Reg. No.

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.

(For those admitted in June 2024 and later)

PROGRAMME AND BRANCH: B.Sc., STATISTICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
II	PART-III	CORE-3	U24ST203	MATRIX AND LINEAR ALGEBRA

Date & Session: 28.04.2025/FN **Time: 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	**SECTION – A (10 X 1 = 10 Marks)** Answer ALL Questions.
CO1	K1	1.	If A and B are two matrices such that AB = BA = I, then B is: a) Transpose of A b) Inverse of A c) Symmetric matrix d) Diagonal matrix
CO1	K2	2.	The determinant of an upper triangular matrix is equal to: a) Sum of diagonal elements b) Product of diagonal elements c) Zero d) Identity matrix
CO2	K1	3.	If *A* is an orthogonal matrix, then: a) $A^TA=I$ b) $A^TA= 0$ c) $A^{-1} = 0$ d) det(A)=0
CO2	K2	4.	Cramer's Rule is used to solve which type of systems of equations? a) Homogeneous linear systems only b) Non-homogeneous linear systems only c) Non-linear systems of equations d) Both homogeneous and non-homogeneous linear systems
CO3	K1	5.	The rank of a matrix is defined as: a) The number of rows in the matrix. b) The number of columns in the matrix. c) The number of non-zero rows in the row echelon form of the matrix. d) The number of non-zero columns in the column echelon form of the matrix.
CO3	K2	6.	If a matrix *A* is non-singular, its inverse can be computed using: a) Only row operations b) Only column operations. c) Elementary row operations d) Elementary column operations
CO4	K1	7.	The column rank of a matrix is: a) The number of linearly independent rows in the matrix. b) The number of linearly independent columns in the matrix. c) The number of columns in the matrix d) The number of rows in the matrix
CO4	K2	8.	Which of the following is true about elementary row operations and row rank? a) Row rank changes when elementary row operations are applied b) Row rank is unaffected by elementary row operations c) Elementary row operations increase the row rank d) Elementary row operations reduce the row rank.

CO5	K1	9.	What does the Cayley-Hamilton theorem state? a) Every square matrix is diagonalizable. b) The matrix satisfies its own characteristic equation c) The matrix is invertible if its characteristic polynomial has no real roots d) The determinant of the matrix is equal to the trace of the matrix.
CO5	K2	10.	Which of the following is true about the characteristic values (eigenvalues) of a matrix? a) The characteristic values are always real numbers. b) The characteristic values are the roots of the characteristic polynomial. c) The characteristic values are always equal to the trace of the matrix d) The characteristic values are the diagonal elements of the matrix

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	Compute the value of b if the matrix given below is a singular matrix $A=\begin{pmatrix} 9 & b \\ 6 & 2 \end{pmatrix}$
			(OR)
CO1	K3	11b.	Explain Singular and Non-singular matrix with example
CO2	K3	12a.	Find the product of two matrix if $A=\begin{bmatrix} 5 & 7 & 1 \\ 2 & 9 & 3 \\ 2 & 5 & 7 \end{bmatrix}$, $B=\begin{bmatrix} 3 & 7 & 2 \\ 1 & 3 & 2 \\ 4 & 1 & 3 \end{bmatrix}$
			(OR)
CO2	K3	12b.	Compute the inverse of the matrix $A=\begin{bmatrix} 2 & 4 & -6 \\ 7 & 3 & 5 \\ 1 & -2 & 4 \end{bmatrix}$
CO3	K4	13a.	Compute rank by using elementary transformation $A=\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$
			(OR)
CO3	K4	13b.	Find the rank of the matrix $A=\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{bmatrix}$
CO4	K4	14a.	Determine the whether the vectors (5, -2, 4), (2, -3, 5), (4, 5, -7) are linearly independent or dependent
			(OR)
CO4	K4	14b.	Determine the dimension, and a basis for the row space of the matrix $B = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 0 & 1 \\ 0 & 2 & -1 \\ 1 & 1 & 4 \end{bmatrix}$
CO5	K5	15a.	List the Properties of Eigen Values
			(OR)
CO5	K5	15b.	Discuss about characteristics roots and characteristic vectors

Course Outcome	Bloom's K-level	Q. No.	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Define a matrix and explain the types of matrices with examples. **(OR)**

CO1	K3	16b.	If A=$\begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$show that (A-I) (A-4I = O. Hence evaluate the matrix A^3=A
CO2	K4	17a.	Discuss the orthogonal and Unitary matrices with examples
			(OR)
CO2	K4	17b.	Identify the adjoint and reciprocal matrices of the matrix A=$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$
CO3	K4	18a.	Solve the following equations and hence find the equations are x + y +z = 6, x + 2y + 3z = 14, x + 4y + 7z = 30 consistent.
			(OR)
CO3	K4	18b.	Explain the concept of the rank of a matrix and discuss its properties. How is it related to the row echelon form (REF) of a matrix?
CO4	K5	19a.	Examine, if the given vectors ~u=(1,0,0,3), ~v=(0,1,-2,0), ~w=(0,-1,1,1) are linearly independent. If possible, express ~z=(2,-3,2,-3) as a linear combination of ~u, ~v and ~w.
			(OR)
CO4	K5	19b.	Define a vector space and explain its properties
CO5	K5	20a.	Elucidate the proof Cayley-Hamilton theorem
			(OR)
CO5	K5	20b.	Diagonalize the matrix $\begin{bmatrix} 1 & -1 & -2 \\ 0 & 2 & -1 \\ 0 & 0 & 3 \end{bmatrix}$