**Implementprogramfordecomposingtimeseriesdataintotrend and seasonality**

**EX:No.7 DATE:4/04/25**

# AIM:

Implementprogramfordecomposingtimeseriesdataintotrendandseasonality

## OBJECTIVE:

Toimplementtimeseriesdecompositiontoidentifyandanalyzethetrendandseasonal patternsinairpollutiondata for informed decision-making and improved forecasting.

## BACKGROUND:

* Timeseriesdataoftencontainstrend, seasonal, andirregularcomponentsthatinfluenceoverallpatterns.
* Understandingthese componentshelps inbetter analyzinglong-term behaviorand periodicvariations.
* Decompositiontechniqueslikeadditiveormultiplicativemodelsbreaktheseriesintointerpretableparts.
* Thisis especiallyuseful inenvironmental studies to uncoverhidden trends in pollution data.

## SCOPEOFTHEPROGRAM:

1. Applytimeseries decompositionto airpollution data(e.g., PM2.5)from 2012to 2021.
2. Visualizeand analyzetrend and seasonalityto observepollution behavior over time.
3. Enhanceforecastingaccuracybyseparatingcomponents beforeapplyingpredictive models.
4. Theapproachcan be extendedto otherpollutantslikeCO,NO₂, SO₂,and O₃.

**CODE:**

importpandasaspd

importmatplotlib.pyplotasplt

fromstatsmodels.tsa.seasonalimportseasonal\_decompose

#Load dataset

df=pd.read\_csv('/content/us\_air\_pollution\_2012\_2021.csv')#UploadthisfileinColab df['Date'] = pd.to\_datetime(df['Date'])

df.set\_index('Date',inplace=True)

#Selecttime series

ts=df['PM2.5 (µg/m³)'].dropna()

#Decomposeusingadditivemodel

decomposition=seasonal\_decompose(ts,model='additive',period=365)

# Plot components decomposition.plot()

plt.suptitle('TimeSeriesDecompositionofPM2.5',fontsize=16)

plt.tight\_layout() plt.show()

# OUTPUT:

**RESULT:**

Thus,theprogramusingthetimeseriesdataimplementationhasbeendonesuccessfully.