

PART A – THEORETICAL FOUNDATION

1. What is Inferential Statistics?

Inferential statistics is a branch of statistics that uses sample data to make conclusions about a population. It helps estimate population parameters, test hypotheses, and predict trends. It relies on probability theory to measure uncertainty. Examples include confidence intervals and hypothesis testing.

2. What is Hypothesis Testing and its Components?

Hypothesis testing is a statistical process used to determine whether there is enough evidence to reject a null hypothesis. It involves formulating null and alternative hypotheses, selecting a significance level, calculating a test statistic, and interpreting the p-value. The decision is made based on statistical evidence from sample data.

3. Explain Confidence Interval and Critical Value.

A confidence interval is a range of values that is likely to contain the true population parameter with a certain confidence level (such as 95%). The critical value is a threshold obtained from a probability distribution that determines the boundary of the acceptance region. It helps decide whether to reject the null hypothesis.

4. Define p-value.

The p-value represents the probability of obtaining results as extreme as the observed data, assuming the null hypothesis is true. A smaller p-value indicates stronger evidence against the null hypothesis. If the p-value is less than the significance level (α), the null hypothesis is rejected.

5. Differentiate Type I and Type II Errors.

A Type I error occurs when a true null hypothesis is incorrectly rejected. A Type II error occurs when a false null hypothesis is not rejected. Type I error is controlled by the significance level, while Type II error relates to the test's power.

6. Briefly Describe Z-test, T-test, Chi-Square Test, and ANOVA.

A Z-test is used to compare means when the sample size is large and population variance is known. A T-test compares means when the sample size is small or variance is unknown. The Chi-square test examines relationships between categorical variables. ANOVA is used to compare means across three or more groups.

7. What is Covariance?

Covariance measures how two variables change together. A positive covariance indicates that both variables increase or decrease together, while a negative covariance indicates opposite movement. It shows the direction of a relationship but not its strength.

8. What is Correlation?

Correlation measures the strength and direction of the linear relationship between two variables. Its value ranges from -1 to $+1$. A value close to ± 1 indicates a strong relationship, while a value near 0 indicates little or no linear relationship.