—----------Import Important libraries—----------

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from statsmodels.tsa.seasonal import seasonal_decompose
from statsmodels.tsa.holtwinters import SimpleExpSmoothing,Holt,ExponentialSmoothing
```

—-------Read Dataset—----------

```
xls = pd.ExcelFile('Downloads/Airlines+Data.xlsx')
data = pd.read_excel(xls)
data
```

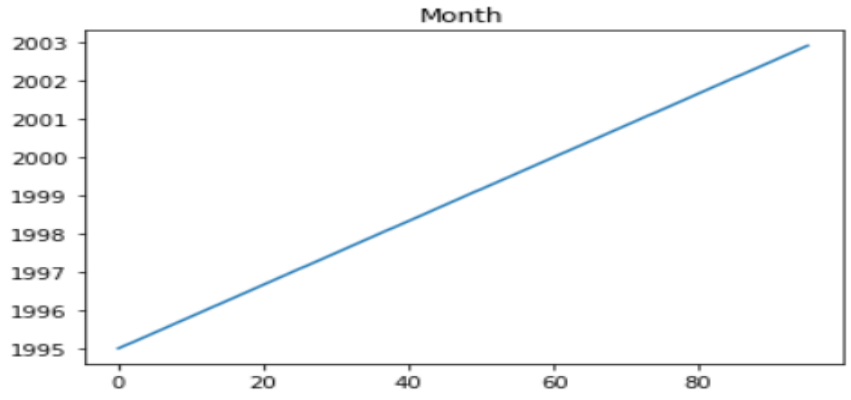
	Month	Passengers
0	1995-01-01	112
1	1995-02-01	118
2	1995-03-01	132
3	1995-04-01	129
4	1995-05-01	121
...	...	...
91	2002-08-01	405
92	2002-09-01	355
93	2002-10-01	306
94	2002-11-01	271
95	2002-12-01	306

96 rows × 2 columns

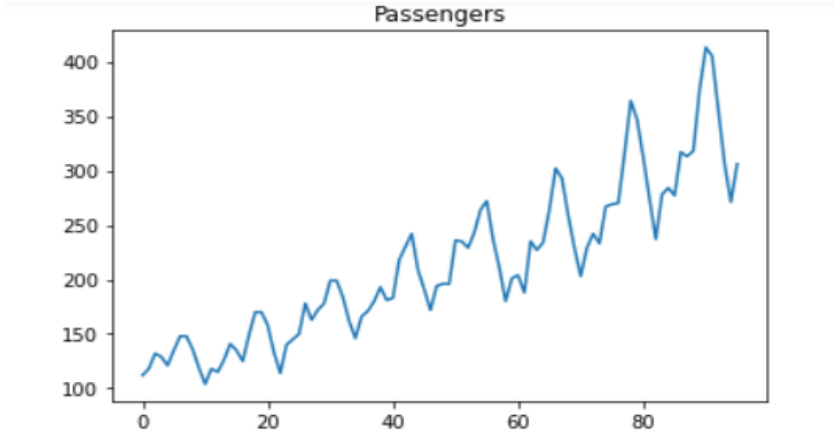
—-------plot1—----------

