

U.G. 6th Semester Examination - 2022

STATISTICS

[HONOURS]

Course Code : STAT-H-CC-T-14

(Multivariate Analysis and Nonparametric Methods)

Full Marks : 50(40+10)

Time : $2\frac{1}{2}$ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Notations and symbols have their usual meanings.

1. Answer any **five** questions: 2×5=10
 - a) State and briefly explain any one broad objective for which multivariate analysis techniques are used.
 - b) Write down the characteristic function of bivariate normal distribution with parameters $\mu_1, \mu_2, \sigma_1^2, \sigma_2^2$ and ρ .
 - c) Mention any two properties of variance-covariance matrix.
 - d) What is sign test? When is it used?
 - e) What is meant by “Expected Cost of Misclassification”?

- f) Distinguish between principal component analysis and factor analysis.
 - g) What is Kolmogorov – Smirnov one sample test?
 - h) What is run test? Give an example.
2. Answer any **two** questions: 5×2=10
 - a) Show that the multiple correlation coefficient $\rho_{1.23\dots p}$ is the maximum possible total correlation between X_1 and linear combinations of the regressor variables $X_2, X_3, \dots, X_p$.
 - b) Obtain the classification rule to assign an observation of unknown origin to one of two p-variate normal populations having the same dispersion matrix.
 - c) In Principal component analysis derive the first principal component.
 - d) Write the comparison between Chi square test and Kolmogorov – Smirnov test.
3. Answer any **two** questions: 10×2=20
 - a) Derive the MLE's of the parameters μ and Σ of p-variate normal distribution based on a random sample of size $N (> p)$ from the distribution.
 - b) Present the motivation, definition and derivation of Fisher's (multiple) discriminant functions.

[Turn over]

- c) Prove that under some assumptions (to be stated), the variance and covariance matrix can be written as $S = LL' + \psi$ in the factor analysis model. Also discuss the effect of an orthogonal transformation.
- d) Discuss the use of test of randomness with an example.

[Internal Assessment : 10]
