Time Series Assesment

Q1. **Time Series**: A time series is a sequence of data points collected or recorded at successive equally spaced time intervals. Common applications include stock market analysis, weather forecasting, economic forecasting, and monitoring system health in engineering.

Q2. **Common Patterns**: Common time series patterns include trend (long-term increase or decrease), seasonality (repeating patterns at fixed intervals), cyclicality (patterns that occur at irregular intervals), and irregularity (random fluctuations). They can be identified visually through plots and interpreted based on domain knowledge.

Q3. **Data Preprocessing**: Time series data can be preprocessed by handling missing values, removing outliers, smoothing noisy data, and transforming non-stationary data into stationary data through differencing or transformations like logarithms.

Q4. **Time Series Forecasting in Business**: Time series forecasting helps in making informed decisions by predicting future trends and patterns. Common challenges include dealing with noisy data, handling outliers, and selecting appropriate forecasting models.

Q5. **ARIMA Modelling**: ARIMA (AutoRegressive Integrated Moving Average) is a popular time series forecasting method that combines autoregression, differencing, and moving averages. It's used to forecast stationary time series data by identifying patterns in the data.

Q6. **ACF and PACF**: ACF and PACF plots help identify the order of ARIMA models by showing the correlation between a time series and its lagged values. Peaks in these plots indicate potential orders for autoregressive and moving average terms.

Q7. **Assumptions of ARIMA Models**: Assumptions include stationarity of the time series, independence of residuals, and normality of residuals. They can be tested using statistical tests and diagnostic plots.

Q8. **Time Series Model Recommendation**: For monthly sales data, a seasonal ARIMA (SARIMA) model may be recommended, considering the presence of seasonality in sales patterns. SARIMA can capture both trend and seasonal components effectively.

Q9. **Limitations of Time Series Analysis**: Limitations include the inability to predict rare events or sudden changes, reliance on historical data patterns, and sensitivity to outliers and noise. For example, during a global pandemic, traditional time series models may struggle to predict drastic changes in consumer behavior.

Q10. **Stationary vs. Non-stationary Time Series**: A stationary time series has constant mean, variance, and autocorrelation over time, while a non-stationary time series exhibits trends, seasonality, or other patterns that change over time. Stationarity affects the choice of forecasting model because many forecasting methods, like ARIMA, require stationarity for accurate predictions. If the time series is non-stationary, preprocessing techniques like differencing may be applied to achieve stationarity before modeling.