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GATE ALL BRANCHES CRASH COURSE 2025

ENGINEERING MATHEMATICS
Linear Algebra

DPP

Q1 The sum of all the elements of the matrix A = $[a_{ij}]$ where $a_{ij} = i^4 - j^4$ is given by 'k'. The value of 'k' is _____.

Q2 Choose the correct statements(s) from below:
(A) For a matrix 'A' , $A.A^T$ is always symmetric.
(B) The rows of an orthogonal matrix are orthogonal to each other.
(C) The number of multiplications required to multiply two matrices $A_{3\times4}$, $B_{4\times5}$ is 60.
(D) For a matrix 'A', $A.A^T$ is always orthogonal.

Q3 The index of the Nilpotent matrix, $A = \begin{bmatrix} 2 & -1 \\ 4 & -2 \end{bmatrix}$ is _____.

Q4 If 'A' and 'B' are symmetric matrices, then AB – BA is:
(A) Symmetric
(B) Skew-Symmetric
(C) Diagonal
(D) Orthogonal

Q5 Total number of diagonal + upper diagonal elements in a matrix of 200 × 200 is _____.

Q6 Which of the following matrix (ces) are orthogonal?
(A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
(B) $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} & 0 \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 \\ 0 & 0 & 1 \end{bmatrix}$
(C) $\begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
(D) $\begin{bmatrix} 1 & -1 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

Q7 The value of the determinant $\begin{bmatrix} \lim\limits_{x\to0}\frac{\sin x}{x} & 2 & \int_0^\infty \frac{\sin x}{x}dx \\ \lim\limits_{x\to0}\frac{x^2\sin x}{x} & \int_\infty^\infty \sin x dx & 4 \\ \lim\limits_{x\to\infty}\frac{\sin x}{x} & 0 & \left(\frac{1}{2}\right) \end{bmatrix}$
(A) $\sqrt{\pi}$ (B) $\sqrt{\frac{\pi}{2}}$
(C) $2\sqrt{\pi}$ (D) $\sqrt{\frac{\pi}{4}}$

Q8 Number of terms in the expansion of a 4 × 4 determinant is _____.

Q9 Choose the correct statement(s) from below
(A) The determinant of an odd order skew - symmetric matrix is zero
(B) For a scalar 'k' ' $|k . A_{n\times n}| = k^n |A_{n\times n}|$
(C) The absolute value of determinant of an orthogonal matrix is1.
(D) The determinant of a matrix 'A' is equal determinant of A^{-1}

Q10 If the product of two non-zero matrices A & B is a zero matrix, then
(A) |A| = 0 & |B| ≠ 0
(B) |A| ≠ 0 & |B| = 0
(C) |A| = 0 & |B| = 0
(D) |A| ≠ 0 & |B| ≠ 0

Q11 The nullity of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 7 & 9 \end{bmatrix}$ is _____.

Q12 For the system of equations
x – y + z = 0

$5x + 8y - 4z = 0$
$-2x + 2y + kz = 0$ to have a non-trivial solution, the value of 'k' is _____.

Q13 If one of the eigen values of the matrix $A = \begin{bmatrix} -1 & 3 & 2 \\ 2 & 5 & 7 \\ 2 & -6 & -4 \end{bmatrix}$ is of the form a + ib, Then the value of 'a' is _____.

Q14 One of the eigen values of the matrix $A = \begin{bmatrix} 0 & 2 & -4 \\ -2 & 0 & 7 \\ 4 & -7 & 0 \end{bmatrix}$ is_____.

(A) 0 (B) 2
(C) 4 (D) – 7

Q15 Choose the correct statement(s)

(A) The eigen vectors of a symmetric matrix are always orthogonal
(B) The eigen values of a skew-symmetric matrix are either zero(or) purely Imaginary
(C) Eigen values of an orthogonal matrix are of unit modules.
(D) Eigen vectors of A and A^T are same.

Q16 Which of the following is an eigen vector of $A = \begin{bmatrix} 1 & 4 & 5 \\ 2 & 3 & 5 \\ 1 & -1 & 0 \end{bmatrix}$

(A) $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ (B) $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$
(C) $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$ (D) $\begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$

Q17 For a square matrix 'A' to be diagonalizable

(A) All the eigen values must be distinct
(B) All the eigen vectors must be linearly independent
(C) All the eigen vectors must be linearly dependent.
(D) '0' must not be an eigen values

Q18 The matrix is of size '4 × 4' and the rank of the matrix is '1', then the number of elements in the null space of the matrix is_____.

Q19 For a given matrix $M = \begin{bmatrix} 12+9i & -i \\ i & 12-9i \end{bmatrix}$ where $i = \sqrt{-1}$, the inverse of the matrix is

(A) $\frac{1}{225}\begin{bmatrix} 12+9i & -i \\ i & 12-9i \end{bmatrix}$
(B) $\frac{1}{225}\begin{bmatrix} i & 12-9i \\ 12+9i & -i \end{bmatrix}$
(C) $\frac{1}{224}\begin{bmatrix} 12-9i & i \\ -i & 12+9i \end{bmatrix}$
(D) $\frac{1}{224}\begin{bmatrix} 12+9i & i \\ i & 12+9i \end{bmatrix}$

Q20 If $A = (a_{ij})_{n\times n}$, where $a_{ij} = i^2 - j^2$ is a square matrix of even order then

(A) A is symmetric and |A| is a perfect square
(B) A is symmetric and |A| = 0
(C) A is a skew-symmetric matrix and |A| = 0
(D) None of these

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Answer Key

Q1	0~0
Q2	(A, B, C)
Q3	2~2
Q4	(B)
Q5	10100~10100
Q6	(A, B, C)
Q7	(A)
Q8	24~24
Q9	(A, B, C)
Q10	(C)
Q11	1~1
Q12	-2~-2
Q13	0~0
Q14	(A)
Q15	(A, B, C)
Q16	(C)
Q17	(B)
Q18	3~3
Q19	(C)
Q20	(D)