2.IMPLEMENT PROGRAMS FOR VISUALIZING TIME SERIES DATA

AIM:

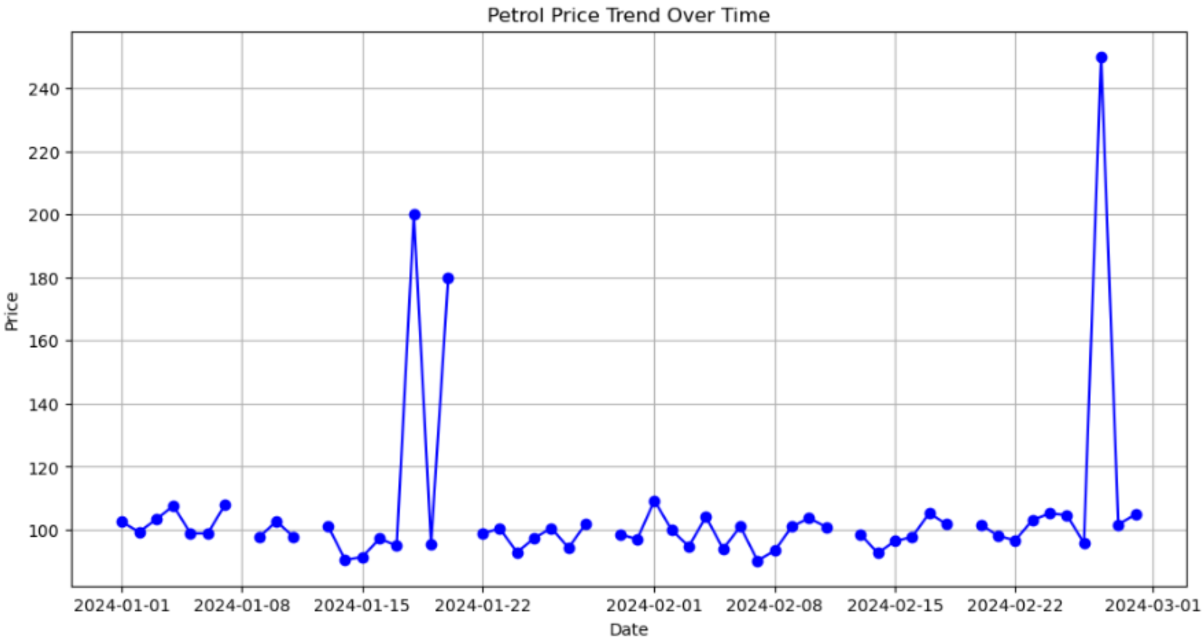
To implement programs for visualizing time series data for the already existing dataset

PROGRAM:

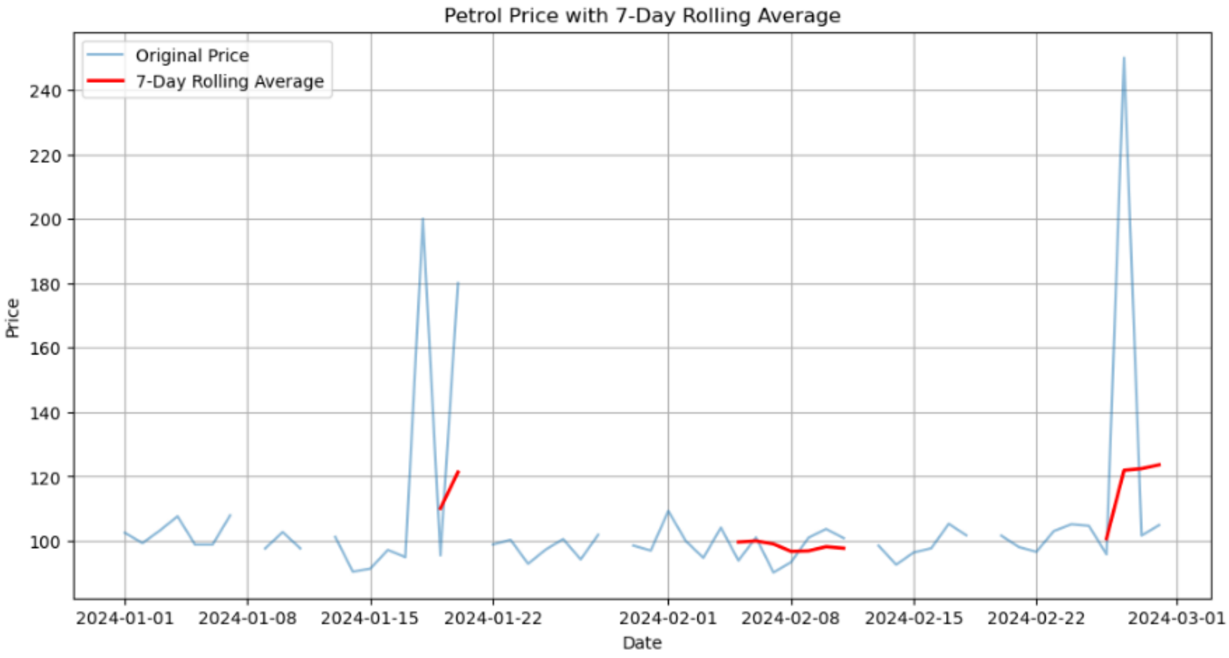
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import MinMaxScaler
from scipy import stats

