Roll No.							

25-ST-21

M.Sc. II SEMESTER [MAIN/ATKT] EXAMINATION MAY - JUNE 2025

STATISTICS

Paper - I

[Linear Algebra]

[Max. Marks : 75] *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 If W_1, W_2 are two subspaces of a finite dimensional vector space V(F), then show that

$$\dim (W_1 + W_2) = \dim W_1 + \dim W_2 - \dim (W_1 \cap W_2)$$

OR

Define the linear dependent and independent vector space, also examine whether the set of vectors (1, −1, 0), (0, 1, −1), (0, 0, 1) is linearly dependent or not.

Q. 2 Define Gram Schmidt Orthogonalization process and apply Gram Schmidt orthogonalization process to obtain an orthonormal basic from the basis from the basis
$B = (\beta_1 , \beta_2 , \beta_3)$ of $V_3(R)$ where $\beta_1 = (1, 0, 1)$, $\beta_2 = (1, 2, -2)$, $\beta_3 = (2, -1, 1)$

OR

Define inner product space and show that $V_2(R)$ is an inner product space with inner product defined on -
$\alpha = (a_1 , a_2)$, $\beta = (b_1 , b_2) \in V_2(R)$ by $(\alpha, \beta) = 3\, a_1 b_1 + 2\, a_2 b_2$

Q. 3 a) What do you understand by linear transformation and explain their properties.

b) What do you mean by partitioned matrix explain.

OR

a) Define Kronecker product and its properties.

b) Describe Hadamard product with suitable example.

P.T.O.

Q. 4 a) Define -

i) Bilinear Form.

ii) Quadratic Form.

b) Define index and signature of quadratic form. Prove that index of a real symmetric matrix is unique.

OR

Reduce the following quadratic form to cannonical form and find its rank and signature.

$q = x^2 + 4y^2 + 9z^2 + t^2 - 12yz + 6zx - 4xy - 2xt - 6zt$

Q. 5 Define eigen value and eigen vectors. Find eigen values and eigen vectors of the following matrix -

$$\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$$

OR

State and prove Cayley Hamilton theorem.