BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - III Computer Science & Business Systems : WINTER: 2025
SUBJECT: COMPUTATIONAL STATISTICS

Day : Wednesday
Date : 17/12/2025

W-24145-2025

Time : 10:00 AM-01:00 PM
Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat diagrams **WHEREVER** necessary.
4) Assume suitable data, if necessary.

Q. 1 Write a python program to demonstrate the use of looping structures (for and while). Explain where each loop type is preferred. **(10)**

OR

Q. 1 Describe the various file access modes (r, w, a, r+, etc) and demonstrate file reading and writing operations with appropriate examples. **(10)**

Q.2 Introduce the basics of time series data. Discuss its key components and explain how time series data differs from other forms of data using practical example. **(10)**

OR

Q. 2 Discuss the role of data aggregation in exploratory data analysis. Explain common aggregation functions like sum, mean, count and demonstrate their application with a dataset. **(10)**

Q. 3 Derive the formula for the multivariate normal distribution, assuming the variables are dependent on one another. **(10)**

OR

Q. 3 Discuss in detail the assumptions of the multiple linear regression model including linearity, multicollinearity, outliers, autocorrelation, homoscedasticity and normality of residuals. **(10)**

Q. 4 Explain the process of classifying a new observation using linear discriminant analysis (LDA). Include the mathematical formulation and an example to illustrate the classification. **(10)**

OR

Q. 4 What is the curse of dimensionality? Discuss various techniques such as PCA, LDA and FA to overcome the curse. **(10)**

Q. 5 Define factor analysis. Clarify how it differs from PCA. Also state its assumptions. **(10)**

OR

Q. 5 Derive the principal component equation based on matrix determinant $|S- \lambda I| = 0$. Explain the terms in PCA. **(10)**

Q. 6 What is agglomerative clustering? Discuss the different types such as single-linkage, complete-linkage and average-linkage. Also explain how they differ in their approach to merge clusters. **(10)**

OR

Q. 6 Describe clustering as a process model. Explain the key stages in applying clustering algorithm effectively to a dataset. **(10)**

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