**Time Series Forecasting**

**December 2024 Examination**

**1. How would you use ARIMA to forecast airline passenger numbers over the next year? What steps would you follow to ensure accurate predictions? (10 Marks)**

**Ans 1.**

**Introduction**

Time series forecasting is a widely used method in predicting future values based on past data points, particularly in scenarios where trends and seasonality are present. One of the most prominent methods for time series forecasting is the ARIMA (AutoRegressive Integrated Moving Average) model, which combines autoregression, differencing, and moving averages to make accurate predictions. In the context of airline passenger forecasting, ARIMA helps businesses and analysts to predict future passenger numbers by identifying trends, seasonal patterns, and irregular fluctuations within the historical data. This forecasting technique is particularly useful for industries like airlines, where understanding passenger demand is crucial for capacity planning,

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**2. How would you forecast patient admissions for a hospital over the next quarter? How would you handle sudden changes, like during a pandemic? (10 Marks)**

**Ms Swaralatha Venkataraman, popularly known as Swara Tai, has been running a small neighborhood grocery store in a western suburb of Mumbai for the past five years. She has been recording daily sales for various products and now wants to forecast future sales to better manage inventory and staff schedules. She is particularly concerned about seasonal products like fresh fruits and vegetables, which exhibit noticeable sales patterns during different seasons. Recently she got to know that you have been pursuing studies in Management. As you are one of her frequent customers, she has asked for your help in forecasting sales for the next quarter.**

**Ans 2.**

**Introduction**

Forecasting is essential for effective decision-making in various sectors, including healthcare and retail. In a hospital setting, predicting patient admissions is crucial for managing resources such as medical staff, beds, and supplies. Accurate forecasting ensures that the hospital operates smoothly and can respond to patient needs efficiently. However, sudden changes, like during a pandemic, introduce volatility, making predictions more challenging. The second part of the question involves forecasting sales for a neighborhood grocery store run by Ms. Swaralatha Venkataraman, commonly known as Swara Tai. Small businesses like hers rely heavily on inventory management to avoid stockouts and minimize wastage. The seasonal nature of her products, such

**3a. Explain the steps involved in building a basic time series forecasting model for daily sales of the grocery store. How would you preprocess the data before modeling? (5 Marks)**

**Ans 3a.**

**Introduction**

Time series forecasting is an essential tool for predicting future sales patterns, especially in retail businesses like grocery stores. Forecasting daily sales allows store owners to make informed decisions regarding inventory management, staffing, and financial planning. Building a basic time series forecasting model involves several steps, from data collection to model selection. Preprocessing the data is crucial for achieving accurate predictions, as it helps ensure the time series is ready for modeling by addressing issues like missing values, seasonality, and trends. This answer outlines the key steps involved in building a time series forecasting model for grocery

**3b. How would you account for seasonal variations in sales, especially for products like fresh fruits and vegetables, in your forecasting model? (5 Marks)**

**Ans 3b.**

**Introduction**

Seasonal variations are common in retail sales, particularly for perishable products like fresh fruits and vegetables. These products tend to have predictable sales patterns based on factors like weather, holidays, and other seasonal events. Accounting for these seasonal fluctuations is essential for accurate forecasting, as it helps businesses better manage inventory and meet demand without overstocking or understocking. In time series forecasting, handling seasonality involves identifying repeating patterns in the data and incorporating them into the model. This answer will