TRUE AND FALSE QUESTIONS.

Question – State whether the following statements are True or false —

① The system of linear equations $x-y=1$ & $2x-2y=3$ has a unique solu.

② If A & B are matrices of same size, then $AB=BA$.

③ If A is 3×4 and B is 4×2 matrix, then $(AB)^T$ is matrix of size 2×3.

④ The matrix $\begin{bmatrix} 1 & 2 \\ 1 & 2 \end{bmatrix}$ is not Invertible.

⑤ The matrix $\begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix}$ is the inverted coefficient matrix of the system of equations —

$$x+3y=4$$
$$2x+5y=7$$

⑥ A diagonal matrix is both upper and lower triangular matrix at same time.

---

⑦ The determinant of the matrix $A=\begin{bmatrix} 1 & 1 & 0 \\ 2 & 4 & 1 \\ 3 & 3 & 0 \end{bmatrix}$ is 2.

⑧ The absolute values of minors and cofactors of the elements of a square matrix are identical.

⑨ If matrix A is invertible, then A^T is also invertible.

⑩ If A is a square matrix with two proportional rows, then $\det(A)=0$.

⑪ If A is a square matrix, then $\det(A^{-1}) = \frac{1}{\det(A)}$.

⑫ If A & B are square matrices of same size, then $\det(AB) \neq \det(A).\det(B)$

---

⑬ If (2,-1) and (3,1) are the initial and terminal points of a vector, then (1,-2) is the component of the vector.

⑭ The vectors (1,2,3) and (-3,2,1) have same magnitude.

⑮ The vectors (4,10,0) and (-5, 2, 9) are orthogonal to each other.

⑯ If $u=(1,3,-2,7)$ and $v=(0,7,2,2)$, then distance between u & v is $\sqrt{58}$.

---

(17) The set R^3 is a subspace of R^4.

(18) Any plane passing through the Origin is a subspace of R^3.

(19) The set $\{(1,0,0),(0,1,0),(0,0,1)\}$ of vectors in R^3 is Linearly Independent.

(20) If a set has exactly one non-zero vector, then this set must be Linearly Dependent.

(21) All linearly independent set in a subspace W is a basis for W.

(22) The basis of a vector space is not unique.

(23) If 'A' is a 3x3 matrix such that $|A| \neq 0$, then row vectors of 'A' span R^3.

(24) If 'A' is mxn matrix, then row space of 'A' and column space of 'A' have different dimens

---

(25) The Sum of eigenvalues of a square matrix is same as its Trace.

(26) The eigenvalues of the matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 6 & -1 & 0 \\ 7 & 2 & 4 \end{bmatrix}$ are 2, 4 and 0.

(27) The Product of eigenvalues of a square matrix is same as its Determinant.

(28) (1,0,2) is the real part of the complex vector $(i+1, 2i, 2i+2)$.

(29) The characteristic polynomial of 2x2 matrix 'A' is of degree 3.

(30) A square matrix 'A' is invertible iff $\lambda = 0$ is an eigenvalue of 'A'.

(31) If a matrix 'A' of size nxn has n linearly independent eigenvectors then matrix 'A' is not Diagonalizable.

(32) If an nxn matrix 'A' has n eigenvalues, then 'A' is Diagnalizable.

(33) If 'A' is real symmetric matrix, then 'A' has complex eigenvalues.

---

(34) The inner product of two vectors cannot be a negative real no.

(35) The inner product of a vector with itself can be negative real no.

(36) If u & v are orthogonal vectors in an inner product space, then $\langle u, v \rangle \neq 0$.

(37) If u & v are unit orthogonal vectors in an inner product space, then $\|u+v\| = 2$.

(38) If $u = (3,4)$ is a vector in R^2, then the length of u is 7.

---

(39) A square matrix 'A' is Orthogonal, if $A^{-1} = A$.

(40) A square matrix 'A' is Unitary, if $A^{*} = A$.

(41) The inverse of an Orthogonal matrix is not necessarily Orthogonal.

(42) If determinant of a matrix is 1 or -1, then the matrix is Orthogonal.

(43) If a matrix 'A' is Orthogonal, then $\det(A) = 1$ or -1.

(44) Every symmetric matrix is Orthogonally Diagonalizable.

(45) In case of real matrices, Unitary and Orthogonal matrices are same.

(46) The eigenvalues of a Hermitian matrix are all real.

---

(47) If $T: V \to V$ is an operator such that $T(v) = 2$, $\forall v \in V$, then T is Linear.

(48) If $T: V \to W$ is an isomorphism, then kernel of T is the zero subspace.

(49) The function $T: R^2 \to R^3$ given by $T(x_1, x_2) = (2x_1 + 3x_2, 4x_2 - 1 - x_1, x_1)$ is Linear.

