3. Implement programs for check stationary time series data.

EX.N0 : 3	**Implement programs for check stationary time series data.**
DATE : 01/02/2025	

AIM:

Implement programs for check stationary time series data.

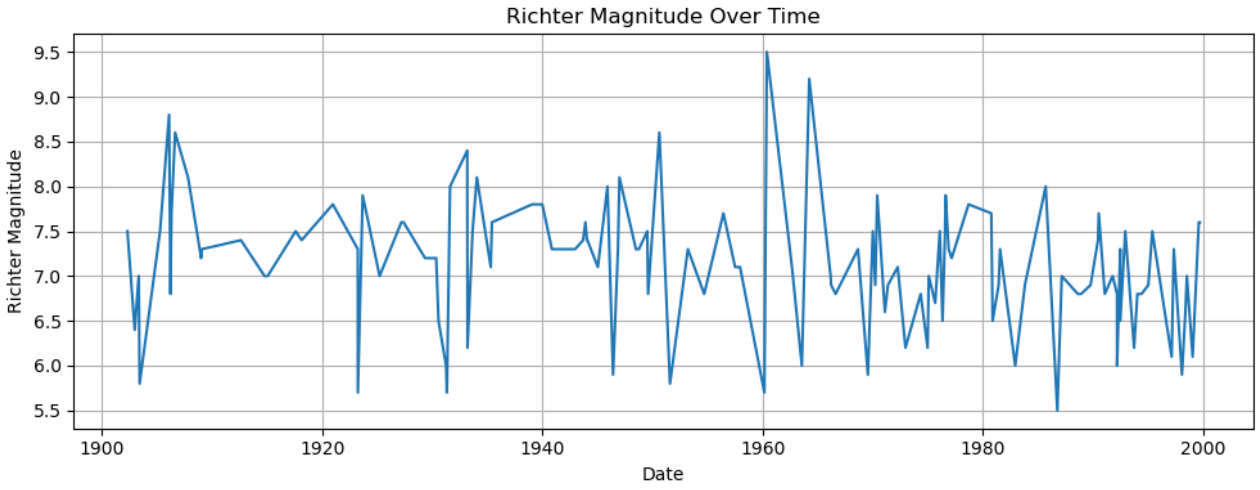
PROGRAM:

```
import pandas as pd

import matplotlib.pyplot as plt

from statsmodels.tsa.stattools import adfuller, kpss


# Load the dataset

df = pd.read_csv('earthquakes.csv')


# Convert 'month' name to month number

df['month'] = pd.to_datetime(df['month'], format='%B').dt.month


# Create a datetime column

df['date'] = pd.to_datetime(df[['year', 'month', 'day']])


# Set the datetime column as index and sort

df.set_index('date', inplace=True)

df.sort_index(inplace=True)
```

```
# Extract the 'richter' series
richter_series = df['richter'].dropna()

# Plot the time series
plt.figure(figsize=(10, 4))
plt.plot(richter_series)
plt.title('Richter Magnitude Over Time')
plt.xlabel('Date')
plt.ylabel('Richter Magnitude')
plt.grid(True)
plt.tight_layout()
plt.show()

# --- Augmented Dickey-Fuller Test ---
adf_result = adfuller(richter_series)
print("=== Augmented Dickey-Fuller Test ===")
print(f"Test Statistic : {adf_result[0]}")
print(f"p-value        : {adf_result[1]}")
print("Critical Values:")
for key, value in adf_result[4].items():
    print(f"   {key} : {value}")
if adf_result[1] < 0.05:
    print("=> Likely Stationary (Reject Null Hypothesis)")
else:
```

```
    print("=> Likely Non-Stationary (Fail to Reject Null Hypothesis)")


print("\n")


# --- KPSS Test ---
kpss_stat, kpss_p, kpss_lags, kpss_crit = kpss(richter_series, regression='c', nlags='auto')
print("=== KPSS Test ===")
print(f"Test Statistic : {kpss_stat}")
print(f"p-value        : {kpss_p}")
print("Critical Values:")
for key, value in kpss_crit.items():
    print(f"   {key} : {value}")
if kpss_stat > kpss_crit['5%']:
    print("=> Likely Non-Stationary (Reject Null Hypothesis)")
else:
    print("=> Likely Stationary (Fail to Reject Null Hypothesis)")
```

OUTPUT:



```
=== Augmented Dickey-Fuller Test =
==
Test Statistic : -5.262070147019102
p-value        : 6.558308053006853e-06
Critical Values:
  1% : -3.486055829282407
  5% : -2.8859430324074076
  10% : -2.5797850694444446
=> Likely Stationary (Reject Null Hypothesis)


=== KPSS Test ===
Test Statistic : 0.808588603488589
p-value        : 0.01
Critical Values:
  10% : 0.347
  5% : 0.463
  2.5% : 0.574
  1% : 0.739
=> Likely Non-Stationary (Reject Null Hypothesis)
```

RESULT:

Thus, the program for Implement programs to check stationary of a time series data is executed successfully.