Part A – Theoretical Foundation

1. What is Inferential Statistics?

Inferential statistics is used to make predictions or draw conclusions about a population based on a sample of data.
It helps in decision-making using probability, estimation, and hypothesis testing.

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2. What is Hypothesis Testing and its Components?

Hypothesis testing is a statistical method used to test assumptions about a population parameter.
Its main components are **Null Hypothesis (H_0)**, **Alternative Hypothesis (H_1)**, **significance level (α)**, and **test statistic**.

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3. Explain Confidence Interval and Critical Value.

A confidence interval gives a range of values within which a population parameter is expected to lie with a certain confidence level.
The critical value is the threshold that determines whether to reject the null hypothesis.

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4. Define p-value.

The p-value is the probability of obtaining results as extreme as the observed results, assuming the null hypothesis is true.
A smaller p-value indicates stronger evidence against the null hypothesis.

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5. Differentiate Type I and Type II Errors.

A **Type I error** occurs when the null hypothesis is rejected even though it is true.
A **Type II error** occurs when the null hypothesis is not rejected even though it is false.

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6. Brief Description of z-test, t-test, chi-square test, and ANOVA.

- **z-test**: Used when population variance is known and sample size is large.

- **t-test**: Used when population variance is unknown and sample size is small.

- **Chi-square test**: Tests association between categorical variables.

- **ANOVA**: Compares means of three or more groups.

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7. What is Covariance?

Covariance measures the direction of the relationship between two random variables.
A positive covariance indicates variables move in the same direction, while a negative covariance indicates opposite movement.

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8. What is Correlation?

Correlation measures the strength and direction of the linear relationship between two variables.
Its value lies between **–1 and +1**, where +1 indicates perfect positive correlation.