**Theoretical Assignments:**

1. **Explain Key Statistical Concepts**

**ANS:- 1**. Descriptive Statistics

These help summarize and describe the main features of a dataset.

📌 Key Terms:

* Mean (Average): Sum of all values ÷ number of values.
* Median: Middle value when data is arranged in order.
* Mode: Most frequently occurring value.
* Range: Difference between highest and lowest values.
* Standard Deviation (SD): Tells how much the values deviate from the mean.
* Variance: Square of the standard deviation (spread of data).

🔹 *Example:* For scores [70, 80, 90], mean = 80, range = 90 - 70 = 20.

2. Inferential Statistics

Used to make predictions or decisions about a population based on a sample.

📌 Key Concepts:

* Population vs. Sample: Entire group vs. a subset.
* Hypothesis Testing: Testing a claim using data (e.g., “Did the training improve scores?”).
* P-value: Probability that the results are due to chance (typically, p < 0.05 means statistically significant).
* Confidence Interval (CI): A range where the true population value likely lies (e.g., “We are 95% confident that the mean is between 80 and 90”).

3. Probability Concepts

Probability helps to quantify uncertainty in outcomes.

📌 Key Ideas:

* Probability: Value from 0 to 1 that shows how likely an event is.
* Independent Events: Outcome of one does not affect the other (e.g., two coin tosses).
* Mutually Exclusive: Events that cannot happen at the same time.

4. Probability Distributions

These describe how values are spread for a random variable.

📌 Common Types:

* Normal Distribution: Bell-shaped curve, most values around the mean.
* Binomial Distribution: For yes/no (success/failure) trials (e.g., flipping a coin 10 times).
* Poisson Distribution: For count data (e.g., number of calls per hour).

5. Correlation and Regression

Used to understand relationships between variables.

📌 Key Concepts:

* Correlation: Measures strength and direction of relationship between two variables (ranges from -1 to +1).
* Regression: Predicts one variable based on another.
  + *Simple Linear Regression*: One predictor.
  + *Multiple Regression*: More than one predictor.

6. Sampling Methods

Sampling allows you to draw conclusions without studying the whole population.

📌 Types:

* Random Sampling: Everyone has an equal chance of being selected.
* Stratified Sampling: Population divided into groups, samples taken from each.
* Cluster Sampling: Random groups are chosen, then all members are studied.

7. Central Limit Theorem (CLT)

As the sample size increases, the sample mean will approach a normal distribution, even if the population is not normal.