



M 22136

Reg. No. :

Name :

Third Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.)

Examination, November 2012

STATISTICS

Paper – 3.2 : Multivariate Analysis

Time : 3 Hours

Max. Marks : 70

Instructions : Answer **any 5** questions without omitting **any** Unit.
All questions carry **equal** marks.

UNIT – I

- I. a) Define non-singular multinormal distribution. Identify the parameters, justifying your answer. (5×14=70)
- b) If $X \sim N_p(\mu, \Sigma)$, derive the distribution of the quadratic form $Y = (X - \mu)' \Sigma^{-1} (X - \mu)$.
- II. a) Define characteristic function of random vector. If $X \sim N_p(\mu, \Sigma)$ derive the characteristic function of X .
- b) Let $X \sim N_p(\mu, \Sigma)$, $X' A X$ and $X' B X$ be two quadratic forms in X . Derive the conditions under which $X' A X$ is independent of $X' B X$.

UNIT – II

- III. a) Define Wishart distribution. State and prove the additive property of Wishart distribution.
- b) Let $A \sim W_p(n, \Sigma)$ and $A = \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix}$ derive the distribution of A_{11} .
- IV. a) Let $X \sim N_p(k_0^H, \Sigma)$, where μ_0 is known, obtain the maximum likelihood estimator of k when
- i) Σ is known
- ii) Σ is unknown.
- b) Derive the likelihood ratio criterion for testing $H_0 : \mu = \mu_0$ in $N_p(\mu, \Sigma)$ when Σ is unknown.

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UNIT – III

- V. a) Explain how do you test independences of subvectors of a multivariate normal vector ?
b) How do you test the hypothesis that two multivariate normal distributions are equal ?
- VI. a) What you mean by spherical multinormal distribution ? Describe how to test $H_0 : \Sigma = \sigma^2 I$ when $X \sim N_p(\mu, \Sigma)$.
b) Derive the sampling distribution of generalized variance.

UNIT – IV

- VII. a) Derive the sampling distribution of multiple correlation coefficient in the non-null case.
b) Define Hotelling's T^2 -Statistic, show that it is invariant under translation.
- VIII. a) Describe the uses of Mahalanobis D^2 -Statistic.
b) What is Fisher-Behren's problem in the multivariate set up ? Explain how do you solve this problem.

UNIT – V

- IX. a) What is the problem discussed in discriminant analysis ? Derive the Bayes procedure of classification into one of two populations where their probability distributions are known.
b) What is Canonical correlation ? Discuss the problem of estimating Canonical correlations and variates in normal populations.
- X. a) Discuss the problem of estimation of principal components.
b) Show that Canonical correlations can be obtained as the non-zero roots of a determinantal equation.
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