In [27]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [28]:
```
dataset=pd.read_csv(r'C:\\Users\\91912\\Desktop\\TCA PDF\\Mall_Customers (1).csv')
dataset
```

Out[28]:

	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
...	...	...	...	...	...
195	196	Female	35	120	79
196	197	Female	45	126	28
197	198	Male	32	126	74
198	199	Male	32	137	18
199	200	Male	30	137	83

200 rows × 5 columns

In [29]:
```
dataset.isnull().sum()
```

Out[29]:
```
CustomerID                0
Gender                    0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

In [30]:
```
dataset.describe()
```

Out[30]:

	CustomerID	Age	Annual Income (k$)	Spending Score (1-100)
count	200.000000	200.000000	200.000000	200.000000
mean	100.500000	38.850000	60.560000	50.200000
std	57.879185	13.969007	26.264721	25.823522
min	1.000000	18.000000	15.000000	1.000000
25%	50.750000	28.750000	41.500000	34.750000
50%	100.500000	36.000000	61.500000	50.000000
75%	150.250000	49.000000	78.000000	73.000000
max	200.000000	70.000000	137.000000	99.000000

In [31]:
```
dataset.dtypes
```

Out[31]:
```
CustomerID                int64
Gender                   object
Age                       int64
Annual Income (k$)        int64
Spending Score (1-100)    int64
dtype: object
```

In [32]:
```
dataset['Gender'].value_counts()
```

Out[32]:
```
Gender
Female    112
Male       88
Name: count, dtype: int64
```

In [33]:
```
annual_income=dataset['Annual Income (k$)']
spending_score=dataset['Spending Score (1-100)']
```

In [34]:
```
sns.scatterplot(x=annual_income,y=spending_score,data=dataset)
```

Out[34]:
```
<Axes: xlabel='Annual Income (k$)', ylabel='Spending Score (1-100)'>
```

In [35]:
```
'''
cust_data=dataset[['Annual Income (k$)','Spending Score (1-100)']]
```

```
cust_data

'''
```

Out[35]:
```
"\ncust_data=dataset[['Annual Income (k$)','Spending Score (1-100)']]\ncust_data\n\n"
```

In [36]:
```
'''

x=dataset.iloc[:,[3,4]]
x

'''
```

Out[36]:
```
'\n\nx=dataset.iloc[:,[3,4]]\nx\n\n'
```

In [37]:
```
x=dataset.iloc[:,[3,4]].values
x
```

Out[37]:
```
array([[ 15,  39],
       [ 15,  81],
       [ 16,   6],
       [ 16,  77],
       [ 17,  40],
       [ 17,  76],
       [ 18,   6],
       [ 18,  94],
       [ 19,   3],
       [ 19,  72],
       [ 19,  14],
       [ 19,  99],
       [ 20,  15],
       [ 20,  77],
       [ 20,  13],
       [ 20,  79],
       [ 21,  35],
       [ 21,  66],
       [ 23,  29],
       [ 23,  98],
       [ 24,  35],
       [ 24,  73],
       [ 25,   5],
       [ 25,  73],
       [ 28,  14],
       [ 28,  82],
       [ 28,  32],
       [ 28,  61],
       [ 29,  31],
       [ 29,  87],
       [ 30,   4],
       [ 30,  73],
       [ 33,   4],
       [ 33,  92],
       [ 33,  14],
       [ 33,  81],
       [ 34,  17],
       [ 34,  73],
       [ 37,  26],
       [ 37,  75],
```

```
[ 38,  35],
[ 38,  92],
[ 39,  36],
[ 39,  61],
[ 39,  28],
[ 39,  65],
[ 40,  55],
[ 40,  47],
[ 40,  42],
[ 40,  42],
[ 42,  52],
[ 42,  60],
[ 43,  54],
[ 43,  60],
[ 43,  45],
[ 43,  41],
[ 44,  50],
[ 44,  46],
[ 46,  51],
[ 46,  46],
[ 46,  56],
[ 46,  55],
[ 47,  52],
[ 47,  59],
[ 48,  51],
[ 48,  59],
[ 48,  50],
[ 48,  48],
[ 48,  59],
[ 48,  47],
[ 49,  55],
[ 49,  42],
[ 50,  49],
[ 50,  56],
[ 54,  47],
[ 54,  54],
[ 54,  53],
[ 54,  48],
[ 54,  52],
[ 54,  42],
[ 54,  51],
```

```
[ 54,  55],
[ 54,  41],
[ 54,  44],
[ 54,  57],
[ 54,  46],
[ 57,  58],
[ 57,  55],
[ 58,  60],
[ 58,  46],
[ 59,  55],
[ 59,  41],
[ 60,  49],
[ 60,  40],
[ 60,  42],
[ 60,  52],
[ 60,  47],
[ 60,  50],
[ 61,  42],
[ 61,  49],
[ 62,  41],
[ 62,  48],
[ 62,  59],
[ 62,  55],
[ 62,  56],
[ 62,  42],
[ 63,  50],
[ 63,  46],
[ 63,  43],
[ 63,  48],
[ 63,  52],
[ 63,  54],
[ 64,  42],
[ 64,  46],
[ 65,  48],
[ 65,  50],
[ 65,  43],
[ 65,  59],
[ 67,  43],
[ 67,  57],
[ 67,  56],
[ 67,  40],
```

```
[ 69,  58],
[ 69,  91],
[ 70,  29],
[ 70,  77],
[ 71,  35],
[ 71,  95],
[ 71,  11],
[ 71,  75],
[ 71,   9],
[ 71,  75],
[ 72,  34],
[ 72,  71],
[ 73,   5],
[ 73,  88],
[ 73,   7],
[ 73,  73],
[ 74,  10],
[ 74,  72],
[ 75,   5],
[ 75,  93],
[ 76,  40],
[ 76,  87],
[ 77,  12],
[ 77,  97],
[ 77,  36],
[ 77,  74],
[ 78,  22],
[ 78,  90],
[ 78,  17],
[ 78,  88],
[ 78,  20],
[ 78,  76],
[ 78,  16],
[ 78,  89],
[ 78,   1],
[ 78,  78],
[ 78,   1],
[ 78,  73],
[ 79,  35],
[ 79,  83],
[ 81,   5],
```

```
       [ 81,  93],
       [ 85,  26],
       [ 85,  75],
       [ 86,  20],
       [ 86,  95],
       [ 87,  27],
       [ 87,  63],
       [ 87,  13],
       [ 87,  75],
       [ 87,  10],
       [ 87,  92],
       [ 88,  13],
       [ 88,  86],
       [ 88,  15],
       [ 88,  69],
       [ 93,  14],
       [ 93,  90],
       [ 97,  32],
       [ 97,  86],
       [ 98,  15],
       [ 98,  88],
       [ 99,  39],
       [ 99,  97],
       [101,  24],
       [101,  68],
       [103,  17],
       [103,  85],
       [103,  23],
       [103,  69],
       [113,   8],
       [113,  91],
       [120,  16],
       [120,  79],
       [126,  28],
       [126,  74],
       [137,  18],
       [137,  83]], dtype=int64)
```

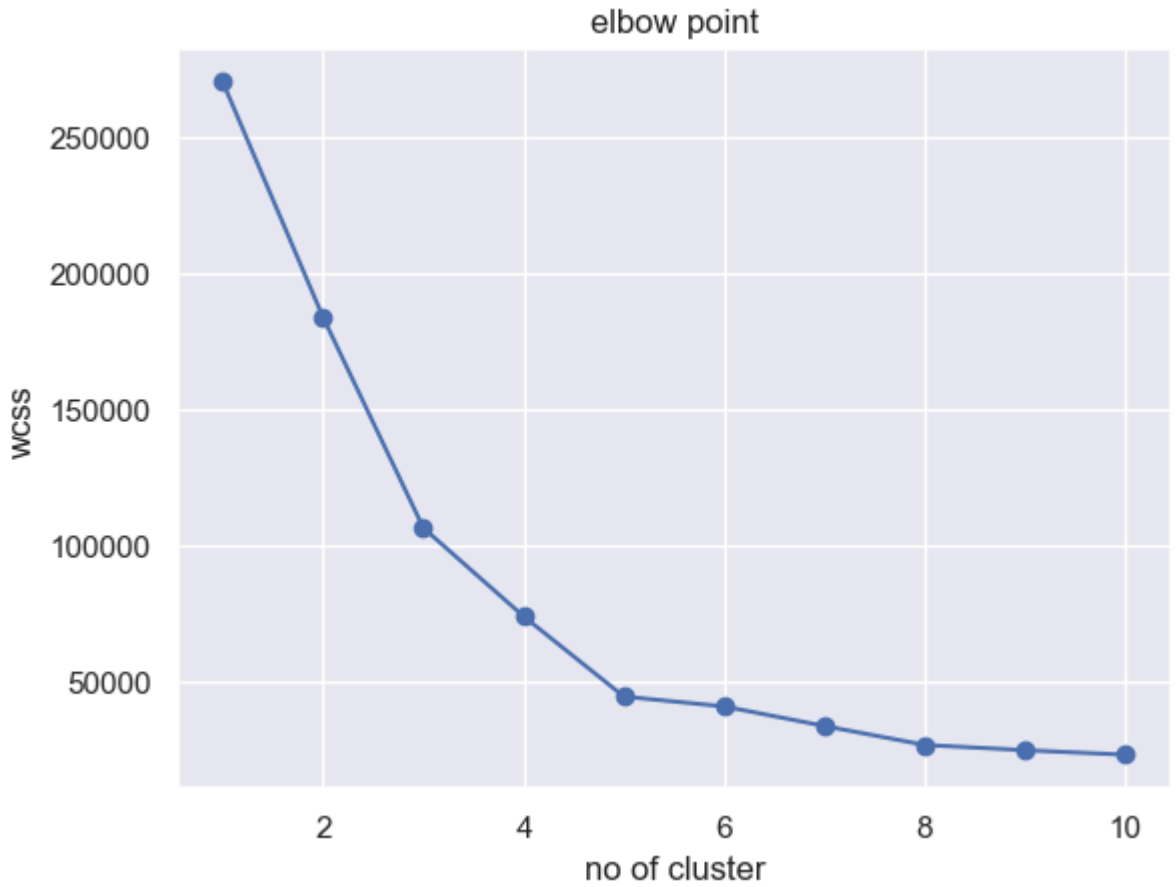
In [38]:
```
from sklearn.cluster import KMeans

