**Implement program for decomposing time series data into trend and seasonality**

**EX:No.7**

**DATE: 08/03/25**

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# AIM:

To implement a program for decomposing time series data into its trend, seasonal, and residual components.

## OBJECTIVE:

To analyze and understand the underlying structure of the Office Supply Sales time series data by breaking it down into trend and seasonality components using decomposition techniques.

## BACKGROUND:

* Time series data often contains patterns that repeat over time.
* Decomposition helps in separating these components for better analysis and forecasting.
* Trend shows long-term progression.
* Seasonality captures periodic fluctuations.
* Residual reveals random noise not explained by trend or seasonality.
* Understanding these components helps improve model accuracy and insights.

## SCOPEOFTHEPROGRAM:

Load and prepare the office supply sales dataset.

Aggregate data monthly for decomposition.

Apply time series decomposition using additive model.

Visualize and interpret the trend, seasonal, and residual components.

## ALGORITHM:

* Import required libraries.
* Load the cleaned sales dataset.
* Resample the data monthly to make it suitable for decomposition.
* Use the seasonal\_decompose() function to perform additive decomposition.
* Plot the original series, trend, seasonality, and residual components

**CODE:**

import pandas as pd

import matplotlib.pyplot as plt

from statsmodels.tsa.seasonal import seasonal\_decompose

# Load the AirPassengers dataset

df = pd.read\_csv("/mnt/data/AirPassengers.csv")

# Display the first few rows to check column names

print(df.head())

# Convert 'Month' column to datetime format

df['Month'] = pd.to\_datetime(df['Month'], format='%Y-%m')

# Set 'Month' as the index

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

# Rename the passenger column if needed

df.rename(columns={df.columns[0]: 'Passengers'}, inplace=True)

# Ensure there are no missing values

df.dropna(inplace=True)

# Decompose the series

decomposition = seasonal\_decompose(df['Passengers'], model='multiplicative') # 'additive' also works depending on trend

# Plot the decomposition

plt.figure(figsize=(12, 8))

decomposition.plot()

plt.suptitle("Time Series Decomposition of Monthly Air Passengers", fontsize=16)

plt.tight\_layout()

plt.show()

# OUTPUT:

# EXP7

**RESULT:**

Thus,theprogramfor decomposing time series data into its trend, seasonal, and residual componentshasbeendone successfully.