PART A — THEORY (Short Answers)

1. Mean, Median, Mode (Employee Salary Example)

- **Mean:** Average salary of employees.
  Formula:

Mean=∑SalaryTotal EmployeesMean = \frac{\sum Salary}{Total\ Employees}Mean=Total Employees∑Salary

Example: If salaries are 20k, 25k, 30k → Mean = 25k.

- **Median:** Middle value after sorting salaries.

Example: 20k, 25k, 80k → Median = 25k.

- **Mode:** Most frequently occurring salary.

Example: 20k, 25k, 25k, 30k → Mode = 25k.

2. Range vs Variance

- **Range:** Difference between highest and lowest value.

Range=Max−MinRange = Max - MinRange=Max−Min

- **Variance:** Measures how far data spreads from the mean.

Example:

Projects completed = [2,4,6]

Range = 6 − 2 = 4

Variance shows how consistently employees complete projects.

3. Normal Distribution vs Poisson Distribution

Normal Distribution	Poisson Distribution
Continuous data	Discrete counts
Bell-shaped curve	Event occurrence
Used for salary/performance	Used for number of events
Mean = Median = Mode	Mean = Variance

Example:

Performance score → Normal

Number of customer complaints → Poisson

4. Skewness

Skewness shows data asymmetry.

- Positive skew → long right tail
- Negative skew → long left tail

Example: Few employees earning very high salary → positively skewed salary data.

5. Conditional Probability

Probability of an event given another event occurred.

P(A|B)=P(A∩B)P(B)P(A|B)=\frac{P(A \cap B)}{P(B)}P(A|B)=P(B)P(A∩B)

Example:

Probability of promotion **given performance score > 80**.

6. Independent vs Mutually Exclusive Events

- **Independent:** One event does not affect another.
  Example: Department and Age.

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- **Mutually Exclusive:** Cannot happen together.
  Example: Promotion = Yes and Promotion = No.

7. Bayes Theorem

Used to update probability using new information.

Example:
Predict promotion probability after seeing performance score.

8. PCA (Principal Component Analysis)

PCA reduces many variables into fewer important variables while keeping maximum information.

Example:
Age, Salary, Hours → converted into few main performance factors.