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Total Pages : 3

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May 2026

B.Sc. (CHEMISTRY) IV SEMESTER

Statistical Analysis for Chemistry (CHU–214–V)

Time : 3 Hours]

[Maximum Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any **four** questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define specificity, accuracy and precision. (1.5)

   (b) A spectrophotometric analysis gives absorbance values of 0.412, 0.415, 0.413 and 0.414. Calculate the mean absorbance. (1.5)

   (c) Differentiate between systematic error and random error in analytical chemistry. (1.5)

   (d) Define a histogram. Explain its importance in statistical data analysis. (1.5)

   (e) The measured concentrations of a solution are 6.1, 6.4, 6.3 and 6.5 ppm. Calculate the standard deviation. (1.5)

(f) Explain the significance of the limit of quantitation (LOQ) in chemical analysis. (1.5)

(g) A calibration curve for an analytical method follows a nonlinear trend. Suggest one way to linearize the data for analysis. (1.5)

(h) What is the purpose of log transformation in nonlinear regression? (1.5)

(i) Define the Chi-square (χ^2) test. (1.5)

(j) What is a Cunisum chart? (1.5)

PART–B

2. (a) Explain the concept of error propagation in chemical analysis. (5)

(b) Define and derive expressions for mean, standard deviation, and relative standard deviation. (6)

(c) Explain the significance of confidence interval in data analysis. (4)

3. Explain in detail the criteria for evaluating an analytical method, including specificity, accuracy, precision, detection limit, quantitation limit, sensitivity, working range, and linearity. (15)

4. (a) Describe linearization techniques and log transformations used in nonlinear fitting. (5)

(b) Explain the concept of charting a distribution in statistical data analysis. (5)

(c) Explain Conventional Control Charts (Shewhart Charts) and their construction. (5)

5. (a) Explain calibration methods used in analytical chemistry. (5)

(b) Discuss regression analysis and its role in calibration curves. (5)

(c) Explain analysis of variance (ANOVA) and its application in chemical data analysis. (5)

6. (a) Define corrections and clarifications in the context of analytical measurements. (5)

(b) Discuss the role of distribution charts in method validation, particularly in checking repeatability and reproducibility of an analytical method. (5)

(c) Explain Limit of detection (LOD) with a suitable example. (5)

7. (a) Describe in detail different types of probability charts used in quality control and process monitoring. (8)

(b) Explain how spectral data is used for qualitative and quantitative analysis in chemical applications. (7)

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