wcss=[]
```

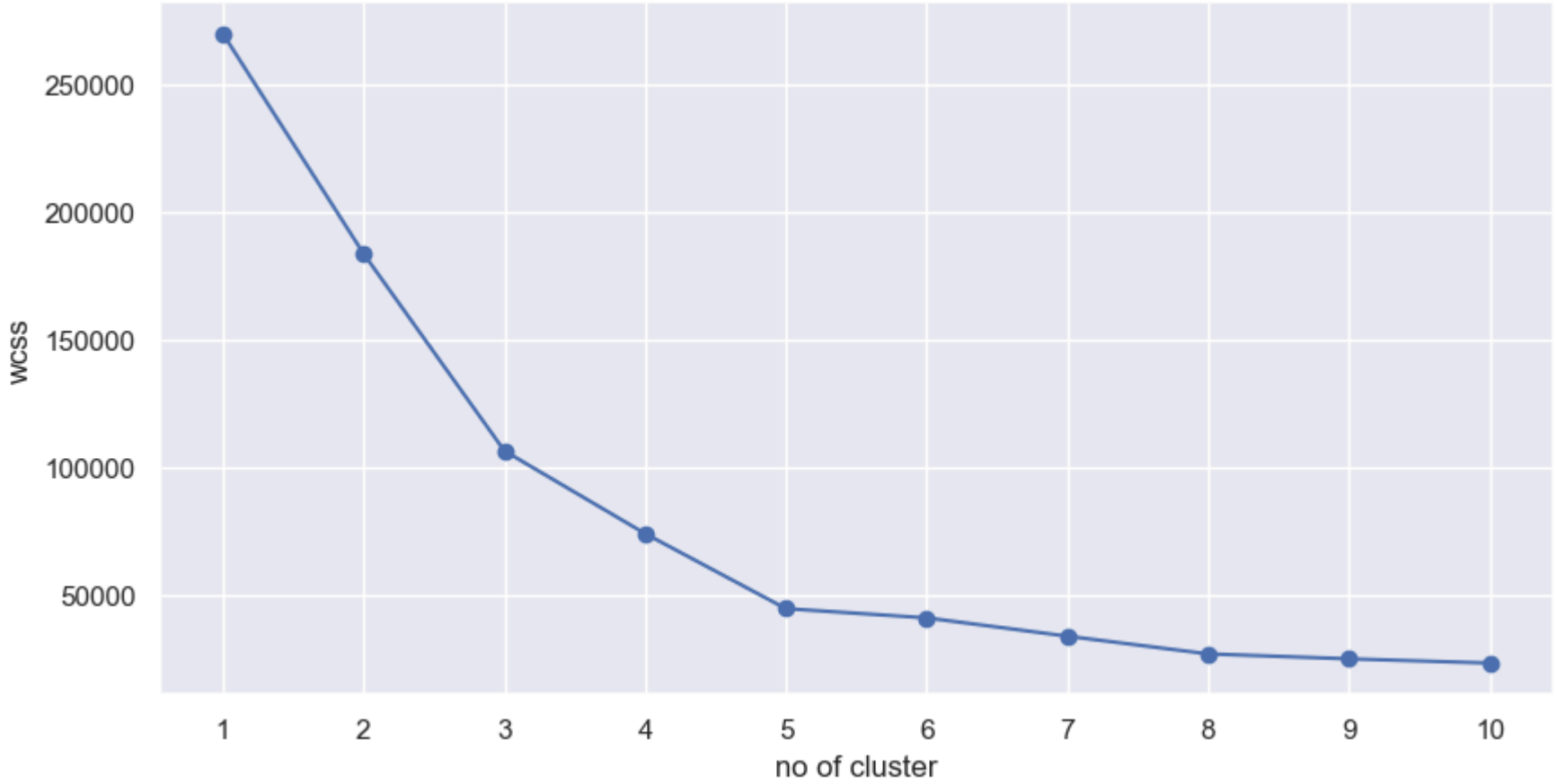
```
for i in range(1,11):
    km=KMeans(n_clusters=i,init='k-means++',random_state=42)
    km.fit(x)
    wcss.append(km.inertia_)
```

In [39]:
```
sns.set()
plt.plot(range(1,11),wcss,marker='o')
plt.xlabel('no of cluster')
plt.ylabel('wcss')
plt.title('elbow point')
```

Out[39]: Text(0.5, 1.0, 'elbow point')



In [40]:
```
plt.figure(figsize=(10,5))
plt.plot([i for i in range(1,11)],wcss,marker='o')
plt.xlabel('no of cluster')
plt.xticks([i for i in range(1,11)])
plt.ylabel('wcss')
plt.show()
```



In [41]:
```
kmeans=KMeans(n_clusters=5,init='k-means++',random_state=42)
y=kmeans.fit_predict(x)