(50) If T is translation operator, then it is Linear.

---

(51) Every square matrix need not have LU-decomposition.

(52) The dominant eigenvalue is 5 for set of eigenvalues $\{3, 4, 5, -5\}$.

(53) If 'A' is an $m \times n$ matrix, then $A^T A$ is an $n \times n$ matrix.

(54) If 'A' is an $m \times n$ matrix, then $A^T A$ is Orthogonally diagonalizable.

(55) In Linear Programming Problems, all variables are restricted to positive values only.

(56) In LPP, a linear objective function is to be optimized.

(57) One of the quickest way to plot a constraint is to find the two points where the constraint crosses the axes and draw a straight line between these points.

(58) The graphical method is used only when LPP have exactly two unknown variables.

ANSWERS

(1) F	(11) T	(21) F	(31) F	(41) F	(51) T
(2) F	(12) F	(22) T	(32) F	(42) F	(52) F
(3) T	(13) F	(23) T	(33) F	(43) T	(53) T
(4) T	(14) T	(24) F	(34) F	(44) T	(54) T
(5) T	(15) T	(25) T	(35) T	(45) T	(55) F
(6) T	(16) T	(26) T	(36) F	(46) T	(56) T
(7) F	(17) F	(27) T	(37) F	(47) F	(57) T
(8) T	(18) T	(28) T	(38) F	(48) T	(58) T
(9) T	(19) T	(29) F	(39) T	(49) F	
(10) T	(20) F	(30) F	(40) F	(50) T	

OBJECTIVE TYPE QUESTIONS

Question - Select one of alternatives from the following questions as your answer —

① Which of the following is Reduced Row Echelon form —

(a) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{bmatrix}$ (d) None

② The inverse of the matrix $\begin{bmatrix} -2 & 3 \\ -1 & 1 \end{bmatrix}$ is —

(a) $\begin{bmatrix} 1 & -3 \\ 1 & -2 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 3 \\ -1 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 3 \\ -1 & -2 \end{bmatrix}$

③ If $A = \begin{bmatrix} 2 & -1 & 5 \\ 3 & 4 & 2 \end{bmatrix}$, then $\left((A^T)^T\right)^T$ is —

(a) $\begin{bmatrix} 2 & -1 & 5 \\ 3 & 4 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 3 \\ -1 & 4 \\ 5 & 2 \end{bmatrix}$ (c) $\left(A^3\right)^T$ (d) does not exist.

④ The inverse of an {invertible / Upper triangular} matrix is —

(a) Upper triangular (b) lower triangular (c) diagonal (d) does not exist.

⑤ If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, then matrix A is —

(a) Upper triangular (b) lower triangular (c) diagonal (d) all of the above.

---

⑥ If $A = \begin{bmatrix} 3 & 2 & -1 \\ -1 & 8 & 7 \\ 4 & -3 & 1 \end{bmatrix}$, then the values of minor and cofactor corresponding to the entry a_{23} are — (a) 1, -1 (b) -1, 1 (c) -17, 17 (d) 17, -17

⑦ If the determinant of $A = \frac{1}{2}$, then $\det(A^{-1})$ is —

(a) $\frac{1}{2}$ (b) 2 (c) $-\frac{1}{2}$ (d) None

⑧ If $A = \begin{bmatrix} 2 & -1 \\ 5 & -2 \end{bmatrix}$, then adjoint of A is —

(a) $\begin{bmatrix} -2 & 1 \\ -5 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} -2 & 5 \\ 1 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} -2 & -1 \\ -5 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & -1 \\ -5 & -2 \end{bmatrix}$

---

⑨ If $u = (2,1,3)$ and $v = (-1,3,2)$, then the distance between u & v is —

(a) $\sqrt{13}$ (b) $\sqrt{14}$ (c) $\sqrt{15}$ (d) $\sqrt{17}$.

⑩ If $\|u\| = 1$, $\|v\| = 2$, $u.v = 0$, then the angle between u & v is —

(a) 0 (b) π (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{3}$.

⑪ If θ is the angle between $u = (1,2,3)$ & $v = (3,2,1)$ then $\cos\theta$ is —

(a) $\frac{10}{\sqrt{14}\sqrt{14}}$ (b) $\frac{5}{7}$ (c) both (a) & (b) (d) Neither (a) nor (b)

⑫ The vector $(2,0,1,-1)$ is orthogonal to the vector —

(a) $(0,1,2,-1)$ (b) $(0,2,-1,1)$ (c) $(1,-1,0,2)$ (d) $(0,-1,2,1)$

⑬ If $u = (2,-3,1)$ and $v = (0,5,7)$ are two vectors in R^3, then $u \times v$ is —

(a) $(-26,14,10)$ (b) $(-26,-14,10)$ (c) $(-26,-14,-10)$ (d) $(26,14,10)$