K Means Clustering Algorithm

Dataset- Mall Customer dataset

importing the libraries

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
```

Loading the data

In [2]:
```
customer_data = pd.read_csv('C:/Users/lekshmi/Downloads/Mall_Customers.csv'
```

Understanding the data and PreProcessing

In [12]:
```
customer_data.head()
```

Out[12]:

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

In [13]:
```
customer_data.shape
```

Out[13]:
```
(200, 5)
```

In [14]:
```
customer_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   CustomerID              200 non-null    int64
 1   Gender                  200 non-null    object
 2   Age                     200 non-null    int64
 3   Annual Income (k$)      200 non-null    int64
 4   Spending Score (1-100)  200 non-null    int64
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

checking missing values

In [3]:
```
customer_data.isnull().sum()
```

Out[3]:
```
CustomerID                0
Gender                    0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

choosing attributes Annual income and Spending score

In [5]:
```
X = customer_data.iloc[:,[3,4]].values
```

```
X
```

Scaling the variables

In [7]:
```
scaler = StandardScaler()
X = scaler.fit_transform(X)
```

choosing number of clusters

wcss- Within Clusters Sum of Squares

In [8]:
```
# finding wcss value for different number of clusters(upto 10)

wcss = []

for i in range(1,11):
  kmeans = KMeans(n_clusters=i, init='k-means++', random_state=42)
  kmeans.fit(X)

  wcss.append(kmeans.inertia_)
```

```
C:\Users\lekshmi\anaconda3\Lib\site-packages\sklearn\cluster\_kmeans.py:87
0: FutureWarning: The default value of `n_init` will change from 10 to 'au
to' in 1.4. Set the value of `n_init` explicitly to suppress the warning
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```
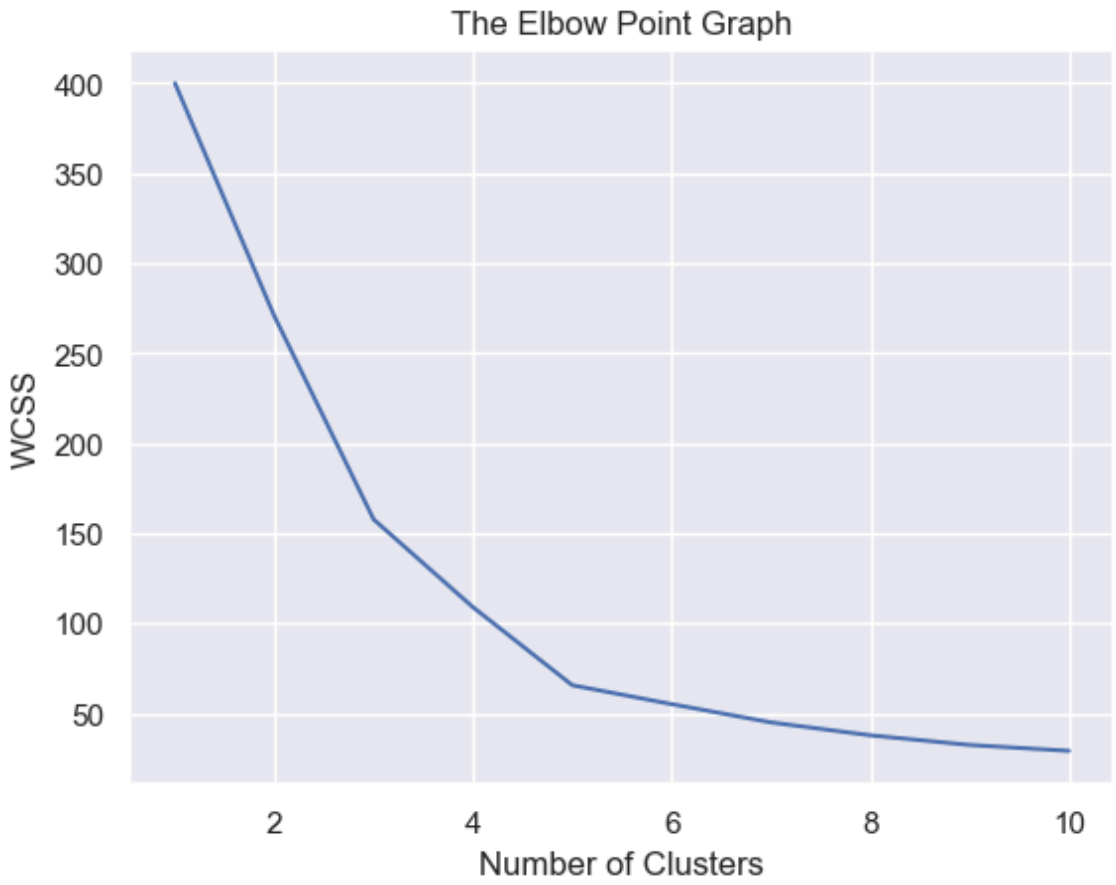

In [9]:
```
sns.set()
plt.plot(range(1,11), wcss)
plt.title('The Elbow Point Graph')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



Optimum Number of Clusters = 5

Training the Kmeans Clustering model

In [10]:
```
kmeans = KMeans(n_clusters=5, init='k-means++', random_state=42)