```
data['Month'].plot()
plt.title('Month')
```

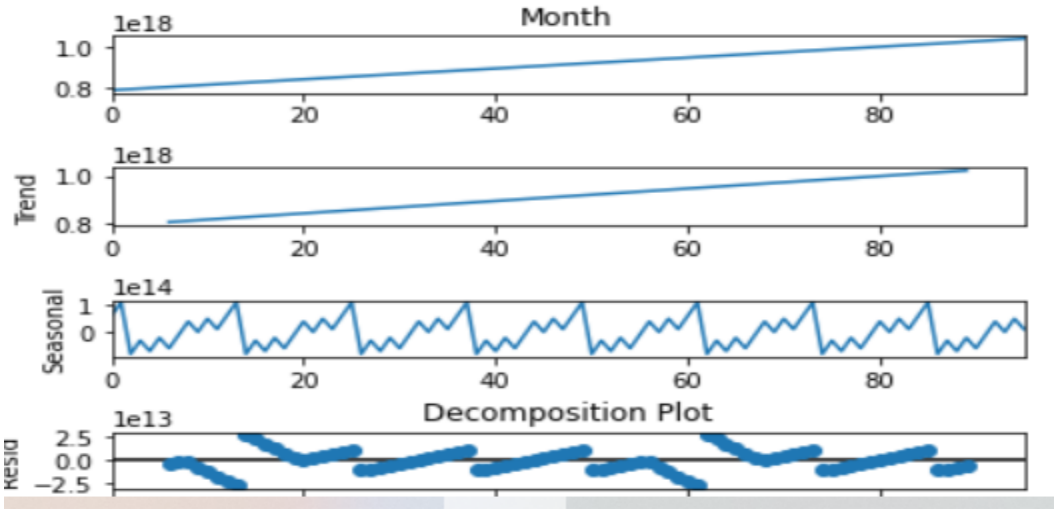
```
Text(0.5, 1.0, 'Month')
```



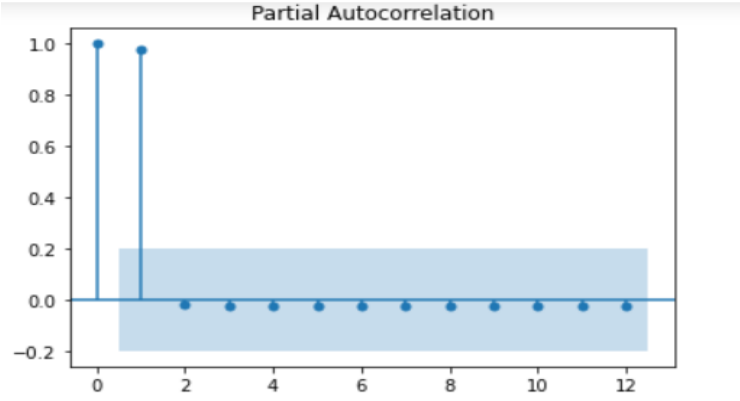
—————plot2—————————
data['Passengers'].plot()
plt.title('Passengers')

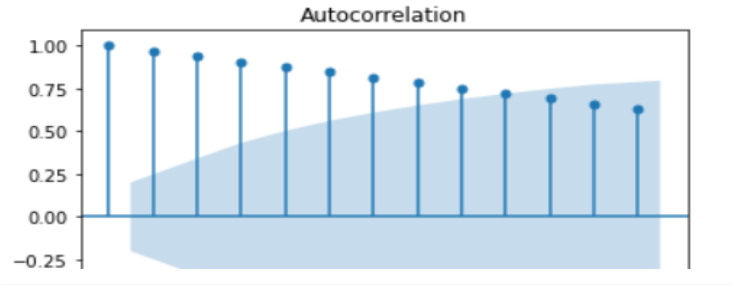


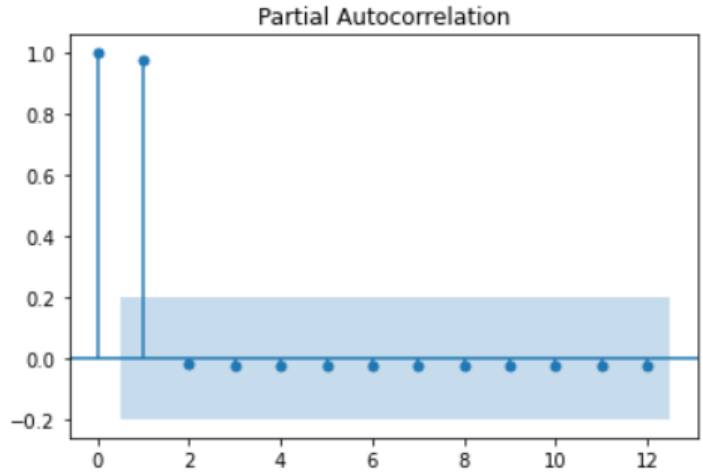
—————plot3—————————
decompose = seasonal_decompose(data['Month'],period=12)
decompose.plot()
plt.title('Decomposition Plot')



—————plot4—————————
import statsmodels.graphics.tsaplots as tsa
tsa.plot_acf(data['Month'],lags=12)
tsa.plot_pacf(data['Month'],lags=12)







—------define function—-------------------
```
def MAPE(pred,org):
    temp=np.abs((pred-org)/org)*100
    return np.mean(temp)
```

—------simpleexpsmoothing—-------------
```
model = SimpleExpSmoothing(data['Passengers']).fit(smoothing_level=0.8)
predict = model.predict(start=data.index[0],end=data.index[-1])
MAPE(predict,data['Passengers'])
```

```
9.076488539432951
```

—---------holt—---------------------
```
model = Holt(data['Passengers']).fit(smoothing_level=0.8,smoothing_slope=0.3)
predict = model.predict(start=data.index[0],end=data.index[-1])
MAPE(predict,data['Passengers'])
```

```
10.18278704821439
```

—----------exponentialsmoothing—--------------
```
model =
ExponentialSmoothing(data['Passengers'],seasonal='add',trend='add',seasonal_periods=12).fit()
predict = model.predict(start=data.index[0],end=data.index[-1])
MAPE(predict,data['Passengers'])
```

```
3.610226296831177
```

—--------forecasting—-------------
```
model.forecast(10)
```

```
96     319.235284
97     311.528413
98     350.278738
99     346.985064
100    351.845130
101    403.925766
102    440.566807
103    427.446405
104    376.628081
105    329.767444
dtype: float64
```