Theory and Practice of Statistics
Paper Code: ADS-3

Duration: 3 Hours **Maximum Marks: 100**

INSTRUCTIONS

1. Answers must be written in English.
2. All questions carry equal marks.
3. The answer to each question or part thereof should begin on a fresh page.
4. Your answer should be precise and coherent.
5. The part/parts of the same question must be answered together and should not be interposed between answers to other questions.
6. **Candidates should attempt five questions in all, selecting at least two questions from each part.**
7. If you encounter any typographical error, please read it as it appears in the text-book.
8. Candidates are advised to go through the General Instructions on the back side of the title page of the Answer Script for strict adherence.
9. No continuation sheets shall be provided to any candidate under any circumstances.
10. Candidates shall put a cross (x) on blank pages of the answer script.

PART A

Q1. Explain the concept of measures of central tendency with detailed explanations and examples of Mean, Median, and Mode. Discuss the situations where each measure is most appropriate and why.

Q2. Discuss the key considerations and steps involved in preparing an effective questionnaire. How can the design of a questionnaire influence the quality and reliability of the collected data? Additionally, Explain the various methods of collecting primary data

Q3. Explain the process of hypothesis testing and the steps involved. Discuss the importance of hypothesis testing in statistical analysis.further, describe the applications of the t-test, chi-square test, and F-test. Provide examples to demonstrate when each test is appropriate.

Q4. Using the data provided, find the regression equations and calculate the standard errors for both y and x estimates. Discuss the implications of these standard errors on the accuracy of your regression model.

x	**1**	**2**	**3**	**4**	**5**
y	2	4	5	4	6

PART B

Q5. You are tasked with conducting a survey to estimate the average household income in a city. Describe how you would apply each of the following sampling techniques: simple random sampling, stratified sampling, cluster sampling, and systematic sampling. Discuss the potential challenges you might face with each technique and how you would address them.

Q6. Given the following data on prices and quantities for two periods, calculate the Laspeyres, Paasche, and Fisher price index numbers. Discuss the differences between these indices and their respective advantages.

Commodity	Base Year Price	Base Year Quantity	Current Year Price	Current Year Quantity
A	10	100	12	120
B	15	200	18	220
C	20	150	25	160

Q7. Using the data points (1,1)(1, 1)(1,1), (2,8)(2, 8)(2,8), (3,27)(3, 27)(3,27), and (4,64)(4, 64)(4,64), derive and compare both Lagrange and Newton's polynomials. Use these polynomials to estimate the value at x=2.5x = 2.5x=2.5 and discuss the accuracy of each method.

Q8. Describe the mathematical methods used for population projection, such as the exponential growth model. Use a hypothetical example to demonstrate these methods.