \in V$ is an Eigen vector of the linear transformation T if $Tx = \lambda x$ for some scalar $\lambda \in F$. Which of the following is the definition of eigen vector?
 Answer: I and II

MCQ13: Obtain an eigen value for the linear operator $T: R^3 \rightarrow R^3$ by $T(x,y,z) = (2x, 2y, 2z)$
 Answer: 2

MCQ14: Two matrices are said to be equal if I. They have the same size. i.e, they have the same numbers of rows as well as columns II. Their elements at all the corresponding positions are the same. Which of the following qualify the definition of equal matrices?
 Answer: I and II

MCQ15: Find the eigen values of $\begin{pmatrix} 2 & 2 & 2 \\ 1 & 1 & 1 \end{pmatrix}$

Answer: 0, 3

MCQ16: Describe $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ such that $T(B) = \begin{pmatrix} 1 & 2 & 4 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{pmatrix} B$, where B is the standard basis of $\mathbb{R}^3$

Answer: $T(x, y, z) = (x+2y+4z, 2x+3y+z, 3x+y+2z)$

MCQ17: Calculate $312 + 01$

Answer: 39

MCQ18: If A is an upper triangular 3×3 matrix, say $A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 0 & 0 & 6 \end{pmatrix}$. Therefore A is

Answer: Lower triangular

MCQ19: A matrix A is invertible when

Answer: The determinant is zero

MCQ20: Let $A = 100708009$, $B = 213540$, find AB if it is defined

Answer: 21467360

MCQ26: Let U, V, W be vector spaces over F . Suppose $S \in L(V, W)$ and $T \in L(U, V)$, then we have

Answer: $S \circ T \in L(U, W)$

MCQ27: Let $T: \mathbb{R}^2 \rightarrow \mathbb{R}^3$ and $S: \mathbb{R}^3 \rightarrow \mathbb{R}^2$ be defined by $T(x_1, x_2) = (x_1, x_2, x_1 + x_2)$ and $S(x_1, x_2, x_3) = (x_1, x_2)$. Then one of the following is true

Answer: $S \circ T \in S$

MCQ28: The required polynomial for any vector space V , the minimal polynomial for identity I and 0 the zero transformation is

Answer: $x-1$ and x

MCQ29: The sum of matrix A and B where B is the identity matrix with respect to addition will give the matrix

Answer: Matrix 0

MCQ30: In properties of matrix addition, the equation $A + B = B + A$ refers to

Answer: Commutative

MCQ31: The transpose of 2 by 3 matrix will give a

Answer: 3 by 2 matrix

MCQ32: Let $[a_{ij}]$ be a square matrix, then the entries $a_{11}, a_{12}, a_{13}, \dots, a_{1n}$ are called

Answer: The diagonal entries of A

MCQ33: The conjugate of $(2 - 3 + i - i)$ is

Answer: $(2 - 3 - i - i)$

MCQ34: For a matrix $A = \begin{pmatrix} 1 & 2 & 2 & 0 \end{pmatrix}$, we have the following except
 Answer: $A=A^T$

MCQ35: Find $\det(T)$ where we defined $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$ by $T(x_1, x_2, x_3) = (3x_1 + x_3, -2x_1 + x_2, -x + 2x_3)$
 Answer: 9

MCQ36: Obtain the cofactor C_{12} of the matrix $A = \begin{pmatrix} 0 & 2 & -1 & 3 & 4 & 1 & 2 & 1 & 6 \end{pmatrix}$
 Answer: -16

MCQ37: Given $A = 102310001$ and $B = 2109038005$. Calculate $\text{tr}(AB)$
 Answer: 30

MCQ38: If $A = 100120$, find $\Pr(A)$
 Answer: 2

MCQ39: Let $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ be defined by $T(x, y) = (x, -y)$ for all $(x, y) \in \mathbb{R}^2$. Show that T is a linear transformation
 Answer: $T(x_1 + y_1, x_2 + y_2) = T(x_1, x_2) + T(y_1, y_2)$

MCQ40: If $T : U \rightarrow V$ is one - one and onto linear transformation, then we can have
 Answer: $T^{-1} : V \rightarrow U$

MCQ41: Obtain the determinant rank of $A = \begin{pmatrix} 1 & 4 & 2 & 5 \end{pmatrix}$
 Answer: 2

MCQ42: Obtain the characteristic polynomial of the matrix $\begin{pmatrix} 1 & 2 & 0 & -1 \end{pmatrix}$
 Answer: $t^2 - 1$

MCQ43: The minimal polynomial of $A = \begin{pmatrix} 0 & 2 & -1 & 3 & 4 & 1 & 2 & 1 & 6 \end{pmatrix}$ is either
 Answer: $(t-1)(t-2)$ or $(t-1)(t-2)^2$

MCQ44: Let U and V be finite dimensional vector space over F and $T : U \rightarrow V$ be a linear transformation, then $\text{rank}(T) + \text{nullity}(T) = ?$
 Answer: $\dim U$

MCQ45: Let $T : U \rightarrow V$ be a linear transformation, then T is 1-1 . if $T(U_1) = T(U_2)$ implies that
 Answer: $U_1 = U_2$

MCQ46: A matrix having three horizontal rows and four vertical columns is called
 Answer: 4 by 4 matrix

MCQ47: If $1023 = xyz3$, find x, y and z
 Answer: $x=1, y=0, z=2$

MCQ48: What is the sum of 1001 and -100-1
 Answer: 0000

MCQ49: Calculate $2B$, where $B=121413000$
 Answer: 11223000

MCQ50: Calculate $312\hat{A}$
 Answer: 36

MCQ21: Let $e_1=0,1,0$ and $e_2=0,0,1$ form the standard basis of R^3 . Let $1,2,2,3$ and $3,4$ be three vectors in R^2 . Obtain the linear transformation $T:R^3 \rightarrow R^2$ such that $T(e_1)=1,2$, $T(e_2)=2,3$ and $T(e_3)=3,4$
 Answer: $Tx_1,x_2,x_3=(x_1+2x_2+3x_3, 2x_1+3x_2+4x_3)$

MCQ22: Given $T:U \rightarrow V$ is one-to-one if and only if
 Answer: $\text{Ker}T = \{0\}$

MCQ23: Given a linear transformation $T:U \rightarrow V$ is onto if and only if
 Answer: $\text{RT} = \text{ker}V$

MCQ24: Let $S, T \in L(u,v)$ where S and T are linear transformation. We define $S+T:U \rightarrow V$ by $(S+T)U=$
 Answer: $Su+T(u)$

MCQ25: $\hat{A}$
 Answer: