In [1]:
```
#import all the libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [3]:
```
#load the dataset
dataset=pd.read_csv("Flyzy Flight Cancellation - Sheet1.csv")
```

In [4]:
```
#print the shape of the dataset
dataset.shape
```

Out[4]:
```
(3000, 14)
```

In [5]:
```
#print the first 5 rows of the dataset
dataset.head()
```

Out[5]:

	Flight ID	Airline	Flight_Distance	Origin_Airport	Destination_Airport	Scheduled_Departure_Time
0	7319483	Airline D	475	Airport 3	Airport 2	4
1	4791965	Airline E	538	Airport 5	Airport 4	12
2	2991718	Airline C	565	Airport 1	Airport 2	17
3	4220106	Airline E	658	Airport 5	Airport 3	1
4	2263008	Airline E	566	Airport 2	Airport 2	19

In [6]:
```
#decribe the dataset
dataset.describe()
```

Out[6]:

	Flight ID	Flight_Distance	Scheduled_Departure_Time	Day_of_Week	Month	Weat
count	3.000000e+03	3000.000000	3000.000000	3000.000000	3000.000000	30
mean	4.997429e+06	498.909333	11.435000	3.963000	6.381000	
std	2.868139e+06	98.892266	6.899298	2.016346	3.473979	
min	3.681000e+03	138.000000	0.000000	1.000000	1.000000	
25%	2.520313e+06	431.000000	6.000000	2.000000	3.000000	
50%	5.073096e+06	497.000000	12.000000	4.000000	6.000000	
75%	7.462026e+06	566.000000	17.000000	6.000000	9.000000	
max	9.999011e+06	864.000000	23.000000	7.000000	12.000000	

In [7]:
```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3000 entries, 0 to 2999
Data columns (total 14 columns):
 #   Column                          Non-Null Count  Dtype  
---  ------                          --------------  -----  
 0   Flight ID                       3000 non-null   int64  
 1   Airline                         3000 non-null   object 
 2   Flight_Distance                 3000 non-null   int64  
 3   Origin_Airport                  3000 non-null   object 
 4   Destination_Airport             3000 non-null   object 
 5   Scheduled_Departure_Time        3000 non-null   int64  
 6   Day_of_Week                     3000 non-null   int64  
 7   Month                           3000 non-null   int64  
 8   Airplane_Type                   3000 non-null   object 
 9   Weather_Score                   3000 non-null   float64
 10  Previous_Flight_Delay_Minutes   3000 non-null   float64
 11  Airline_Rating                  3000 non-null   float64
 12  Passenger_Load                  3000 non-null   float64
 13  Flight_Cancelled                3000 non-null   int64  
dtypes: float64(4), int64(6), object(4)
memory usage: 328.3+ KB
```

In [8]:
```
#check for the dtypes
dataset.dtypes
```

Out[8]:
```
Flight ID                          int64
Airline                           object
Flight_Distance                    int64
Origin_Airport                    object
Destination_Airport               object
Scheduled_Departure_Time           int64
Day_of_Week                        int64
Month                              int64
Airplane_Type                     object
Weather_Score                    float64
Previous_Flight_Delay_Minutes    float64
Airline_Rating                   float64
Passenger_Load                   float64
Flight_Cancelled                   int64
dtype: object
```

In [9]:
```
#check for any missing values
dataset.isnull().sum()
```

Out[9]:
```
Flight ID                        0
Airline                          0
Flight_Distance                  0
Origin_Airport                   0
Destination_Airport              0
Scheduled_Departure_Time         0
Day_of_Week                      0
Month                            0
Airplane_Type                    0
Weather_Score                    0
Previous_Flight_Delay_Minutes    0
Airline_Rating                   0
Passenger_Load                   0
Flight_Cancelled                 0
dtype: int64
```

In [10]:
```
#print the columns
dataset.columns
```

Out[10]:
```
Index(['Flight ID', 'Airline', 'Flight_Distance', 'Origin_Airport',
       'Destination_Airport', 'Scheduled_Departure_Time', 'Day_of_Week',
       'Month', 'Airplane_Type', 'Weather_Score',
       'Previous_Flight_Delay_Minutes', 'Airline_Rating', 'Passenger_Load',
       'Flight_Cancelled'],
      dtype='object')
```

In [15]:
```
#check for the type of dataset
type(dataset)
```

Out[15]:
```
pandas.core.frame.DataFrame
```

In [20]:
```
#check for numeric variables
numeric_columns=dataset.select_dtypes(include=['float64', 'int64' ]).columns
numeric_columns
```

Out[20]:
```
Index(['Flight ID', 'Flight_Distance', 'Scheduled_Departure_Time',
       'Day_of_Week', 'Month', 'Weather_Score',
       'Previous_Flight_Delay_Minutes', 'Airline_Rating', 'Passenger_Load',
       'Flight_Cancelled'],
      dtype='object')
```

In [21]:
```
#check for categorical variables
numeric_columns=dataset.select_dtypes(include=['object', 'object' ]).columns
numeric_columns
```

Out[21]:
```
Index(['Airline', 'Origin_Airport', 'Destination_Airport', 'Airplane_Type'], dtype
='object')
```

In [22]:
```
from sklearn.preprocessing import LabelEncoder
```

In [23]:
```
label_encoder=LabelEncoder()
```

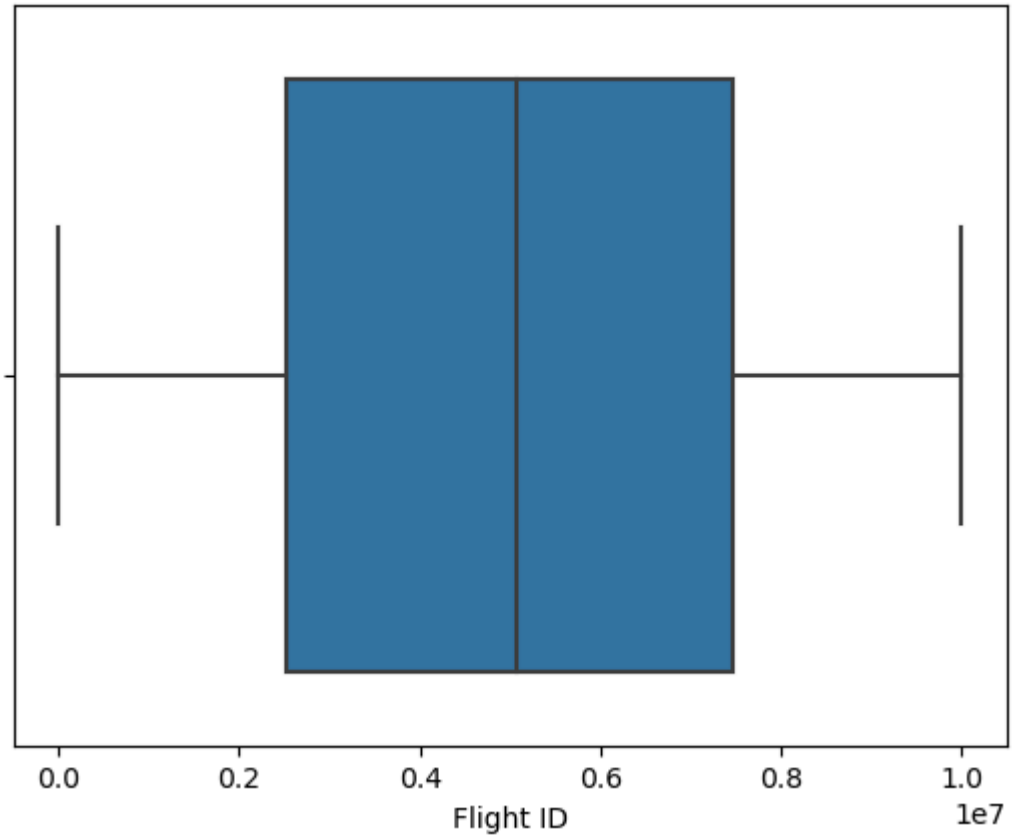
In [24]:
```
#change all categorical variables to numerical variables
dataset['Airline']=label_encoder.fit_transform(dataset['Airline'])
dataset['Origin_Airport']=label_encoder.fit_transform(dataset['Origin_Airport'])
dataset['Destination_Airport']=label_encoder.fit_transform(dataset['Destination_Air
dataset['Airplane_Type']=label_encoder.fit_transform(dataset['Airplane_Type'])
```

In [25]:
```
#check for the dtypes again to make sure all columns are numeric
dataset.dtypes
```

Out[25]:
```
Flight ID                          int64
Airline                            int32
Flight_Distance                    int64
Origin_Airport                     int32
Destination_Airport                int32
Scheduled_Departure_Time           int64
Day_of_Week                        int64
Month                              int64
Airplane_Type                      int32
Weather_Score                    float64
Previous_Flight_Delay_Minutes    float64
Airline_Rating                   float64
Passenger_Load                   float64
Flight_Cancelled                   int64
dtype: object
```

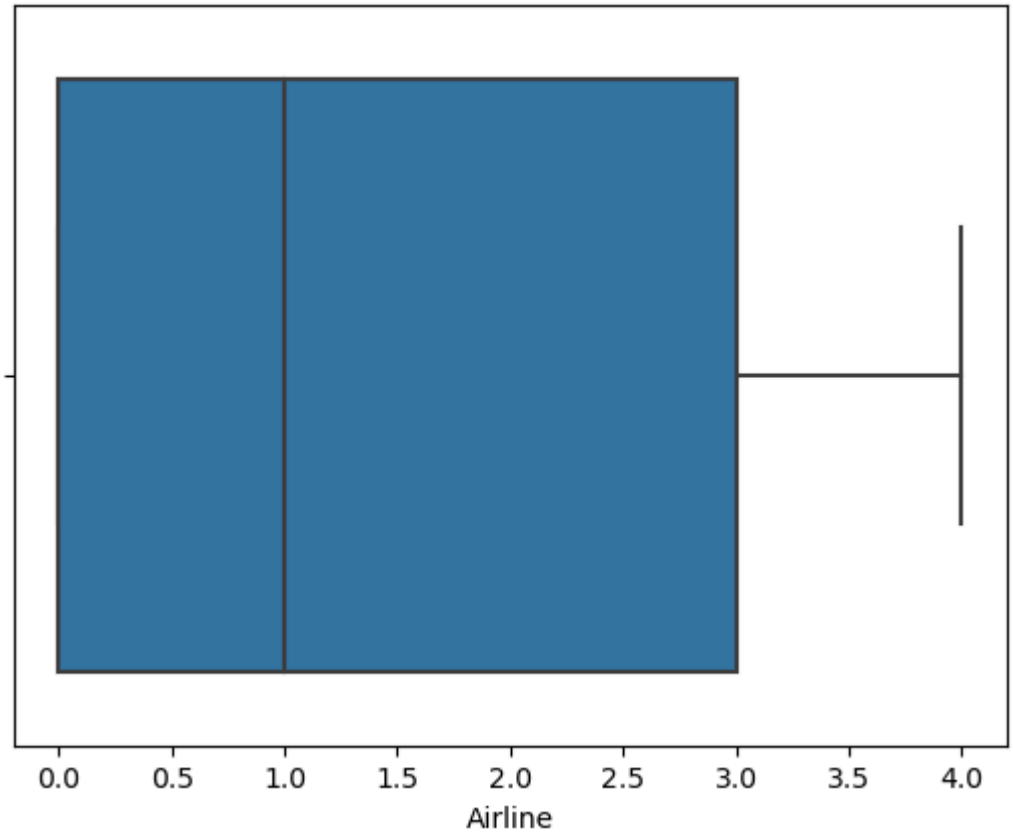
In [26]:
```
#use a boxplot to check for outliers in every column
sns.boxplot(x=dataset['Flight ID'])
```

Out[26]:
```
<Axes: xlabel='Flight ID'>
```



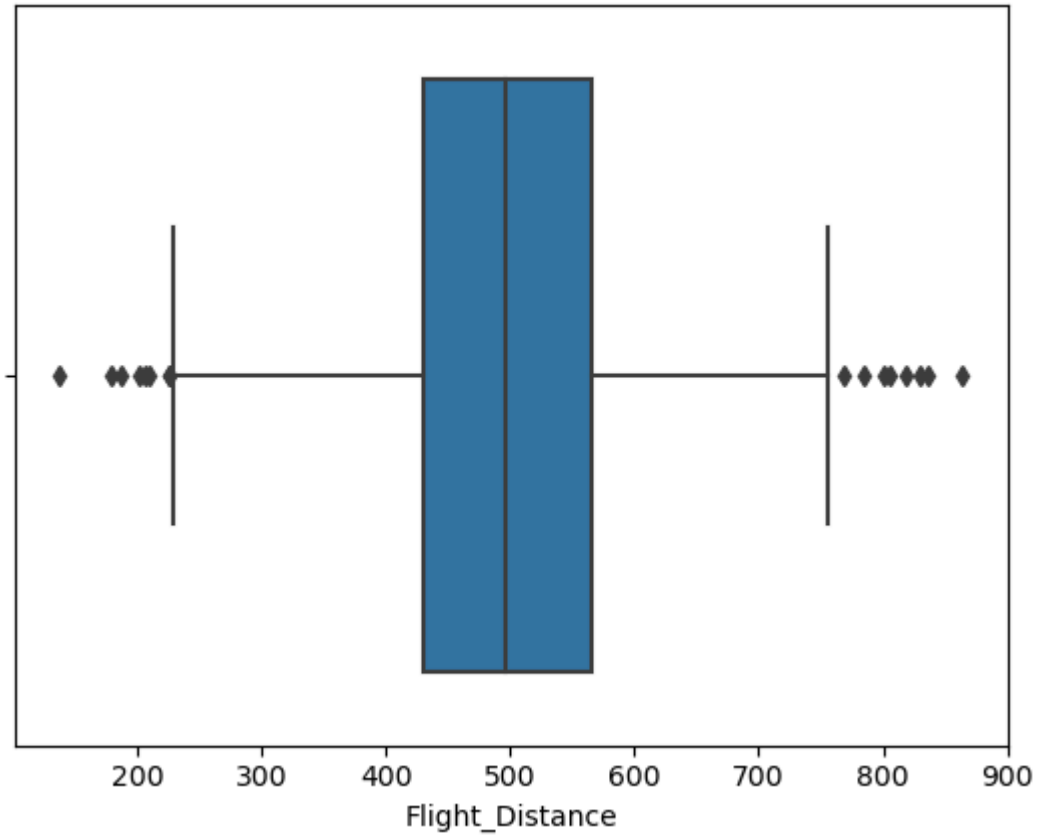
In [27]:
```
sns.boxplot(x=dataset['Airline'])
```

Out[27]:
```
<Axes: xlabel='Airline'>
```



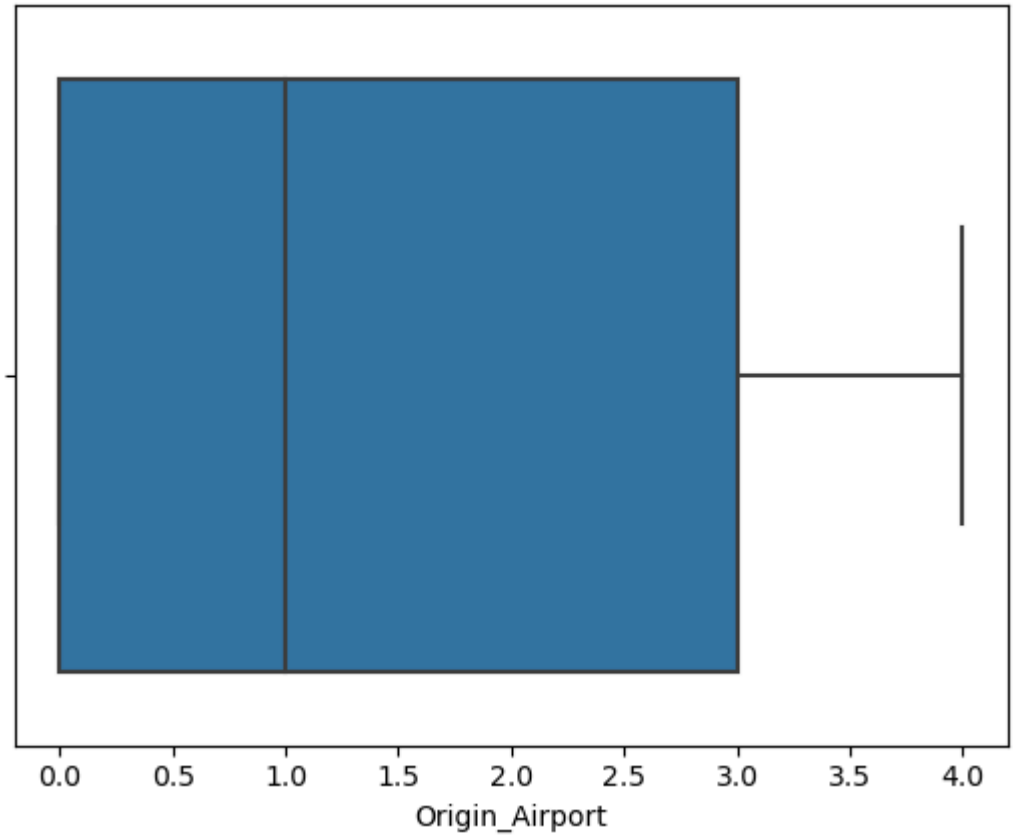
In [28]:
```
sns.boxplot(x=dataset['Flight_Distance'])
```

Out[28]:
```
<Axes: xlabel='Flight_Distance'>
```



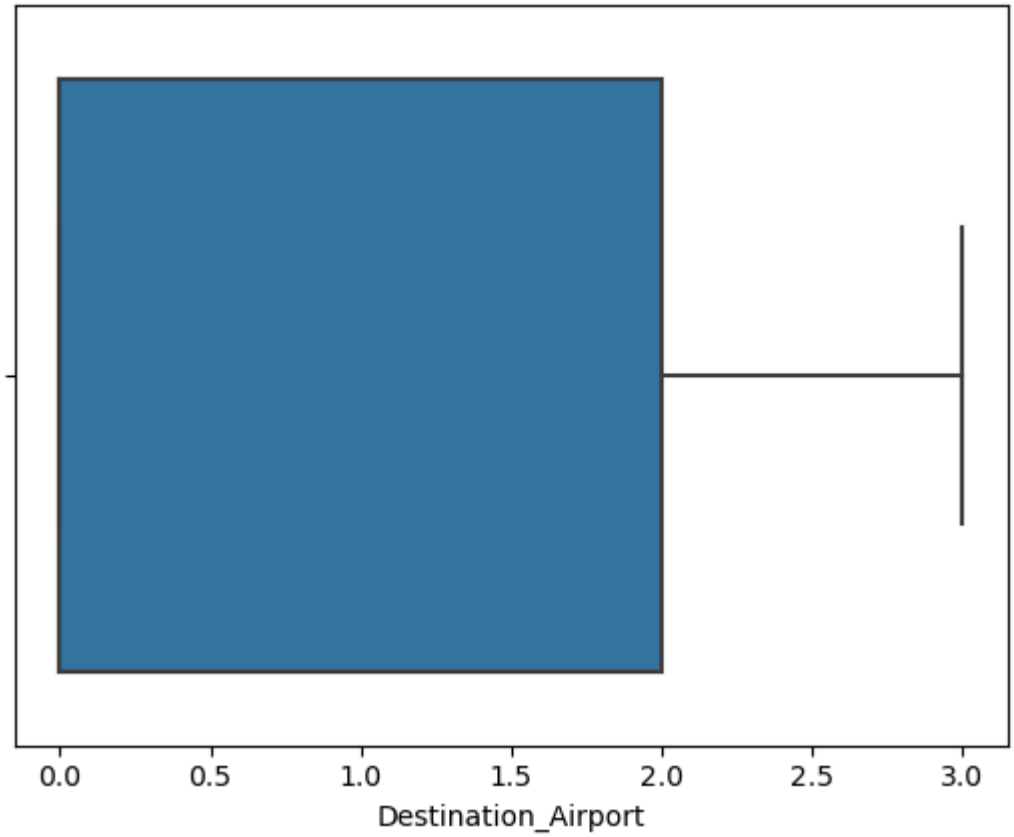
In [29]:
```
sns.boxplot(x=dataset['Origin_Airport'])
```

Out[29]:
```
<Axes: xlabel='Origin_Airport'>
```



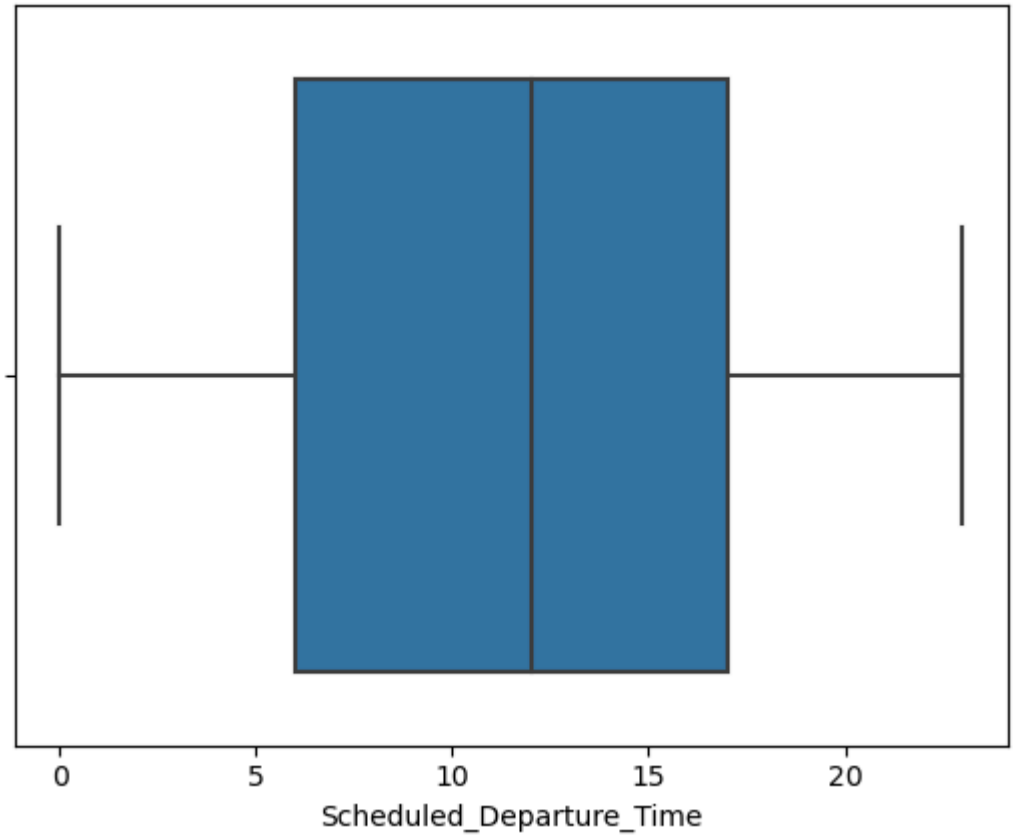
In [30]:
```
sns.boxplot(x=dataset['Destination_Airport'])
```

Out[30]:
```
<Axes: xlabel='Destination_Airport'>
```



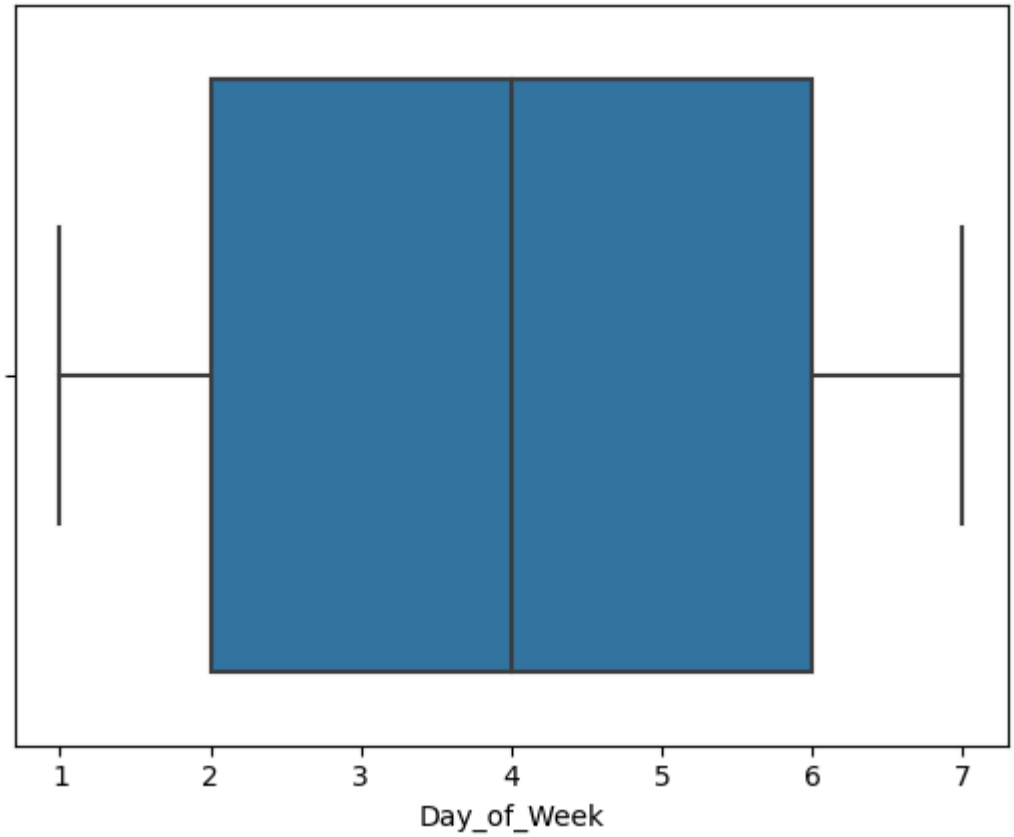
In [31]:
```
sns.boxplot(x=dataset['Scheduled_Departure_Time'])
```

Out[31]:
```
<Axes: xlabel='Scheduled_Departure_Time'>
```



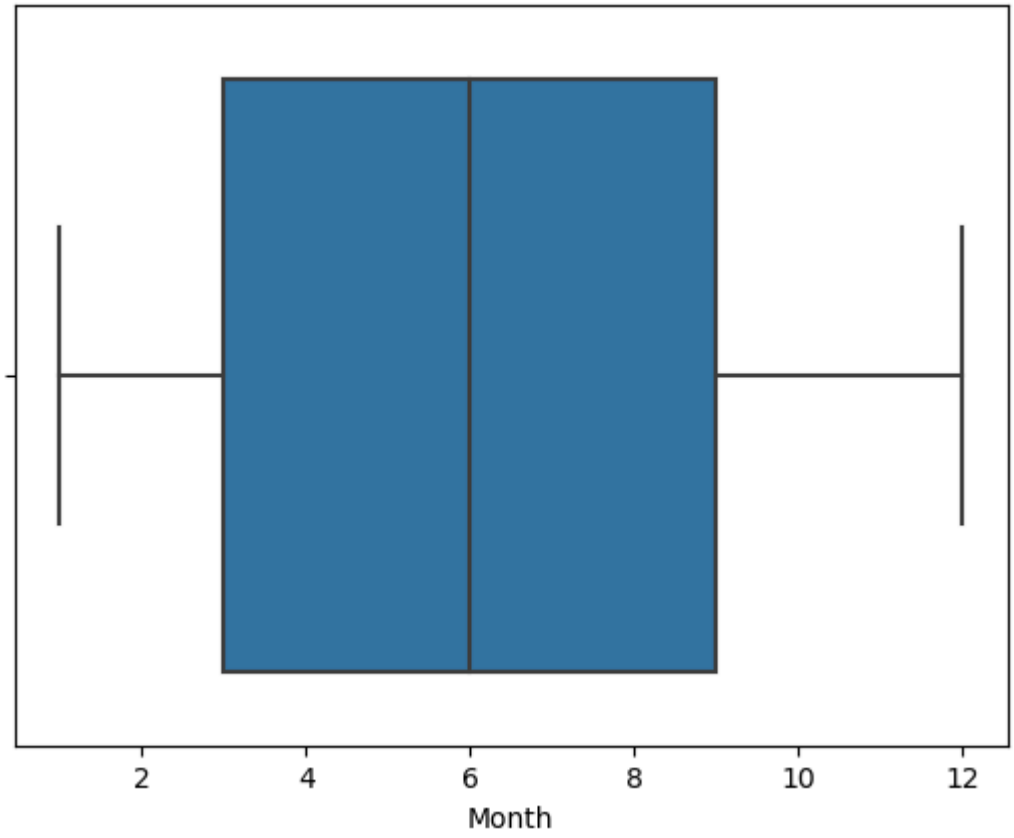
In [32]:
```
sns.boxplot(x=dataset['Day_of_Week'])
```

Out[32]:
```
<Axes: xlabel='Day_of_Week'>
```



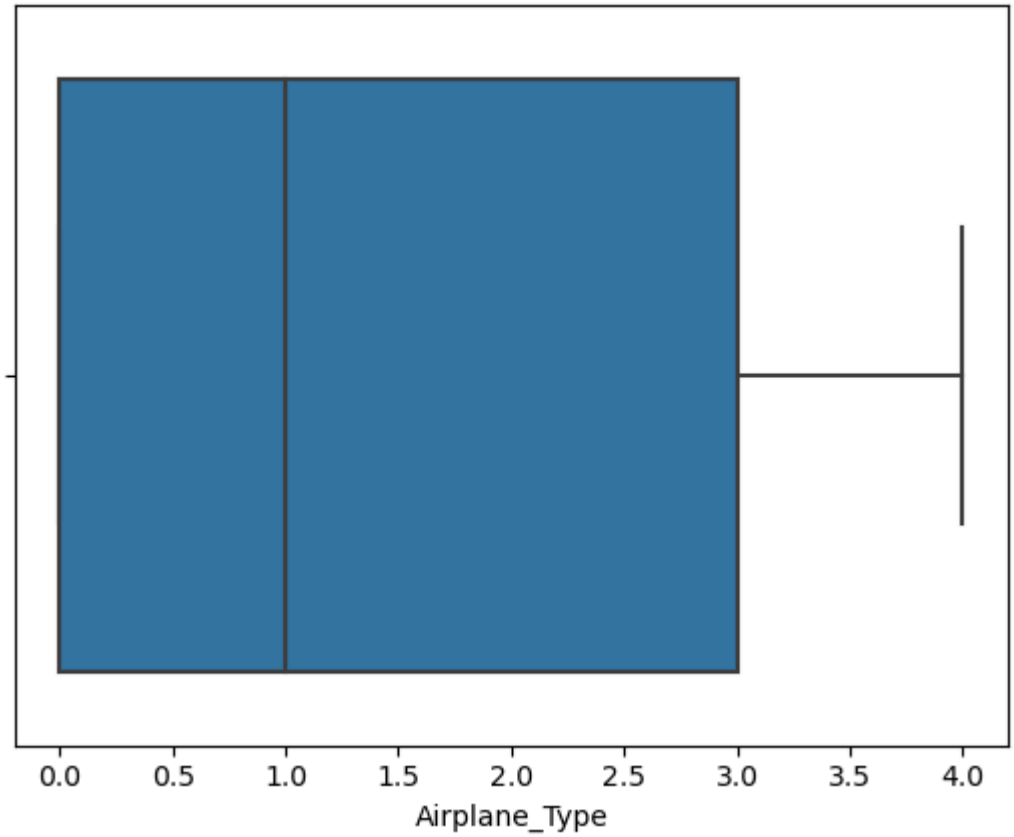
In [33]:
```
sns.boxplot(x=dataset['Month'])
```

Out[33]:
```
<Axes: xlabel='Month'>
```



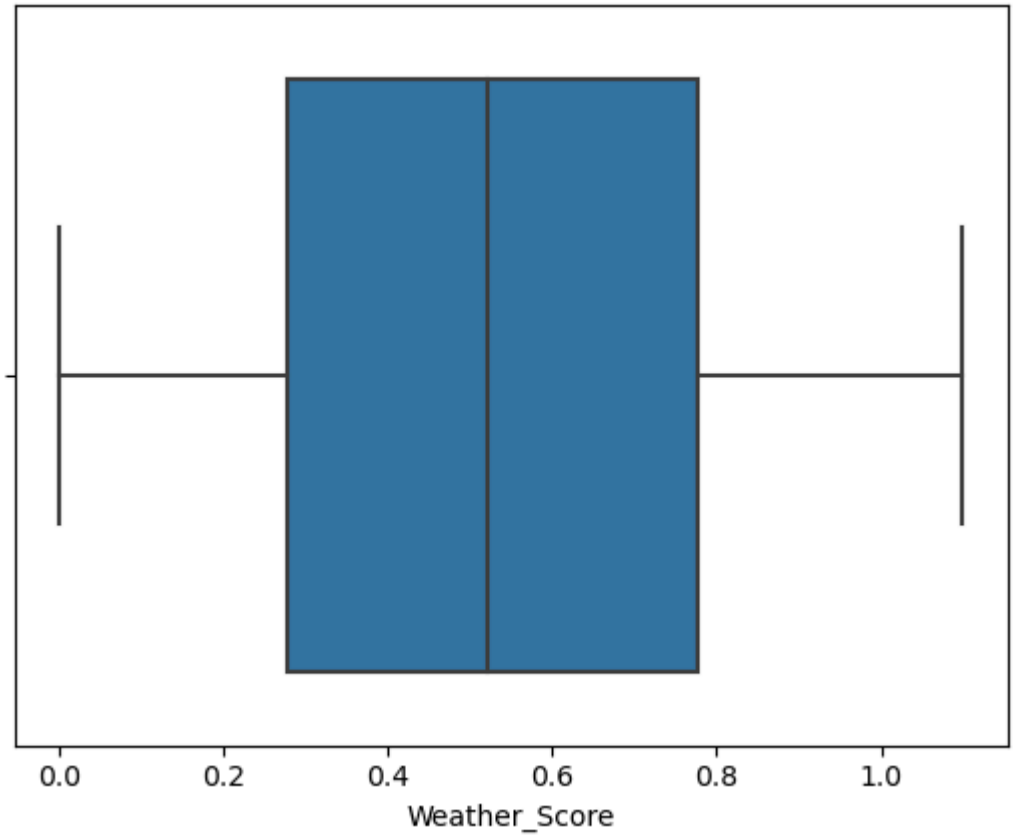
In [34]:
```
sns.boxplot(x=dataset['Airplane_Type'])
```

Out[34]:
```
<Axes: xlabel='Airplane_Type'>
```



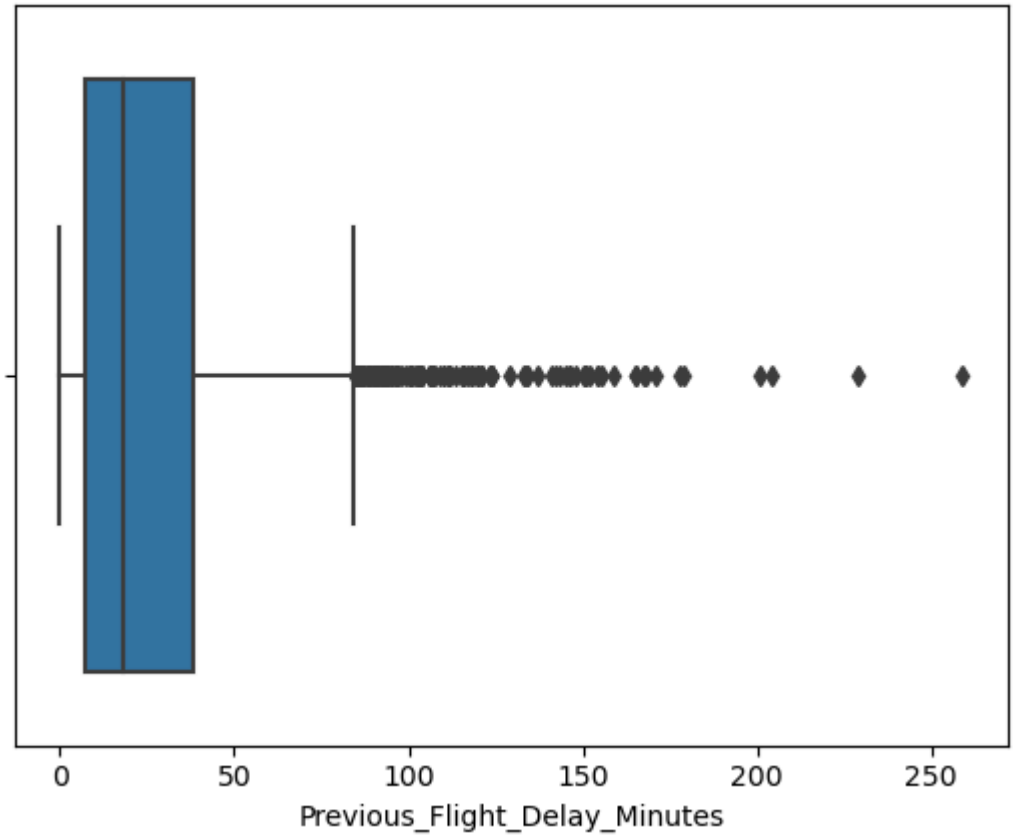
In [35]:
```
sns.boxplot(x=dataset['Weather_Score'])
```

Out[35]:
```
<Axes: xlabel='Weather_Score'>
```



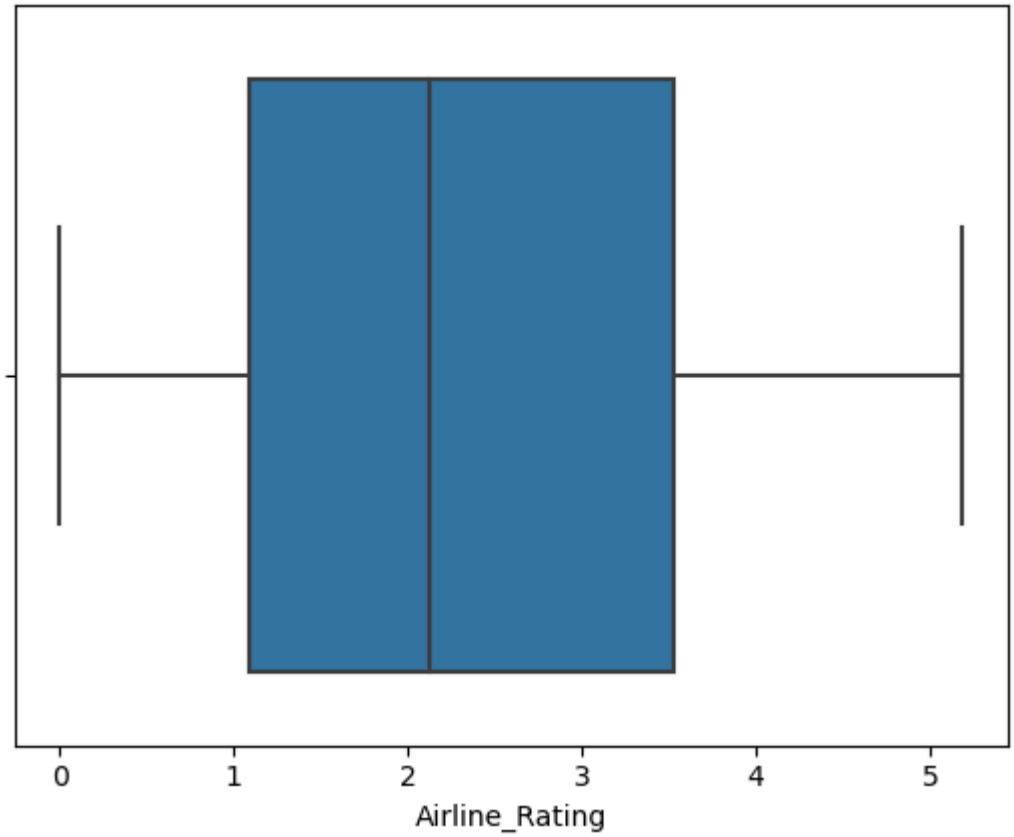
In [36]:
```
sns.boxplot(x=dataset['Previous_Flight_Delay_Minutes'])
```

Out[36]:
```
<Axes: xlabel='Previous_Flight_Delay_Minutes'>
```



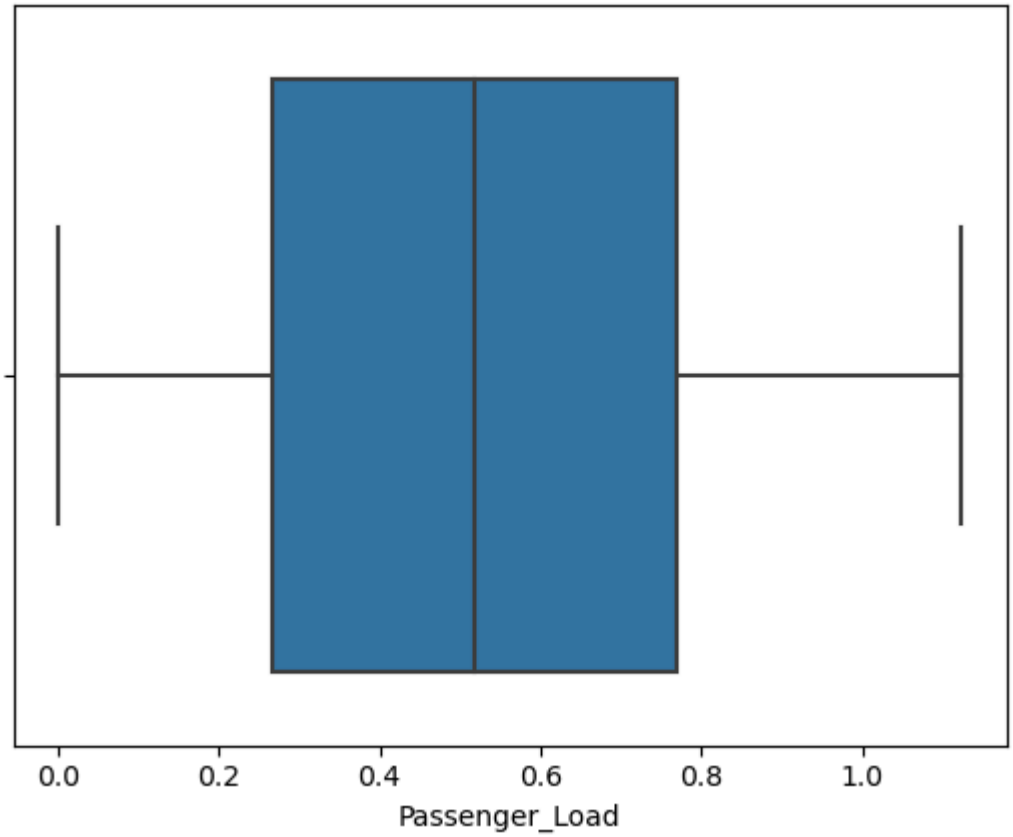
In [37]:
```
sns.boxplot(x=dataset['Airline_Rating'])
```

Out[37]:
```
<Axes: xlabel='Airline_Rating'>
```



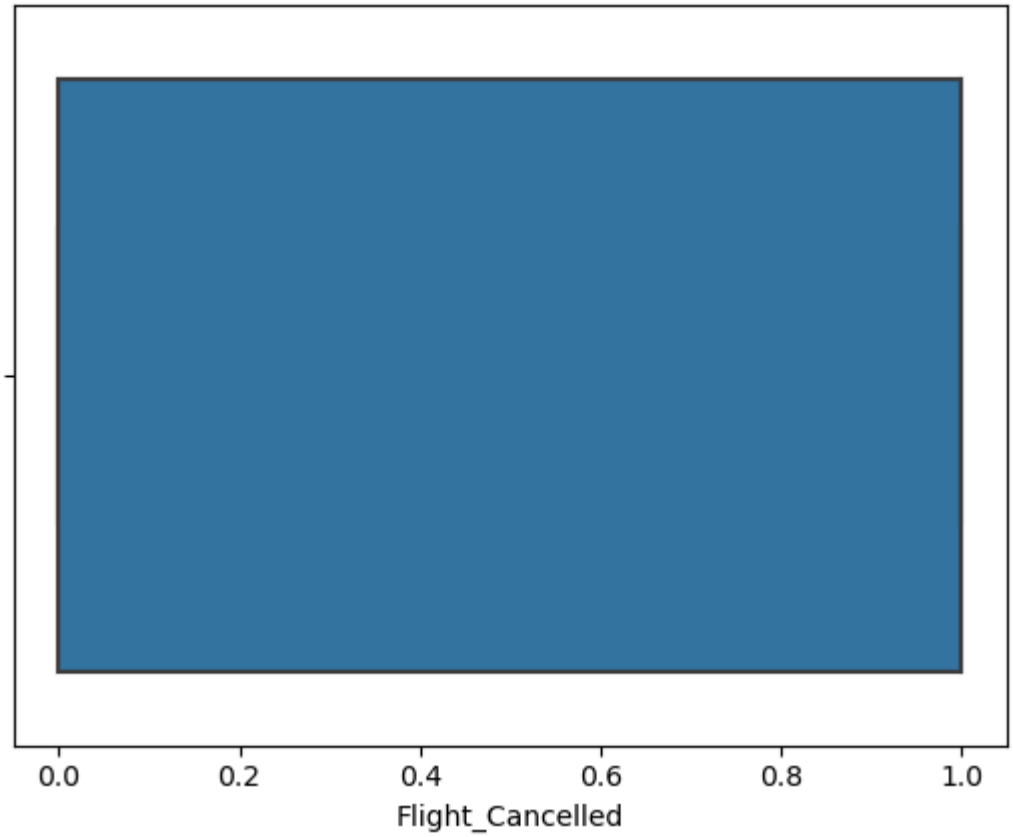
In [38]:
```
sns.boxplot(x=dataset['Passenger_Load'])
```

Out[38]:
```
<Axes: xlabel='Passenger_Load'>
```



In [39]:
```
sns.boxplot(x=dataset['Flight_Cancelled'])
```

Out[39]:
```
<Axes: xlabel='Flight_Cancelled'>
```



In [42]:
```
def detect_outliers(dataset):
    outliers = []
    threshold = 3
    mean = np.mean(dataset)
    std = np.std(dataset)
```

```
    for value in data:
