**Q28)** **What is Normal distribution ? What are the four Assumptions of Normal distribution ? Explain in detail.**

The Normal Distribution is a continuous probability distribution that is symmetrical around its mean, meaning most of the observations cluster around the central peak, and the probabilities for values further away from the mean taper off equally in both directions. It is also known as the Gaussian distribution.

The shape of the normal distribution is often referred to as a bell curve because of its bell-like appearance when plotted.

**Four Assumptions of Normal Distribution:-**

**Randomness:**

The data should be a random sample from the population. This means every member of the population has an equal chance of being included in the sample.

**Independence:**

Observations should be independent of each other. The outcome of one observation should not influence or affect the outcome of another.

**Homogeneity of Variance (Homoscedasticity):**

The variance of the errors should be consistent across all levels of the independent variable(s). In simpler terms, the spread of data points should be roughly the same across the range of values of the independent variables.

**Normality of Errors:**

The residuals (errors) of the model should be normally distributed. This does not necessarily mean the data itself needs to be normally distributed, but rather that the deviations from the model should follow a normal distribution.

**Q29) Write all the characteristics or Properties of the Normal Distribution curve.**

Characteristics or Properties of the Normal Distribution Curve

**Symmetry:**

The normal distribution curve is perfectly symmetrical about its mean. This symmetry means that the left side of the curve is a mirror image of the right side.

As a result, the mean, median, and mode of the distribution are all the same and located at the center of the distribution.

**Bell-Shaped Curve:**

The shape of the normal distribution is often described as a "bell curve" because of its bell-like appearance.

It has a single peak at the center (mean) and tapers off towards the tails, indicating that extreme values (very high or very low) are less likely than values near the mean.

**Asymptotic**:

The tails of the normal distribution curve extend infinitely in both directions and approach the horizontal axis asymptotically.

This means that the probability of obtaining a value further from the mean decreases but never actually reaches zero.

**Mean, Median, and Mode are Equal:**

For a normal distribution, the mean, median, and mode are all equal and located at the center of the distribution.

This property reflects the perfect symmetry of the distribution.

**No Skewness:**

The normal distribution has a skewness of 0, indicating no skew. This means it is perfectly symmetrical, with no inclination or asymmetry to the left or right.

**Kurtosis:**

The normal distribution has a kurtosis of 3, which is often referred to as mesokurtic. This indicates that the tails of the distribution are neither too heavy nor too light compared to a normal distribution.

**Area Under the Curve (AUC):**

The total area under the normal distribution curve is equal to 1, representing the total probability of all possible outcomes.

This property ensures that the distribution can be used as a probability density function (PDF) to describe the likelihood of various outcomes.

Q30) **Which of the following options are correct about Normal Distribution Curve.**

* **Option (a):** Incorrect. Within one standard deviation (sigma ) approximately 68% of observations lie, not 50%.
* **Option (b):** Correct. Within one standard deviation from the mean , approximately 68.268% of observations lie.
* **Option (c)**: Correct. Within two standard deviations from the mean , approximately 95.45% of observations lie.
* **Option (d):** Correct. Within three standard deviations from the mean (, approximately 99.73% of observations lie.
* **Option (e)**: Correct. Only 0.27% of observations lie outside the range

**ANS-** Options b,c,d and e are correct.