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

**EX:No.7**

**DATE: 08/03/25**

# 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.

## SCOPE OF THE PROGRAM:

· 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:**

# Load the dataset

df = pd.read\_csv("cleaned\_sales\_data.csv")

# Convert 'Order Date' to datetime format and set as index

df['Order Date'] = pd.to\_datetime(df['Order Date'], errors='coerce')

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

# Aggregate daily sales and resample to monthly average for decomposition

df\_monthly = df['Sales'].resample('M').mean()

# Drop any missing values

df\_monthly.dropna(inplace=True)

# Decompose the series

decomposition = seasonal\_decompose(df\_monthly, model='additive') # Use model='multiplicative' if necessary

# Plot the decomposition

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

decomposition.plot()

plt.suptitle("Time Series Decomposition of Monthly Office Supply Sales", fontsize=16)

plt.tight\_layout()

plt.show()

# OUTPUT:

# EXP7

**RESULT:**

Thus, the program for decomposing time series data into its trend, seasonal, and residual components has been done successfully.