        z_score = (value - mean) / std
        if np.abs(z_score) > threshold:
            outliers.append(value)
            return outliers
```

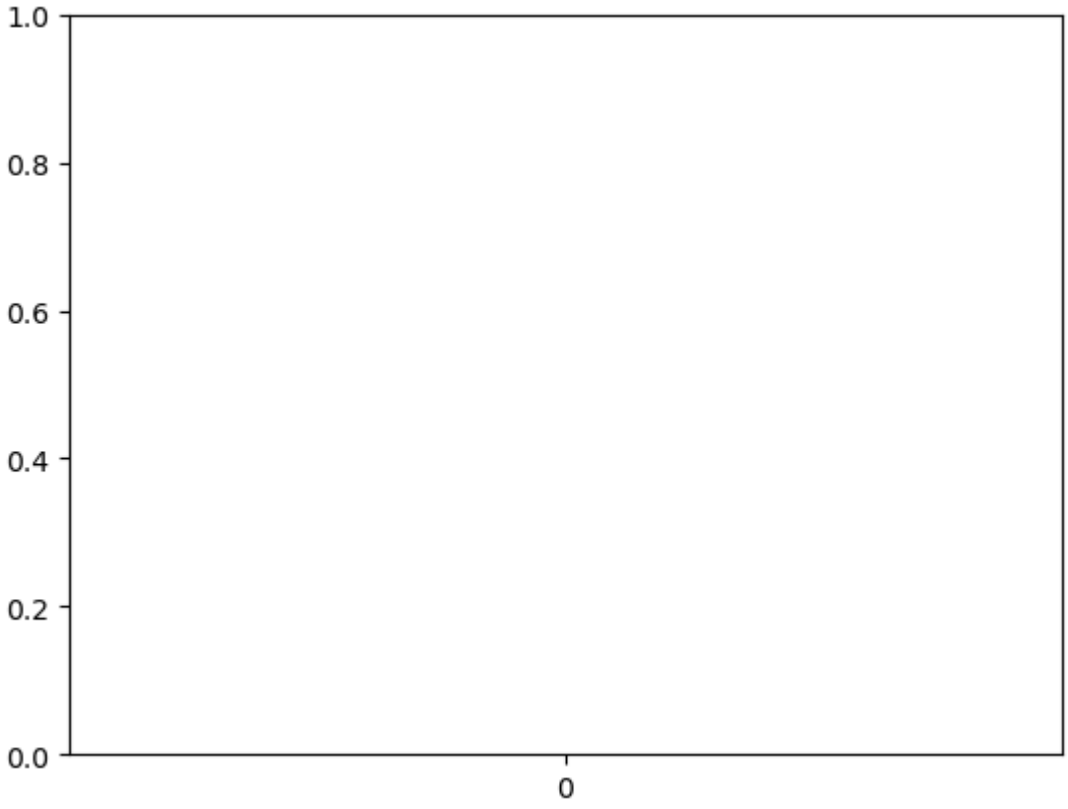
In [43]:
```
#use the winsorize method to check if you've handled all outliers
from scipy.stats.mstats import winsorize
import numpy as np
```

In [44]:
```
dataset=np.random.normal(loc=0, scale=1, size=100)
```

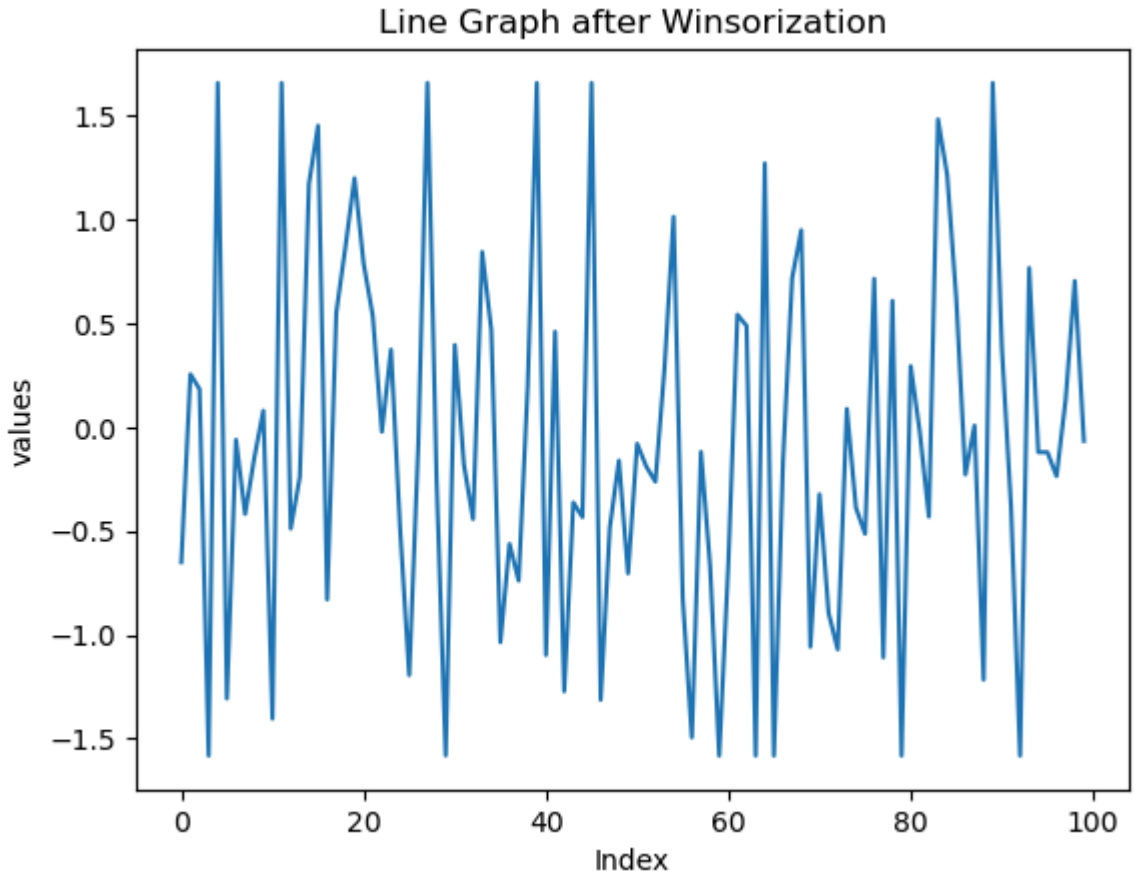
In [47]:
```
dataset_winsorized=winsorize(dataset, limits=[0.05, 0.05])
print(dataset_winsorized)
```

```
[-0.64965234  0.25563499  0.18341794 -1.58128981  1.65804405 -1.30616738
 -0.05996652 -0.41772447 -0.14846198  0.07988675 -1.40303167  1.65804405
 -0.48775732 -0.23932739  1.1720029   1.45197459 -0.829427    0.55233677
  0.86807595  1.19937002  0.78821331  0.53706415 -0.02147413  0.3739901
 -0.4891361  -1.19349522 -0.07508567  1.65804405 -0.25027876 -1.58013726
  0.39634842 -0.1801127  -0.4419832   0.84428345  0.46998497 -1.03515374
 -0.56152248 -0.73826327  0.20186136  1.65804405 -1.09670596  0.46055817
 -1.27122344 -0.36201104 -0.43284583  1.65804405 -1.31238608 -0.48293471
 -0.16023945 -0.70322171 -0.07881647 -0.18894878 -0.26166639  0.2839005
  1.01395192 -0.82351454 -1.49335014 -0.11829412 -0.66687738 -1.58128981
 -0.65725689  0.54252294  0.48814617 -1.58128981  1.27082612 -1.58128981
 -0.16003668  0.71797108  0.9492323  -1.05712916 -0.32273816 -0.89456671
 -1.06976138  0.08854586 -0.38755384 -0.513144    0.71523408 -1.10819748
  0.60906254 -1.58128981  0.29483511 -0.02213082 -0.43037894  1.48309072
  1.21692373  0.6211766  -0.22740329  0.00834157 -1.21546636  1.65804405
  0.3844207  -0.37414805 -1.58128981  0.76744058 -0.11987383 -0.11998199
 -0.23562321  0.13360845  0.70463811 -0.06581468]
```

In [49]:
```
sns.boxplot(dataset=dataset)
plt.show()
```

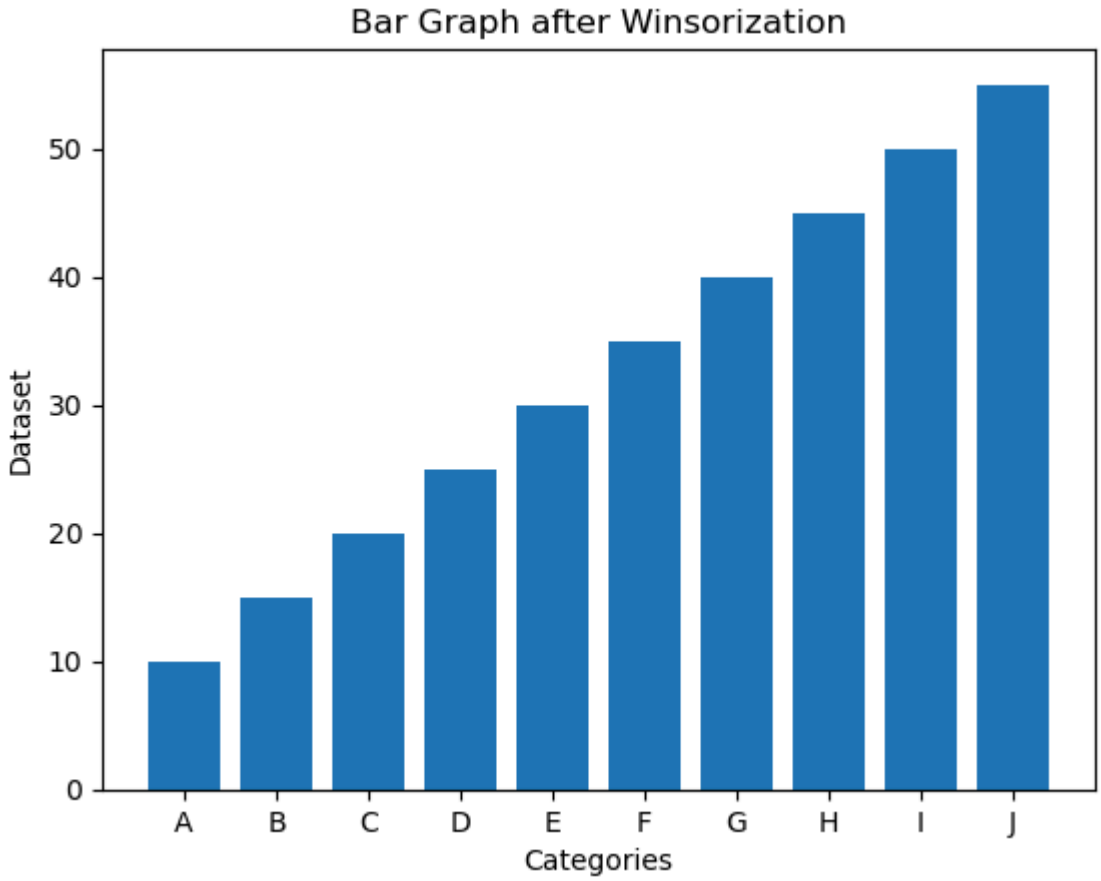


In [50]:
```
#print the line graph to check if you've handled all outliers
plt.plot(dataset_winsorized)
plt.xlabel('Index')
plt.ylabel('values')
plt.title('Line Graph after Winsorization')
plt.show()
```



In [54]:
```
##print the bar graph to check if you've handled all outliers
dataset= [10, 15, 20, 25, 30, 35, 40, 45, 50, 55]
categories= ['A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J']

plt.bar(categories, dataset)
plt.xlabel('Categories')
plt.ylabel('Dataset')
plt.title('Bar Graph after Winsorization')
plt.show()
```



In [58]:
```
type(dataset)
```

Out[58]:
```
list
```

In [62]:
```
data=[dataset]
summary={i: dataset.count(i) for i in dataset}
print(summary)
```

```
{10: 1, 15: 1, 20: 1, 25: 1, 30: 1, 35: 1, 40: 1, 45: 1, 50: 1, 55: 1}
```

In [70]:
```
#lastly print the dtypes/ DataFrame
dataset=pd.DataFrame(dataset)
print(dataset.dtypes)
```

```
0    int64
dtype: object
```

In [66]:

In [ ]: