In [1]:

```
import pandas as pd
```

In [8]:

```
df=pd.read_csv("sales_data_sample.csv",encoding = 'Latin-1')
## if we don't add "",encoding = 'Latin-1'"" then we get error
```

In [9]:

```
df.head()
```

Out [9]:

	ORDERNUMBER	QUANTITYORDERED	PRICEEACH	ORDERLINENUMBER	SALES	ORDERDATE	STATUS	QTR_ID	MONTH_ID	YEAR_
0	10107	30	95.70	2	2871.00	2/24/2003 0:00	Shipped	1	2	2003
1	10121	34	81.35	5	2765.90	5/7/2003 0:00	Shipped	2	5	2003
2	10134	41	94.74	2	3884.34	7/1/2003 0:00	Shipped	3	7	2003
3	10145	45	83.26	6	3746.70	8/25/2003 0:00	Shipped	3	8	2003
4	10159	49	100.00	14	5205.27	10/10/2003 0:00	Shipped	4	10	2003

5 rows × 25 columns

In [11]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2823 entries, 0 to 2822
Data columns (total 25 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   ORDERNUMBER       2823 non-null   int64  
 1   QUANTITYORDERED   2823 non-null   int64  
 2   PRICEEACH         2823 non-null   float64
 3   ORDERLINENUMBER   2823 non-null   int64  
 4   SALES             2823 non-null   float64
 5   ORDERDATE         2823 non-null   object 
 6   STATUS            2823 non-null   object 
 7   QTR_ID            2823 non-null   int64  
 8   MONTH_ID          2823 non-null   int64  
 9   YEAR_ID           2823 non-null   int64  
 10  PRODUCTLINE       2823 non-null   object 
 11  MSRP              2823 non-null   int64  
 12  PRODUCTCODE       2823 non-null   object 
 13  CUSTOMERNAME      2823 non-null   object 
 14  PHONE             2823 non-null   object 
 15  ADDRESSLINE1      2823 non-null   object 
 16  ADDRESSLINE2      302 non-null    object 
 17  CITY              2823 non-null   object 
 18  STATE             1337 non-null   object 
 19  POSTALCODE        2747 non-null   object 
 20  COUNTRY           2823 non-null   object 
 21  TERRITORY         1749 non-null   object 
 22  CONTACTLASTNAME   2823 non-null   object 
 23  CONTACTFIRSTNAME  2823 non-null   object 
 24  DEALSIZE          2823 non-null   object 
dtypes: float64(2), int64(7), object(16)
memory usage: 551.5+ KB
```

In [13]:

```
df.isnull().sum()
```

Out [13]:

```
ORDERNUMBER            0
QUANTITYORDERED        0
PRICEEACH              0
ORDERLINENUMBER        0
SALES                  0
ORDERDATE              0
STATUS                 0
QTR_ID                 0
MONTH_ID               0
YEAR_ID                0
PRODUCTLINE            0
MSRP                   0
PRODUCTCODE            0
CUSTOMERNAME           0
PHONE                  0
ADDRESSLINE1           0
ADDRESSLINE2        2521
CITY                   0
STATE               1486
POSTALCODE            76
COUNTRY                0
TERRITORY           1074
CONTACTLASTNAME        0
CONTACTFIRSTNAME       0
DEALSIZE               0
dtype: int64
```

In [14]:

```
## so only two columns are important of the dataset i.e. QuantityOrdered and PriceEach other are irre
data=df[['QUANTITYORDERED','PRICEEACH']]
```

In [16]:
```
data.head(4)
```

Out [16]:

	QUANTITYORDERED	PRICEEACH
0	30	95.70
1	34	81.35
2	41	94.74
3	45	83.26

In [18]:
```
## Do normalization of the data
from sklearn.preprocessing import StandardScaler
# make object of it
scaler=StandardScaler()
normalized_data=scaler.fit_transform(data)
print(normalized_data)
```

```
[[-0.52289086  0.5969775 ]
 [-0.11220131 -0.11445035]
 [ 0.60650538  0.54938372]
 ...
 [ 0.81185016  0.81015797]
 [-0.11220131 -1.06186404]
 [ 1.2225397  -0.89925195]]
```

In [19]:
```
## Using elbow method , determine the best value of k
# wcss= within cluster sum of squares . It's a measure of how close data points are to the centroid

from sklearn.cluster import KMeans

wcss=[]
for i in range(1,16):
    k_means=KMeans(n_clusters=i,init='k-means++',max_iter=300,n_init=10,random_state=10)
    # Here
    # n_clusters specifies the number of clusters you want the algorithm to find in your data.
    # init determines the method for initializing the positions of the cluster centers (centroids).
    # max_iter=300 Sets the maximum number of iterations the algorithm will run for a single initial
    # n_init=10 Specifies the number of times the KMeans algorithm will run with different centroid
    k_means.fit(normalized_data)
    wcss.append(k_means.inertia_)
```