print(y)
```

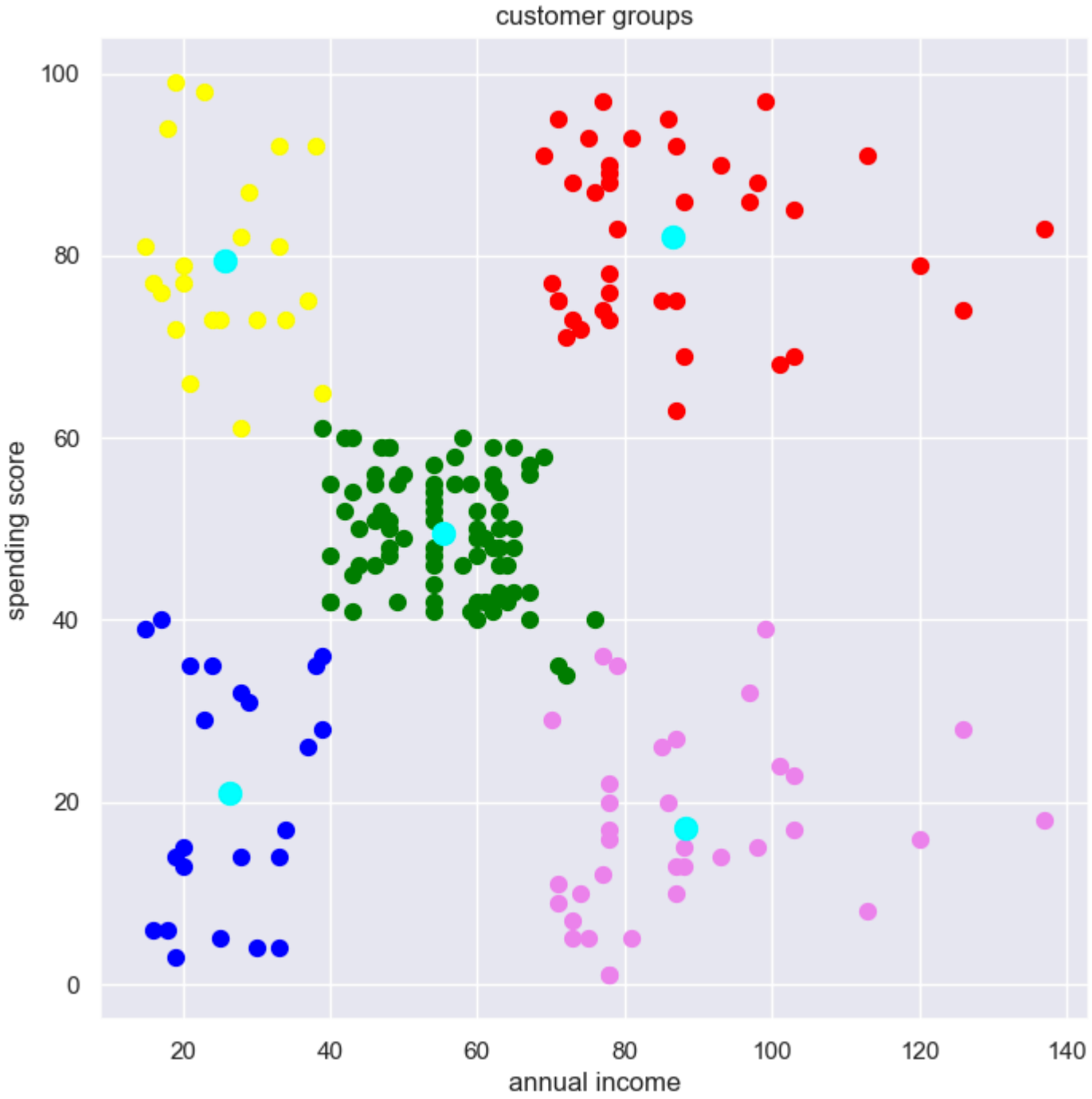
```
[4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4 2 4
 2 4 2 4 2 4 0 4 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 1 3 1 0 1 3 1 3 1 0 1 3 1 3 1 3 1 3 1 0 1 3 1 3 1
 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3
 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1]
```

In [45]:

```
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=100, c='cyan', label='centroids')

plt.title('customer groups')
plt.xlabel('annual income')
plt.ylabel('spending score')
plt.show()
```


customer groups
spending score
annual income
100
80
60
40
20
0
20
40
60
80
100
120
140

In [ ]:

In [ ]: