Registration Number:

Date & session:

ST. JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc. (STATISTICS) – II SEMESTER
SEMESTER EXAMINATION: APRIL 2023
ST 8321 – MULTIVARIATE ANALYSIS

Time: 2 Hours **Max Marks: 50**

This paper contains TWO printed pages and ONE part

Note: Scientific calculator is allowed

PART-A

Answer any FIVE of the following **10x 5= 50**

1. A) Define multivariate normal distribution. Obtain its Characteristic function.
   B) Find the pdf of $Y = X_1 + X_2 - X_3$ if $\underline{X} = (X_1, X_2, X_3)' \sim N_3(\mu, \Sigma)$. (6+4)

2. A) Derive the null distribution of the test statistic for testing $H_0: \mu = \mu_0$ against $H_0: \mu \neq \mu_0$ of a multivariate normal distribution when Σ is unknown.
   B) Derive the MLEs of the variance covariance of multivariate normal distribution. (6+4)

3. A) Derive the Multivariate regression coefficients using method of likelihood.
   B) Explain the estimation of factor loadings. (6+4)

4. A) Explain the method of testing the significance of canonical correlations.
   B) Briefly explain Multivariate analysis of variance. (7+3)

5. A) Define Principal components. Explain the utility of principal component analysis.

   B) Suppose $\underline{X} = (X_1, X_2, X_3)'$ has the covariance matrix, $\Sigma = \begin{pmatrix} 1 & -2 & 0 \\ -2 & 5 & 0 \\ 0 & 0 & 2 \end{pmatrix}$. Obtain the first two principal components. (5+5)

6. A) What is clustering? Explain the method of hierarchical clustering technique with an example.

   B) Derive the Fisher's linear discriminant function for discrimination between two groups. (5+5)

7. A) Explain the method of extracting the common factor loadings.

   B) Explain the application of Factor analysis. (7+3)