```
C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the
environment variable OMP_NUM_THREADS=12.
  warnings.warn(
C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
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C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
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C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
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```

```
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C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
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  warnings.warn(
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a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the
environment variable OMP_NUM_THREADS=12.
  warnings.warn(
```
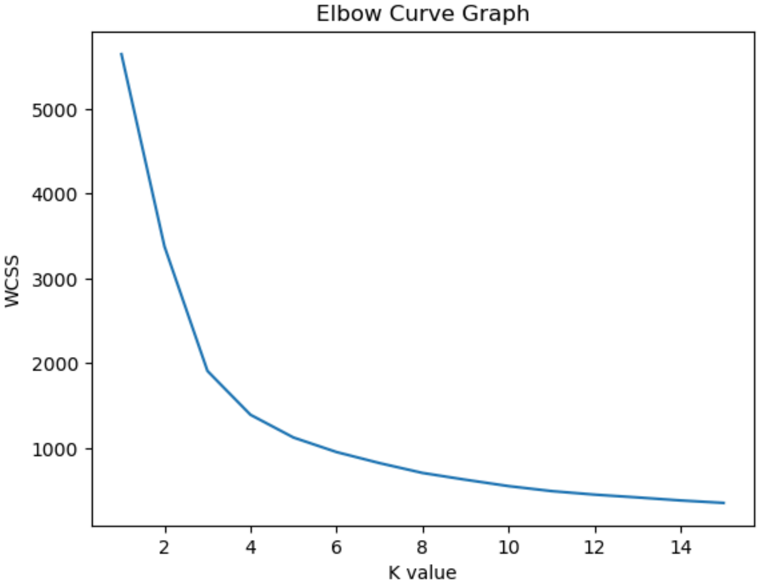

In [21]:

```python
## Elbow Graph
import matplotlib.pyplot as plt
plt.plot(range(1,16),wcss)
plt.xlabel("K value")
plt.ylabel("WCSS")
plt.title("Elbow Curve Graph")
```

Out [21]:

```
Text(0.5, 1.0, 'Elbow Curve Graph')
```



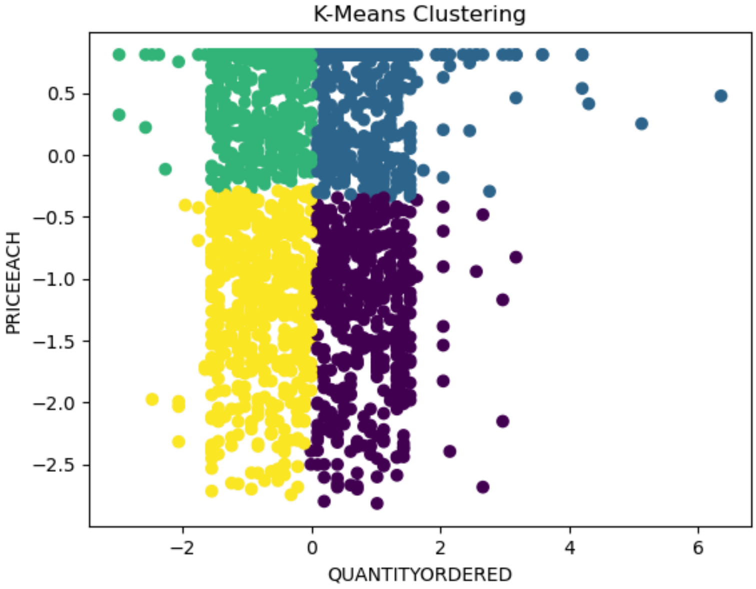
In [27]:

```python
# from graph we can see that for k=4 is the optimal value , so train the model
k_means=KMeans(n_clusters=4,init='k-means++',max_iter=300,n_init=10,random_state=10)
clusters=k_means.fit_predict(normalized_data)
# The fit_predict method combines the operations of fitting the model and predicting
```

```
C:\Users\Ashvini Mahajan\Anaconda\Lib\site-packages\sklearn\cluster\_kmeans.py:1382: UserWarning: KMeans is known to have
a memory leak on Windows with MKL, when there are less chunks than available threads. You can avoid it by setting the
environment variable OMP_NUM_THREADS=12.
  warnings.warn(
```

In [29]:

```python
## Visualization of the clusters
plt.scatter(normalized_data[:, 0], normalized_data[:, 1], c=clusters, cmap='viridis')
# x aixs numbers =normalized_data[:, 0]
# y aixs numbers =normalized_data[:, 1]
# The c parameter specifies the color of the markers (data points) in the scatter plot
# The cmap parameter stands for "colormap." It defines the colormap used to map numerical data to co
plt.xlabel('QUANTITYORDERED')
plt.ylabel('PRICEEACH')
plt.title('K-Means Clustering')
plt.show()
```


K-Means Clustering
PRICEEACH
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−2
0
2
4
6
QUANTITYORDERED

```
In [ ]:
```