22P415 (Pages: 2) Name: ……..

Reg. No: ..……..

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2024

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC19P MST4 C14 / CC22P MST4 C14 - MULTIVARIATE ANALYSIS

(Statistics)

(2019 Admission onwards)

Time: Three Hours Maximum: 30 Weightage

Part A

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

1. Define partial regression coefficient.
2. If $X \sim N_p(\mu, \sigma)$, find the characteristic function of $X'AX$.
3. Derive the distribution of sample mean vector from a multivariate normal distribution.
4. What do you mean by generalized variance?
5. Define Mahalanobis D^2 statistic. Also write down its relation with Hotelling's T^2 statistic.
6. Explain the problem of classification with an example.
7. Define orthogonal factor model.

(4 × 2 = 8 Weightage)

Part B

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

8. If $X \sim N_p(0, \sigma)$, show that a necessary and sufficient condition for the independence of $X'AX$ and linear form $\alpha'X$ is that $A\Sigma\alpha = 0$.
9. If X has multivariate normal distribution, then show that every marginal distribution of X is also multivariate normal.
10. Derive the maximum likelihood estimators of mean vector and dispersion matrix of a multivariate normal distribution.
11. Write a short note on canonical correlation.
12. Define sphericity. Explain the sphericity test.
13. Explain the iterative procedure to calculate sample principal components.
14. Describe how to classify an observation into one of two known multivariate normal populations.

(4 × 3 = 12 Weightage)

Part C

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

15. State and prove a necessary and sufficient condition for the independence of two quadratic forms.
16. Derive the distribution of the sample multiple correlation coefficient when the population multiple correlation coefficient is zero.
17. Explain how to test equality of several covariance matrices.
18. Describe classification into one of several multivariate normal populations.

(2 × 5 = 10 Weightage)

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