**Ex No: 13 Implementation of clustering techniques- K Means**

**Problem Scenario**

A retail mall wants to segment its customers into meaningful groups to improve marketing strategies and personalized offers. The available dataset contains information about customers, including **Annual Income** and **Spending Score**. Since there is no predefined category, an **unsupervised learning** approach is required.

Link: [Dataset](https://gist.githubusercontent.com/pravalliyaram/5c05f43d2351249927b8a3f3cc3e5ecf/raw/8bd6144a87988213693754baaa13fb204933282d/Mall_Customers.csv)

In this experiment, we will implement the **K-Means clustering algorithm** using Python to group customers with similar behavior into clusters. The steps include:

1. Loading and preprocessing the dataset (selecting Annual Income and Spending Score).
2. Using the **Elbow Method** to determine the optimal number of clusters (K).
3. Applying the K-Means algorithm to assign customers to clusters based on similarity.
4. Visualizing the resulting clusters with different colors and showing the cluster centroids.

This clustering will help the mall identify groups such as **high-income high-spending**, **low-income low-spending**, or other customer patterns, enabling more effective targeted promotions.

**Expected Output**

1. Display of the **first few rows** of the dataset.
2. A plot of the **Elbow Method**, showing the sum of squared distances vs. number of clusters to identify the optimal K.
3. Cluster assignments for each data point.
4. A **scatter plot** of customers color-coded by cluster, showing how they are grouped.
5. Cluster centroids displayed on the scatter plot.
6. Insights about customer segments based on the clustering results (e.g., which cluster represents high-spending customers).