



QP CODE: 25050631



25050631

Reg No :

Name :

MSc DEGREE (CSS) EXAMINATION DECEMBER 2025

First Semester

Core Courses - ST500102 - ANALYTICAL TOOLS FOR STATISTICS

M Sc STATISTICS, MSc APPLIED STATISTICS

2019 Admission Onwards

332A0927

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

Weight 1 each.

1. Define the subspace of a vector space, give an example.
2. Explain linearly independent vectors, give one example.
3. Define the basis of a vector space, and give one example.
4. Give the symmetric matrix associated with the quadratic form, $x^2 + 2y^2 + 3z^2 + 4xy + 5yz + 6zx$
5. What do you mean by column rank and row rank of a matrix?
6. Show that inverse of an orthogonal matrix is again orthogonal.
7. Give any two applications of spectral decomposition of real symmetric matrices.
8. State Cayley-Hamilton theorem, Give any two application of the same.
9. What do you mean by reflexive g inverse ?
10. Show that moore penrose g inverse is unique.

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

Weight 2 each.

11. a) Show that the product of two orthogonal matrices with same order is orthogonal.
b) Show that inverse of an orthogonal matrix is also orthogonal.
12. Prove that every super set of a linearly independent set is linearly independent.
13. If A is an $m \times m$ Idempotent matrix, then show that
(a) $I_m - A$ is also idempotent.
(b) Each eigen value of A is 0 or 1.





14. Show that any two characteristic vectors corresponding to two distinct characteristic roots of a hermitian matrix are orthogonal.
15. Obtain the spectral decomposition of $A = \begin{pmatrix} 1-a & a \\ b & 1-b \end{pmatrix}$
16. Any system of characteristic vectors $X_1, X_2, \dots, X_n$ corresponding to a system of distinct characteristic root $\lambda_1, \lambda_2, \dots, \lambda_n$, of a matrix are linearly independent.
17. Classify the following quadratic form, $2x^2 + 2y^2 + 3z^2 - 4yz - 4zx + 2xy$.
18. A non homo system, $AX = B$, consistant iff $\rho(A : B) = \rho(A)$

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight **5** each.

19. (a) Let S be a subspace of a finite dimensional vector space. Then prove that every generating set C of S contains a basis of S.
(b) Let V be a finite dimensional vector space. Show that all bases of V have same number of elements.
20. Compute the g inverse of $A = \begin{pmatrix} 18 & 2 & 46 \\ 2 & 1 & 2 \\ 46 & 2 & 130 \end{pmatrix}$
21. Explain the Gram-Schmidt Orthogonalisation procedure to find the ortho normal set of vectors.
22. Explain the definiteness of the quadratic form , $6x^2 + 3y^2 + 14z^2 + 18xz + 4zy + 4xy$

(2×5=10 weightage)

