

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2025
(Regular/Improvement/Supplementary)

STATISTICS
FMST4C13 - MULTIVARIATE ANALYSIS

Time: 3 Hours**Maximum Weightage: 30****Part A: Answer any *four* questions. Each carries *two* weightage.**

1. Define partial regression coefficient.
2. Derive the distribution of sample mean vector from $N_p(\mu, \Sigma)$.
3. State and prove the additive property of Wishart distribution.
4. Define Hotelling's T^2 and Mahalanobis D^2 statistics. State the relation between them.
5. Explain Likelihood ratio tests.
6. How will you summarize sample variation by principal components?
7. Briefly explain the orthogonal factor model.

(4 × 2 = 8 weightage)

Part B: Answer any *four* questions. Each carries *three* weightage.

8. Prove that the necessary and sufficient condition that the quadratic form $X'AX$ (where $X \sim N_p(\mu, \Sigma)$) to have a chi square distribution.
9. State and prove a necessary and sufficient condition for the p - variate vector X to have normal distribution.
10. Derive the maximum likelihood estimators of mean vector μ and dispersion matrix Σ of multivariate normal distribution.
11. Derive the distribution of sample correlation coefficient (null case).
12. Explain Sphericity test.
13. How will you classify into one of two multivariate normal populations when the parameters are unknown.
14. Explain the maximum likelihood method for estimating parameters in an Orthogonal Factor Model.

(4 × 3 = 12 weightage)

(P.T.O.)

Part C: Answer any two questions. Each carries five weightage.

15. Derive the conditional distribution of one subvector given the other subvector when a p - variate normal vector is divided into two subvectors.
16. Define Wishart distribution and derive its density function.
17. How will you test the equality of a mean vector of a multivariate normal distribution when the dispersion matrix is unknown to a given vector using Likelihood ratio test?
18. Explain classification into one of several multivariate normal populations.

(2 × 5 = 10 weightage)