Clustering:

Number of Clusters Formed: 6

- The dataset is segmented into 6 clusters, reflecting distinct customer purchasing behaviors. This segmentation helps in understanding different customer groups, enabling more targeted strategies for marketing, product recommendations, and customer service. Each cluster captures unique behavioral patterns, supporting personalized approaches to customer engagement.

Davies-Bouldin Index (DB Index): 0.9982

- The DB Index of 0.9982 indicates that the clusters are well-separated with minimal intra-cluster variance. A lower value reflects better-defined clusters. This suggests that the clustering algorithm has effectively differentiated customer groups, leading to distinct clusters with clear boundaries and minimal overlap, ensuring meaningful segmentation.

Silhouette Score: 0.3977

- A Silhouette Score of 0.3977 indicates moderate cohesion within clusters and reasonable separation between them. This suggests that while customers are somewhat well-matched to their respective clusters, there is potential for refining cluster boundaries to achieve better internal consistency and clearer differentiation between groups for more actionable insights.

Inertia (Sum of Squared Distances): 580.8527

- Inertia of 580.8527 measures the compactness of the clusters, with lower values indicating greater compactness. This value suggests that while the clusters are relatively compact, there is still some spread within them. Further optimization, such as adjusting the number of clusters, could improve compactness and reduce variability.

Average Cluster Size: 33 customers

- With an average cluster size of 33 customers, the segmentation is balanced, ensuring that each group has enough data points for meaningful analysis. Balanced cluster sizes are essential for reliable insights, preventing overrepresentation of any one group and allowing for more accurate interpretations and actionable business decisions.