# Step 1: Generate Synthetic Time Series Data
np.random.seed(42)
date_range = pd.date_range(start='2024-01-01', periods=60, freq='D')
prices = np.random.normal(loc=100, scale=5, size=60)

# Introduce missing values
missing_indices = np.random.choice(60, 6, replace=False)
prices[missing_indices] = np.nan

# Introduce outliers
outlier_indices = np.random.choice(60, 3, replace=False)
prices[outlier_indices] = [200, 250, 180]

# Create DataFrame
df = pd.DataFrame({'Date': date_range, 'Price': prices})

# Save to CSV
csv_path = 'petrol_prices_timeseries.csv'
df.to_csv(csv_path, index=False)

# Step 2: Load Data
loaded_df = pd.read_csv(csv_path, parse_dates=['Date'])

# Step 3: Handle Missing Data
loaded_df['Price'].fillna(method='ffill', inplace=True)  # Forward fill
```

```
# Step 4: Detect & Remove Outliers
z_scores = np.abs(stats.zscore(loaded_df['Price']))
loaded_df = loaded_df[z_scores < 2]  # Keep values within 2 standard deviations

# Step 5: Normalize Data
scaler = MinMaxScaler()
loaded_df['Normalized_Price'] = scaler.fit_transform(loaded_df[['Price']])
```

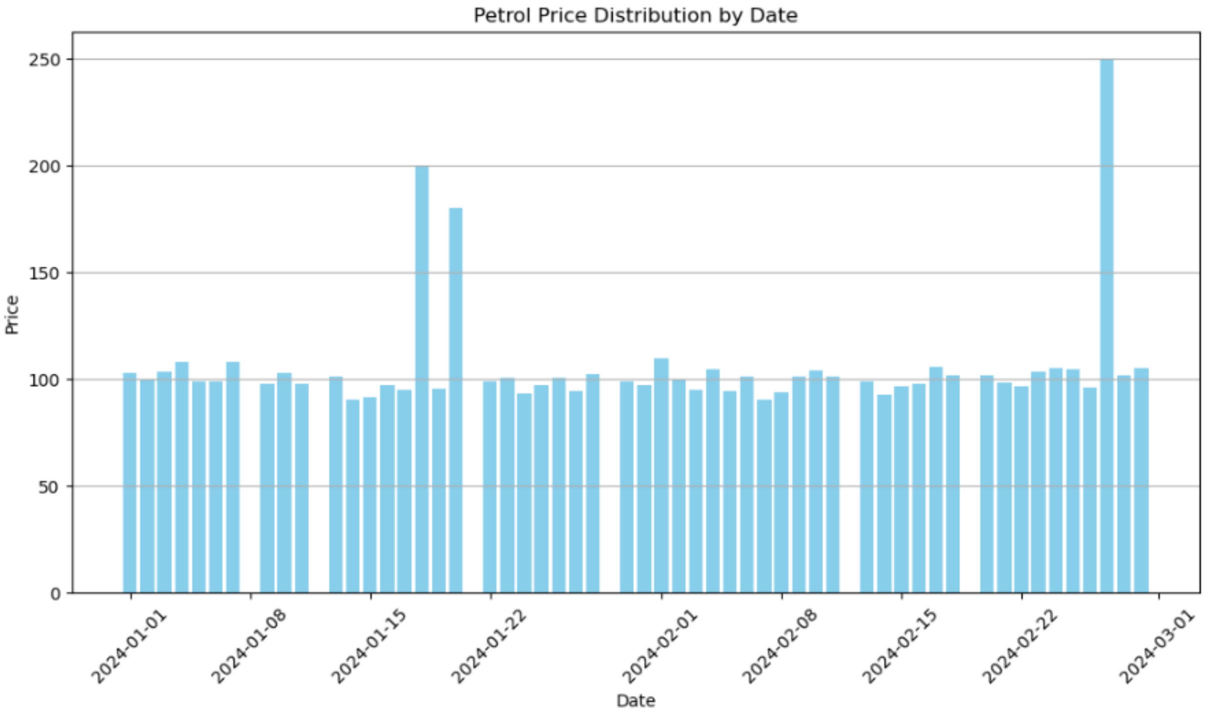
```
#Line Plot (Trend Visualization)
plt.figure(figsize=(12, 6))
plt.plot(df['Date'], df['Price'], marker='o', linestyle='-', color='b')
plt.title('Petrol Price Trend Over Time')
plt.xlabel('Date')
plt.ylabel('Price')
plt.grid(True)
plt.show()
```



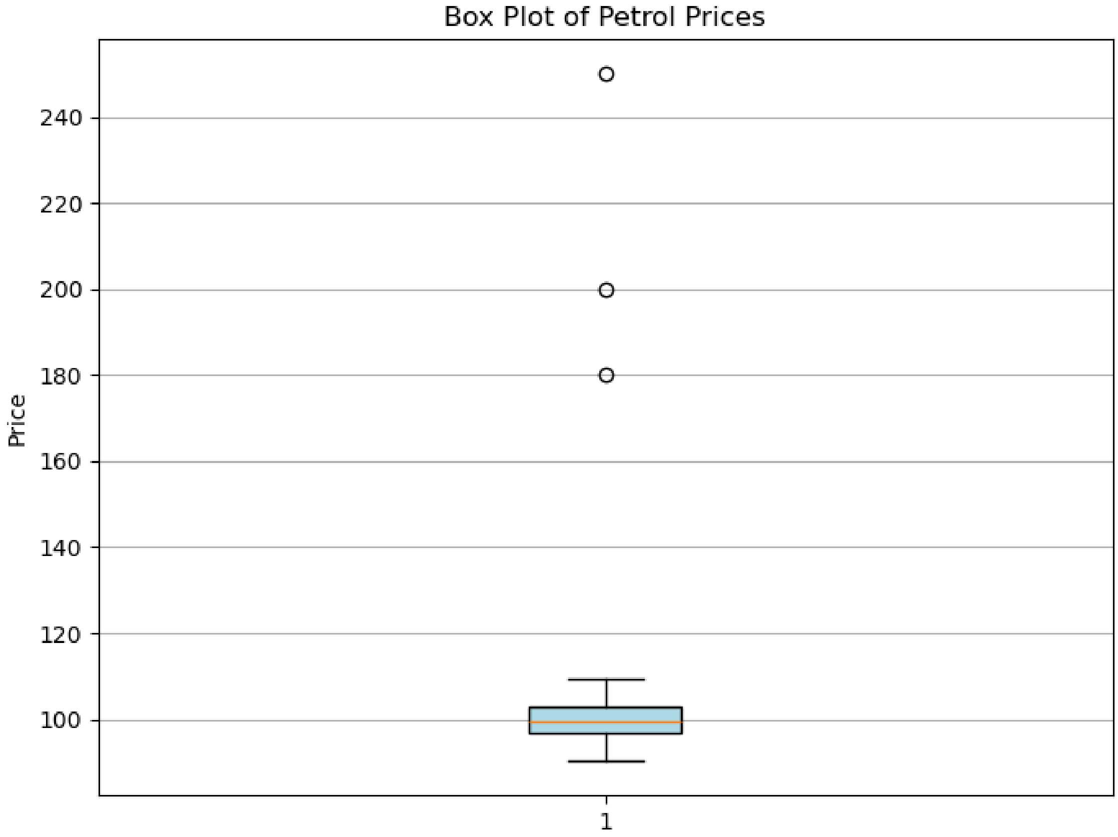
```
#rolling plot
df['Rolling_Avg'] = df['Price'].rolling(window=7).mean()

plt.figure(figsize=(12, 6))
plt.plot(df['Date'], df['Price'], label='Original Price', alpha=0.5)
plt.plot(df['Date'], df['Rolling_Avg'], label='7-Day Rolling Average',
color='red', linewidth=2)
plt.title('Petrol Price with 7-Day Rolling Average')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend()
plt.grid(True)
plt.show()
```



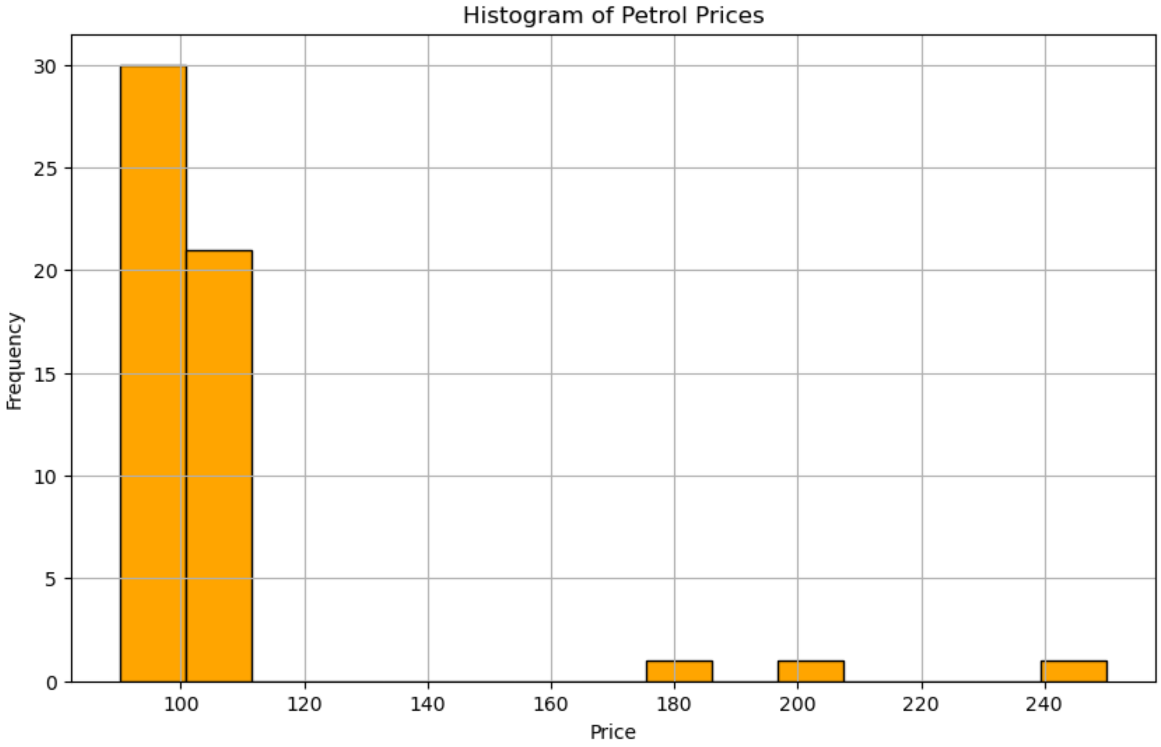
```
#Bar Plot
plt.figure(figsize=(12, 6))
plt.bar(df['Date'], df['Price'], color='skyblue')
plt.title('Petrol Price Distribution by Date')
plt.xlabel('Date')
plt.ylabel('Price')
plt.xticks(rotation=45)
plt.grid(axis='y')
plt.show()\
```



```
#Box Plot
plt.figure(figsize=(8, 6))
plt.boxplot(df['Price'].dropna(), vert=True, patch_artist=True,
boxprops=dict(facecolor='lightblue'))
plt.title('Box Plot of Petrol Prices')
plt.ylabel('Price')
plt.grid(axis='y')
plt.show()
```



```
#Histogram
plt.figure(figsize=(10, 6))
plt.hist(df['Price'].dropna(), bins=15, color='orange', edgecolor='black')
plt.title('Histogram of Petrol Prices')
plt.xlabel('Price')
plt.ylabel('Frequency')
plt.grid(True)
plt.show()
```



RESULT:

The program to implement the visualization of the time series data has been executed successfully