1)What is meant by time-dependent seasonal components?

Ans- A seasonal effect is a systematic and calendar related effect. Some examples include the sharp escalation in most Retail series which occurs around December in response to the Christmas period, or an increase in water consumption in summer due to warmer weather.

2) How can time-dependent seasonal components be identified in time series data?

Ans- We can use the ACF to determine if seasonality is present in a time series. For example, Yt = γ · St + ϵt. The larger the amplitude of seasonal fluctuations, the more pronounced the oscillations are in the ACF.

3) What are the factors that can influence time-dependent seasonal components?

Ans- Seasonality may be caused by various factors, such as weather, vacation, and holidays and consists of periodic, repetitive, and generally regular and predictable patterns in the levels of a time series. Seasonal fluctuations in a time series can be contrasted with cyclical patterns.

4) How are autoregression models used in time series analysis and forecasting?

Ans- Autoregression is a time series model that uses observations from previous time steps as input to a regression equation to predict the value at the next time step. It is a very simple idea that can result in accurate forecasts on a range of time series problems.

Autoregressive models predict future values based on past values. They are widely used in technical analysis to forecast future security prices. Autoregressive models implicitly assume that the future will resemble the past.

5) How do you use autoregression models to make predictions for future time points?

Ans- An autoregressive (AR) model forecasts future behavior based on past behavior data. This type of analysis is used when there is a correlation between the time series values and their preceding and succeeding values. Autoregressive modeling uses only past data to predict future behavior.

Time series forecasting occurs when you make scientific predictions based on historical time stamped data. It involves building models through historical analysis and using them to make observations and drive future strategic decision-making.

6) What is a moving average (MA) model and how does it differ from other time series models?

Ans- The moving average model is a time series model that accounts for very short-run autocorrelation. It basically states that the next observation is the mean of every past observation. The order of the moving average model, q, can usually be estimated by looking at the ACF plot of the time series.

The primary difference between an AR and MA model is based on the correlation between time series objects at different time points. The covariance between x(t) and x(t-n) is zero for MA models. However, the correlation of x(t) and x(t-n) gradually declines with n becoming larger in the AR model.

7) What is a mixed ARMA model and how does it differ from an AR or MA model?

Ans- ARMA is a model that is combined from the AR and MA models. In this model, the impact of previous lags along with the residuals is considered for forecasting the future values of the time series. Here β represents the coefficients of the AR model and α represents the coefficients of the MA model.

**Yt = β₁\* yₜ-₁ + α₁\* Ɛₜ-₁ + β₂\* yₜ-₂ + α₂ \* Ɛₜ-₂ + β₃ \* yₜ-₃ + α₃ \* Ɛₜ-₃ +………… + βₖ \* yₜ-ₖ + αₖ \* Ɛₜ-ₖ**

ARIMA combines autoregressive features with those of moving averages. An AR(1) autoregressive process, for instance, is one in which the current value is based on the immediately preceding value, while an AR(2) process is one in which the current value is based on the previous two values.