# return a label for each data point based on their cluster
Y = kmeans.fit_predict(X)

print(Y)
```

```
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 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4 1
 4 1 4 1 4 1 4 1 4 1 4 1 4 1 4]
```
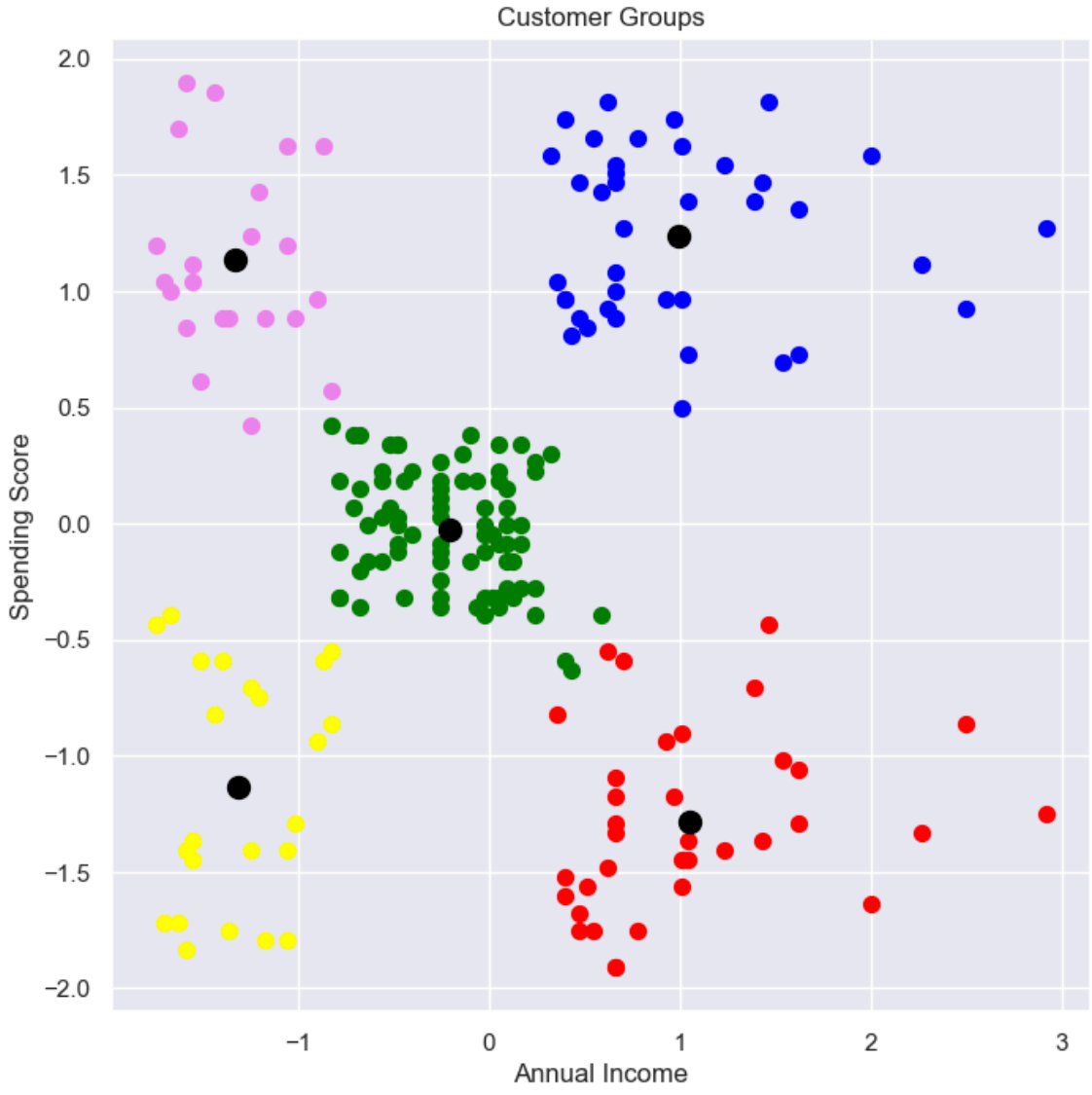

Visualising clusters

In [11]:
```
plt.figure(figsize=(8,8))
plt.scatter(X[Y==0,0], X[Y==0,1], s=50, c='green', label='Cluster 1')
plt.scatter(X[Y==1,0], X[Y==1,1], s=50, c='red', label='Cluster 2')
plt.scatter(X[Y==2,0], X[Y==2,1], s=50, c='yellow', label='Cluster 3')
plt.scatter(X[Y==3,0], X[Y==3,1], s=50, c='violet', label='Cluster 4')
plt.scatter(X[Y==4,0], X[Y==4,1], s=50, c='blue', label='Cluster 5')


plt.scatter(kmeans.cluster_centers_[:,0], kmeans.cluster_centers_[:,1], s=1

plt.title('Customer Groups')
plt.xlabel('Annual Income')
plt.ylabel('Spending Score')
plt.show()
```



cluster 4 has high spending score but low annual income

cluster 2 has high annual income but low spending score

cluster 5 has both high annual income and spending score

K-Means is a popular unsupervised machine learning algorithm used for clustering, where it partitions a dataset into a predetermined number of clusters by iteratively

assigning data points to the cluster with the nearest centroid and updating the centroids based on the mean of the assigned points. The algorithm aims to minimize the within-cluster sum of squared distances, providing a simple and efficient method for grouping data into distinct clusters based on similarity.