In [30]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
```

In [4]:
```
df = pd.read_csv("TechElectroCustomerData.csv")
df.head()
```

Out[4]:

	CustomerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchases	PreferredCa
0	1001	58	Male	Married	73598	53	Ele
1	1002	32	Male	Divorced	31717	87	Ele
2	1003	55	Female	Married	26952	29	Ele
3	1004	32	Male	Divorced	38031	87	Ap
4	1005	32	Female	Divorced	43231	18	Ele

In [5]:
```
df.isnull().sum()
```

Out[5]:
```
CustomerID           0
Age                  0
Gender               0
MaritalStatus        0
AnnualIncome (USD)   0
TotalPurchases       0
PreferredCategory    0
dtype: int64
```

In [6]:
```
df.drop_duplicates(inplace=True)
```

In [8]:
```
label_encoder = LabelEncoder()

df['Gender'] = label_encoder.fit_transform(df['Gender'])
df['MaritalStatus'] = label_encoder.fit_transform(df['MaritalStatus'])
df['PreferredCategory'] = label_encoder.fit_transform(df['PreferredCategory'])
```

In [9]:
```
numerical_col = ['Age', 'AnnualIncome (USD)', 'TotalPurchases']
min_max_scaler = MinMaxScaler()
standard_scaler = StandardScaler()
df['Age'] = min_max_scaler.fit_transform(df['Age'].values.reshape(-1, 1))
df['AnnualIncome (USD)'] = min_max_scaler.fit_transform(df['AnnualIncome (USD)']
df['TotalPurchases'] = standard_scaler.fit_transform(df['TotalPurchases'].values
```

In [10]:
```
df.head()
```

Out[10]:

	CustomerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchases	Preferr
0	1001	0.851064	1	1	0.745797	-0.096513	
1	1002	0.297872	1	0	0.096318	1.497973	
2	1003	0.787234	0	1	0.022424	-1.222033	
3	1004	0.297872	1	0	0.194234	1.497973	
4	1005	0.297872	0	0	0.274874	-1.737897	

In [14]:
```
df_encode = pd.get_dummies(df, columns=['PreferredCategory'], drop_first=True)
```

In [15]:
```
df_encode.head()
```

Out[15]:

	CustomerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchases	Preferr
0	1001	0.851064	1	1	0.745797	-0.096513	
1	1002	0.297872	1	0	0.096318	1.497973	
2	1003	0.787234	0	1	0.022424	-1.222033	
3	1004	0.297872	1	0	0.194234	1.497973	
4	1005	0.297872	0	0	0.274874	-1.737897	

In [16]:
```
df.describe()
```

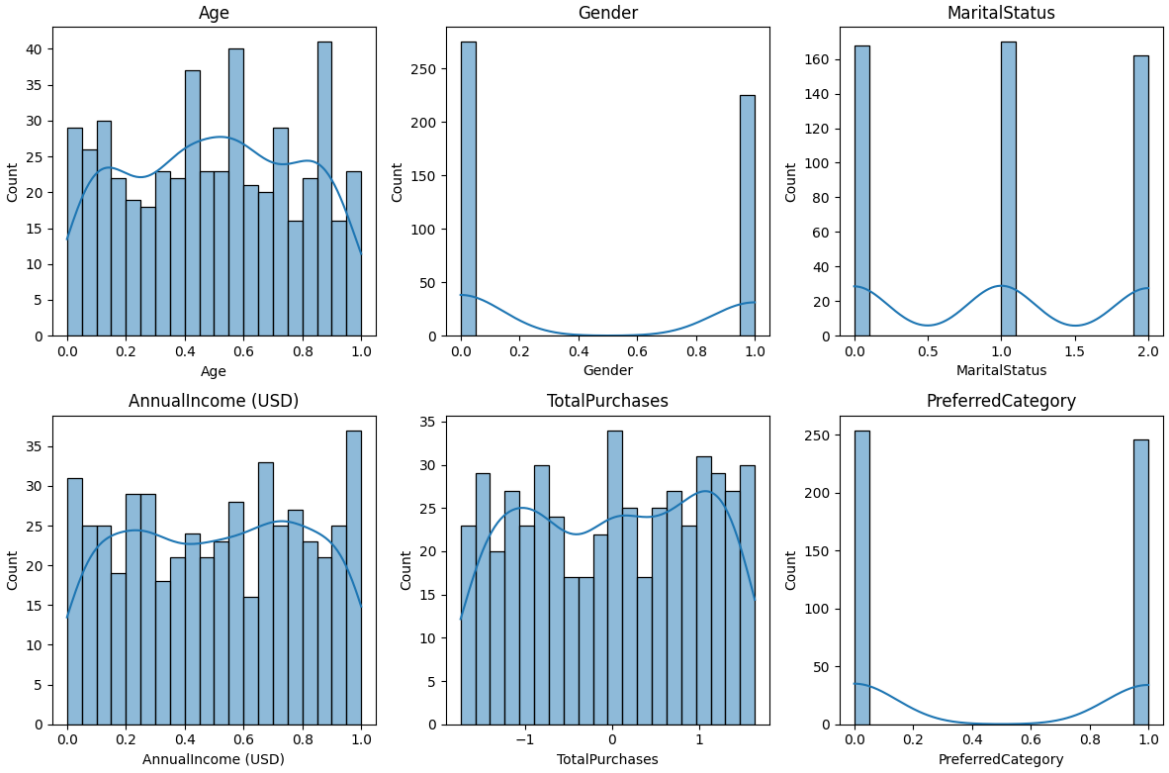
Out[16]:

	CustomerID	Age	Gender	MaritalStatus	AnnualIncome (USD)	TotalPurchase
count	500.000000	500.000000	500.000000	500.000000	500.000000	5.000000e+0
mean	1250.500000	0.496213	0.450000	0.988000	0.508208	9.769963e-1
std	144.481833	0.287089	0.497992	0.813129	0.299264	1.001002e+0
min	1001.000000	0.000000	0.000000	0.000000	0.000000	-1.737897e+0
25%	1125.750000	0.234043	0.000000	0.000000	0.246166	-8.937567e-0
50%	1250.500000	0.510638	0.000000	1.000000	0.518136	4.417666e-0
75%	1375.250000	0.744681	1.000000	2.000000	0.767772	8.883167e-0
