

## PART - A Theory

Q1. Explain Mean, Median, and Mode with a real-life example.

Ans. Mean: Average of values  
Median: Middle value when the data is in ordered form.  
Mode: Most frequent value  
Example: — Monthly Salaries: [20k, 22k, 22k, 25k, 60k]  
Mean: 29.8k  
Median: 22k  
Mode: 22k

Q2. What is the difference between variance and Standard deviation?

Ans. Variance: Average how far the datapoints from the mean

Standard deviation: Square root of variance

Q3. Define Normal Distribution and give one practical use case.

Ans. A bell-shaped symmetric distribution where most real values lies.

Use case: Modeling Student test scores

Q4. Explain Skewness and kurtosis in simple words.

Ans. Skewness: Measure of asymmetric of data (left or right skewed)

Kurtosis: Shows the measure of tailiness.

Q5. What is Probability? Differentiate between Empirical vs Theoretical Probability with examples.

Ans. Probability is the measure that tells us that a particular event will occur.

- Empirical: Based on experiments. Example: - Rain occurred 3 days out of 10  $\rightarrow 0.3$
- Theoretical: Based on mathematical reasoning. Example: - Probability of head in a fair coin  $= 0.5$

Q6. Explain Independent vs Dependent Events with one example each.

Ans. Independent: One event does not affect other.

Example: - Tossing two coins

Dependent: One event affects the other. Example: - Drawing cards without replacements.

Q7. What is the intuition of Bayes theorem in daily life?

Ans. Bayes theorem updates the probability when you have new evidence.

Example: - If you hear someone cough (evidence), Bayes theorem helps update the probability.

Q8. Explain Eigenvalue and Eigenvector in simple terms.

Ans. Eigenvalue: The factor by which the eigenvector is stretched

Eigenvector: A special vector whose direction doesn't change under a transformation.

Example: In machine learning (PCA), Eigenvectors give main directions of data, Eigenvalues show their importance.