EXP:9 17/4/2025	neural network-based time series forecasting model.

AIM:

To Develop a neural network-based time series forecasting model.

PROCEDURE:

```
# Step 1: Install TensorFlow (if not pre-installed)
!pip install tensorflow

# Step 2: Import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import MinMaxScaler
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, LSTM
from google.colab import files

# Step 3: Upload the dataset
uploaded = files.upload()

# Step 4: Load and preprocess the data
filename = list(uploaded.keys())[0]
df = pd.read_csv(filename)
df.columns = ['Month', 'Sales']
df['Sales'] = pd.to_numeric(df['Sales'], errors='coerce')
df = df.dropna()
df['Month'] = pd.date_range(start='2001-01-01', periods=len(df),
freq='M')
df.set_index('Month', inplace=True)

# Step 5: Normalize and create sequences
scaler = MinMaxScaler()
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scaled_data = scaler.fit_transform(df[['Sales']].values)

def create_sequences(data, seq_length):
    X, y = [], []
    for i in range(len(data) - seq_length):
        X.append(data[i:i + seq_length])
        y.append(data[i + seq_length])
    return np.array(X), np.array(y)

seq_length = 5
X, y = create_sequences(scaled_data, seq_length)

# Step 6: Train-test split
train_size = int(len(X) * 0.8)
X_train, X_test = X[:train_size], X[train_size:]
y_train, y_test = y[:train_size], y[train_size:]

# Step 7: Build and train LSTM model
model = Sequential([
    LSTM(50, activation='relu', input_shape=(seq_length, 1)),
    Dense(1)
])
model.compile(optimizer='adam', loss='mse')
model.fit(X_train, y_train, epochs=100, verbose=0)

# Step 8: Predict and inverse transform
predicted = model.predict(X_test)
predicted = scaler.inverse_transform(predicted)
y_test_actual = scaler.inverse_transform(y_test)

# Step 9: Plot results
plt.figure(figsize=(12, 6))
plt.plot(np.arange(len(y_test_actual)), y_test_actual, label='Actual
Sales')
plt.plot(np.arange(len(predicted)), predicted, label='Predicted Sales',
linestyle='--')
plt.title('LSTM Neural Network Forecasting')
plt.xlabel('Time Step')
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plt.ylabel('Sales')
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()
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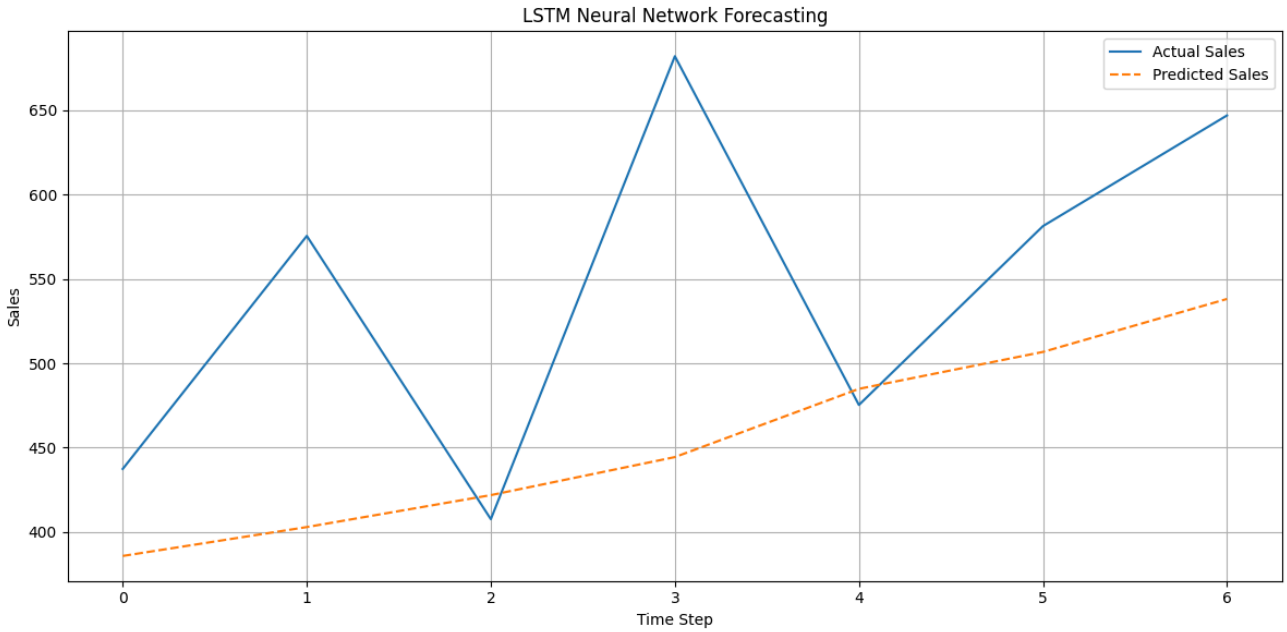
OUTPUT:



RESULT:

Thus the program has been executed successfully.