7.Decomposing time series data into trend and seasonality

Aim:

To implement program for decomposing time series data into trend and seasonality.

Procedure:

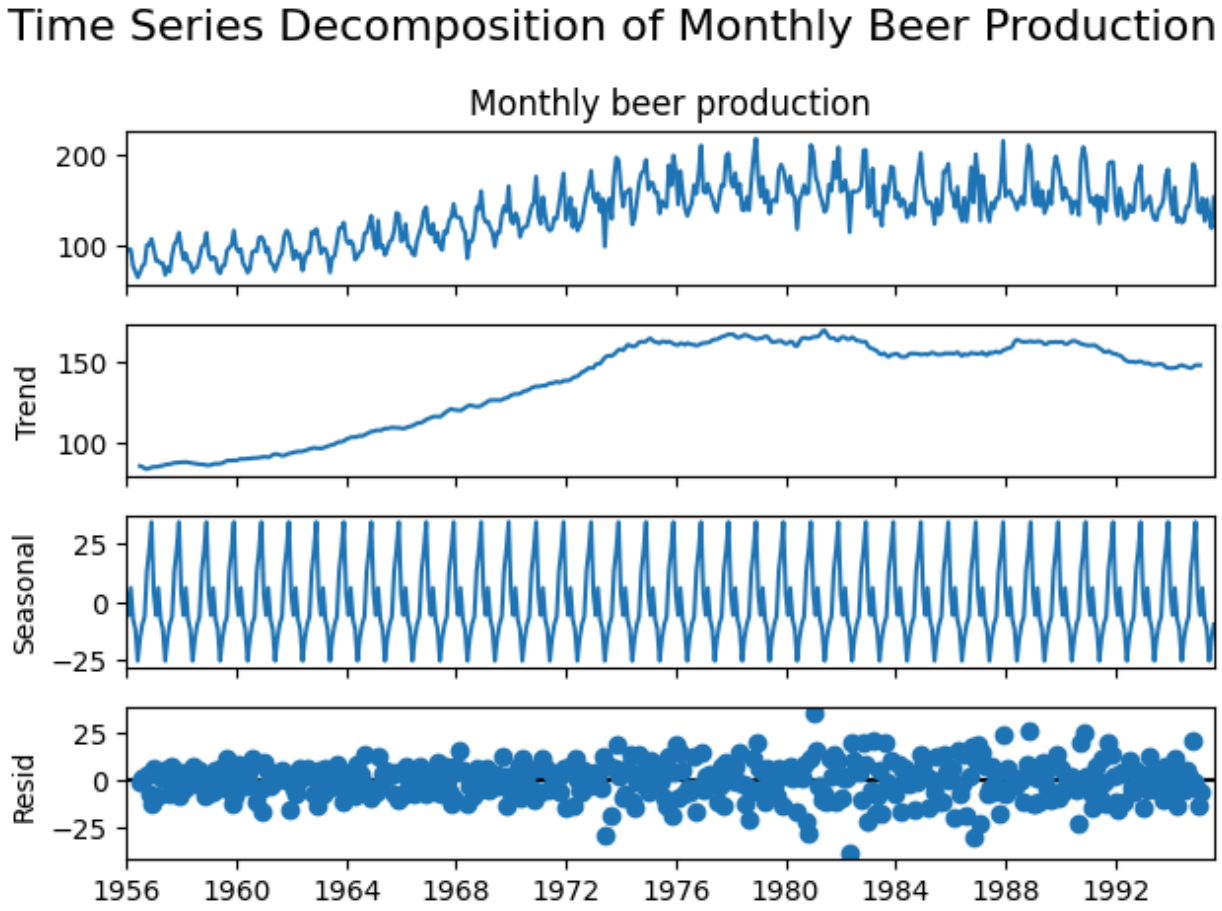
1. Load and preprocess the beer production data (convert the `Month` column to datetime).
2. Decompose the time series using `seasonal_decompose()` to extract trend, seasonality, and residuals.
3. Visualize the decomposition results to understand the components.
4. Interpret the trends, seasonality, and residuals for further analysis or forecasting.
5. Apply forecasting models (like ARIMA or Prophet) to predict future beer production.

Code:

```
pip install pandas matplotlib statsmodels pmdarima

import pandas as pd
import matplotlib.pyplot as plt
from statsmodels.tsa.seasonal import seasonal_decompose

# Load the dataset
df = pd.read_csv(r"C:\Users\Lenovo\Downloads\monthly-beer.csv")

# Convert the '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)
```

```
# Check the actual column names in the DataFrame
print(df.columns)  # Print the column names to verify

# Access the column using the correct name (e.g., 'Monthly beer production')
# Replace 'Monthly beer production' with the actual column name from the print output
decomposition = seasonal_decompose(df['Monthly beer production'], model='additive', period=12)

# Plot the decomposition
decomposition.plot()
plt.suptitle('Time Series Decomposition of Monthly Beer Production', fontsize=16)
plt.tight_layout()
plt.show()
```

Output:



Result:

The above program has been executed successfully.