max	1500.000000	1.000000	1.000000	2.000000	1.000000	1.638663e+0

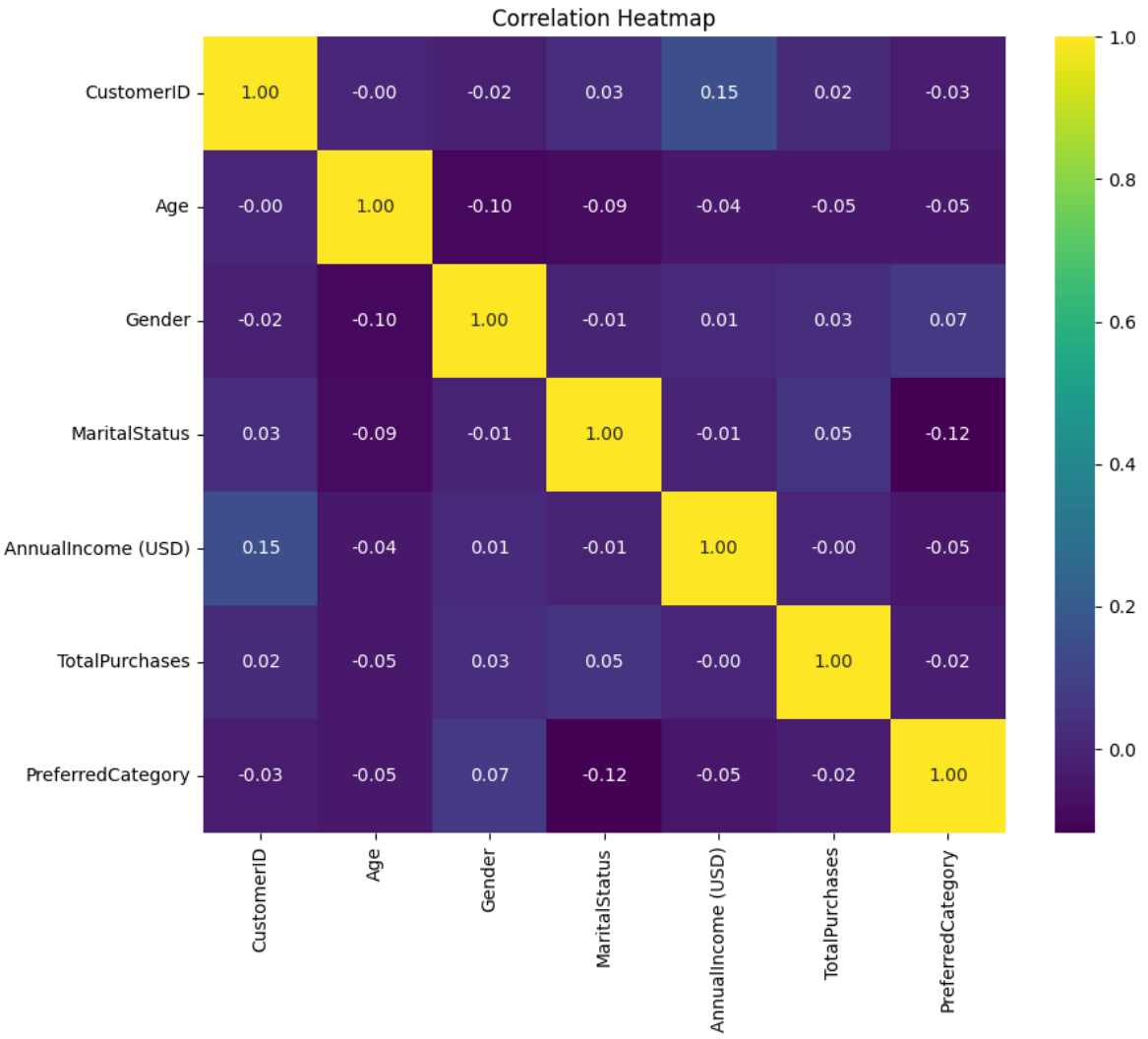
In [17]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 500 entries, 0 to 499
Data columns (total 7 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   CustomerID          500 non-null    int64  
 1   Age                 500 non-null    float64
 2   Gender              500 non-null    int32  
 3   MaritalStatus       500 non-null    int32  
 4   AnnualIncome (USD)  500 non-null    float64
 5   TotalPurchases      500 non-null    float64
 6   PreferredCategory   500 non-null    int32  
dtypes: float64(3), int32(3), int64(1)
memory usage: 21.6 KB
```

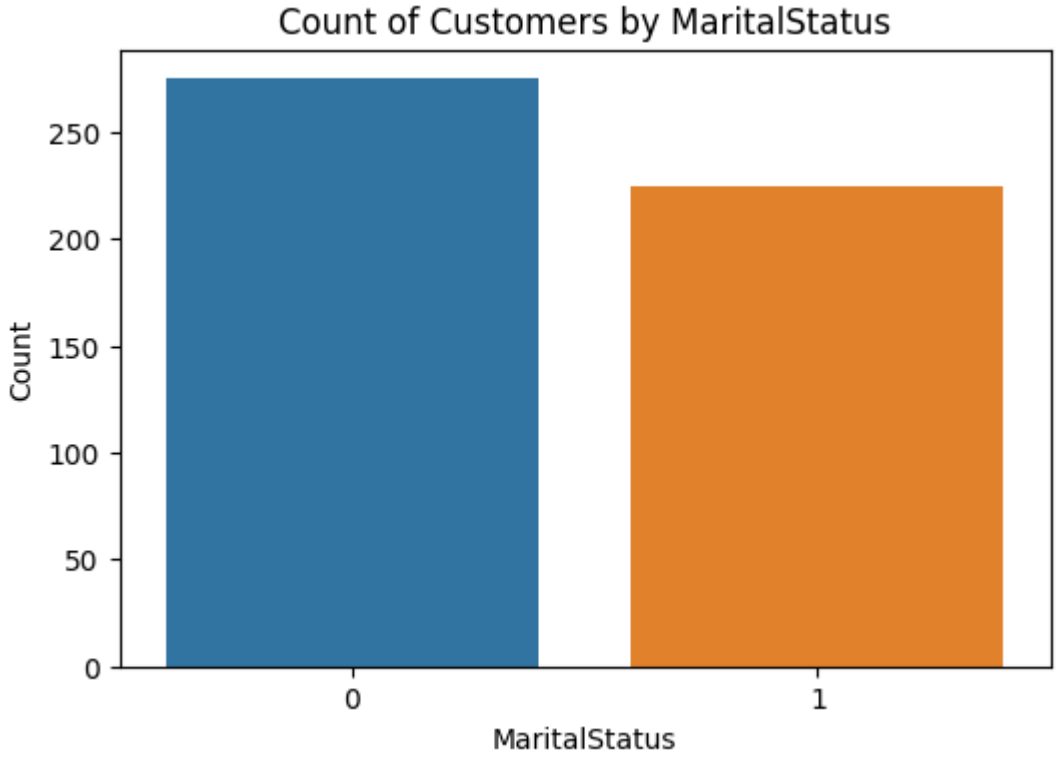
In [27]:
```
plt.figure(figsize=(12, 8))
for i, column in enumerate(df.columns[1:]):
    plt.subplot(2, 3, i + 1)
    sns.histplot(df[column], bins=20, kde=True)
    plt.title(column)
plt.tight_layout()
plt.show()
```



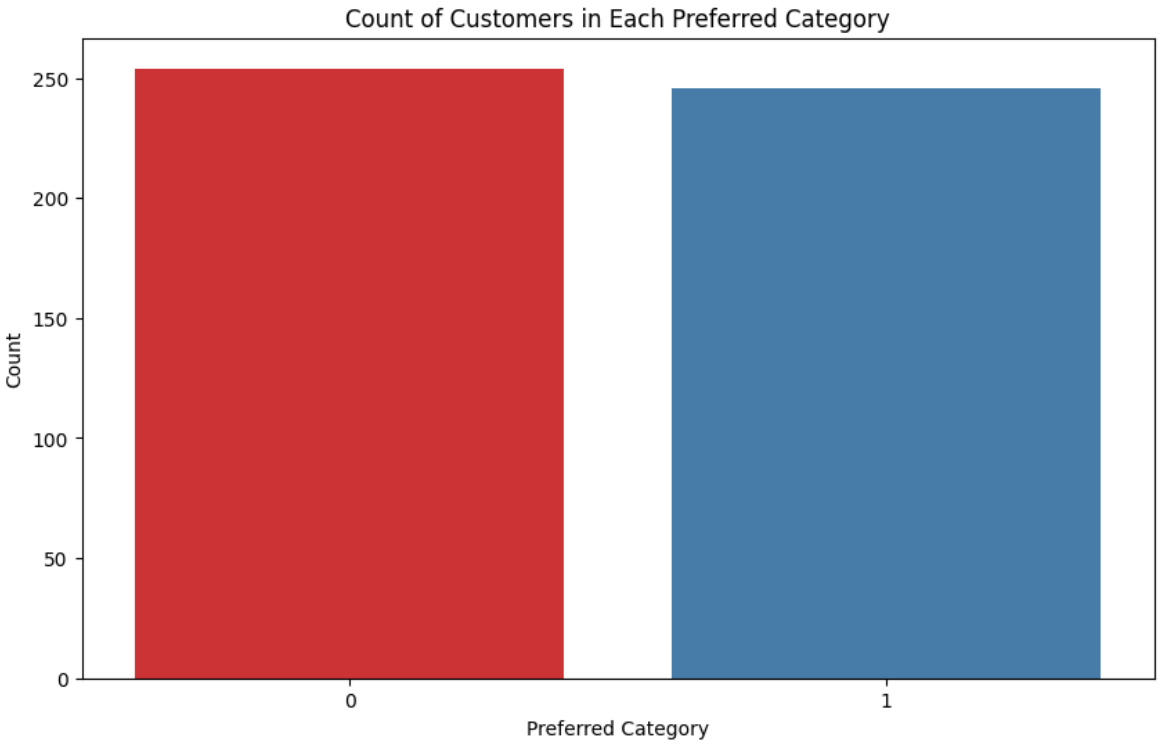
In [21]:
```
plt.figure(figsize=(10, 8))
corr_matrix = df.corr()
sns.heatmap(corr_matrix, annot=True, cmap='viridis', fmt=".2f")
plt.title('Correlation Heatmap')
plt.show()
```



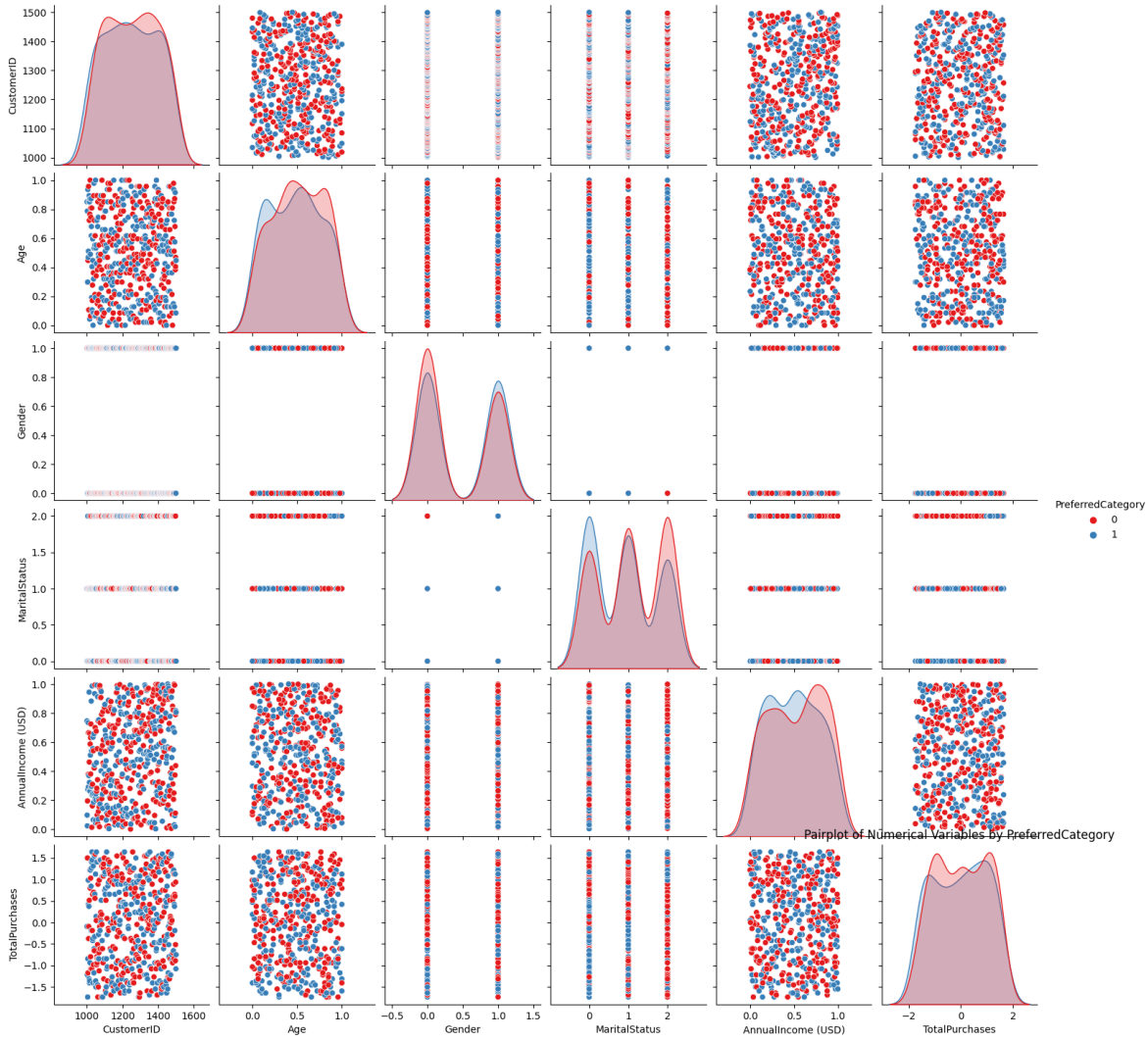
In [28]:
```
plt.figure(figsize=(6, 4))
sns.countplot(x='Gender', data=df)
plt.title('Count of Customers by MaritalStatus')
plt.xlabel('MaritalStatus')
plt.ylabel('Count')
plt.show()
```



In [29]:
```
plt.figure(figsize=(10, 6))
sns.countplot(x='PreferredCategory', data=df, palette='Set1')
plt.title('Count of Customers in Each Preferred Category')
plt.xlabel('Preferred Category')
plt.ylabel('Count')
plt.show()
```



In [22]:
```
sns.pairplot(df, hue='PreferredCategory', palette='Set1')
plt.title('Pairplot of Numerical Variables by PreferredCategory')
plt.show()
```



In [32]:
```
features = ['AnnualIncome (USD)', 'TotalPurchases']
X = df[features]
```

In [33]:
```
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

In [34]:
```
wcss = []
```

In [35]:
```
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++', random_state=42)
    kmeans.fit(X_scaled)
    wcss.append(kmeans.inertia_)
```

```
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
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  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
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f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
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f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
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f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
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f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
```
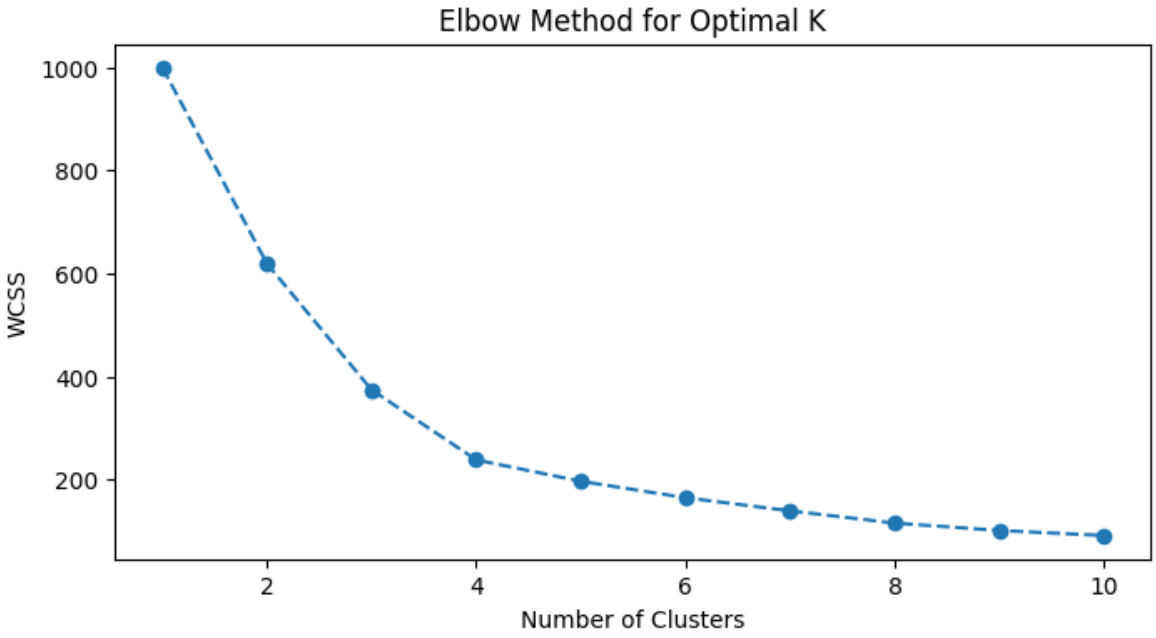

In [36]:

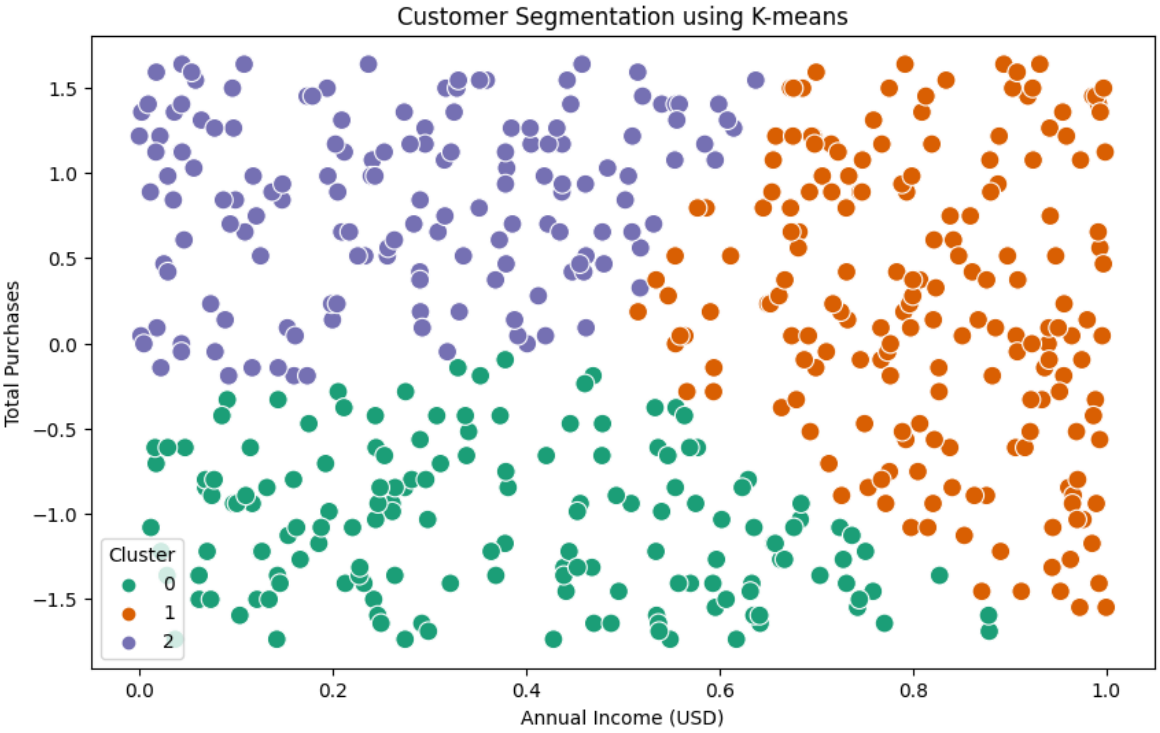
```
plt.figure(figsize=(8, 4))
plt.plot(range(1, 11), wcss, marker='o', linestyle='--')
plt.title('Elbow Method for Optimal K')
plt.xlabel('Number of Clusters')
plt.ylabel('WCSS')
plt.show()
```



In [38]:
```
k = 3

kmeans = KMeans(n_clusters=k, init='k-means++', random_state=42)
df['Cluster'] = kmeans.fit_predict(X_scaled)
```

```
C:\Python310\lib\site-packages\sklearn\cluster\_kmeans.py:1412: FutureWarning: Th
e default value of `n_init` will change from 10 to 'auto' in 1.4. Set the value o
f `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
```

In [40]:
```
plt.figure(figsize=(10, 6))
sns.scatterplot(x='AnnualIncome (USD)', y='TotalPurchases', data=df, hue='Cluste
plt.title('Customer Segmentation using K-means')
plt.xlabel('Annual Income (USD)')
plt.ylabel('Total Purchases')
plt.show()
```



In [ ]: