23P415 (Pages: 2) Name: ……..

Reg. No……..

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2025

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC22P MST4 C11 - MULTIVARIATE ANALYSIS

(Statistics)

(2022 Admission onwards)

Time: Three Hours Maximum: 30 Weightage

Part A

Answer any ***four*** questions. Each question carries 2 weightage.

1. Define a quadratic form.
2. Briefly explain partial regression coefficient.
3. Derive the Maximum Likelihood Estimator of the mean vector of a Multivariate Normal Distribution $N_p(\mu, \Sigma)$.
4. What do you mean by Generalized variance?
5. Define Mahalanobis distance and Mahalanobis D^2 statistic.
6. Briefly explain the problem of classification.
7. How will you summarize sample variation by Principal Components?

(4 × 2 = 8 Weightage)

Part B

Answer any ***four*** questions. Each question carries 3 weightage.

8. State and prove a necessary and sufficient condition for the p – variate vector X to have normal distribution.
9. Let X be p – variate Normal. Obtain the marginal and conditional distribution of subsets.
10. Derive the null distribution of simple correlation coefficient.
11. Define Wishart distribution. State any two properties of it.
12. Explain how Hotelling's T^2 statistic is used to test the equality of a mean vector to a given vector using likelihood ratio criterion?
13. Explain Sphericity test.
14. How will you classify an observation into one of two multivariate normal population when the parameters are known?

(4 × 3 = 12 Weightage)

Part C

Answer any ***two*** questions. Each question carries 5 weightage.

15. Let $X \sim N(0, I)$ and $X'AX \sim \chi^2_{(a)}$ and $X'BX \sim \chi^2_{(b)}$. State and prove a necessary and sufficient condition that the quadratic forms are independently distributed.
16. Explain the concept of canonical correlation and derive the canonical variates.
17. Explain the likelihood ratio test for testing the equality of dispersion matrices.
18. Explain the two methods of estimation used in factor analysis.

(2 × 5 = 10 Weightage)

****