**Financial Data Analysis & Fraud Detection**

**Objective:**

The aim of this task is to analyze financial data for a company, identify patterns, detect anomalies, and provide insights into potential cases of fraudulent transactions. You will be working with a dataset containing transactional records and customer details, and you will be required to create complex SQL queries to extract insights.

**Dataset Description:**

**Tables:**

1. **Transactions**
   * **TransactionID**: Unique identifier for each transaction
   * **CustomerID**: Unique identifier for each customer
   * **TransactionDate**: Date and time of the transaction
   * **TransactionAmount**: Amount of the transaction in USD
   * **TransactionType**: Type of transaction (e.g., "Deposit", "Withdrawal", "Transfer", "Loan Payment")
   * **AccountType**: Type of account (e.g., "Savings", "Checking", "Loan")
   * **Location**: The branch or location where the transaction occurred
   * **Status**: Whether the transaction was successful or failed
2. **Customers**
   * **CustomerID**: Unique identifier for each customer
   * **CustomerName**: Full name of the customer
   * **DOB**: Date of birth
   * **AccountBalance**: Current balance in the customer’s primary account
   * **JoinDate**: Date the customer joined the bank
   * **Email**: Customer's email address
   * **PhoneNumber**: Customer's phone number

**Tasks:**

**1. Data Exploration and Overview:**

* Query the **total number of customers** and the **total number of transactions** in the dataset.
* Find the **total transaction volume** for all transactions (sum of all TransactionAmount values).
* Identify the **top 5 customers** based on the **highest account balance**.
* Determine the **average transaction amount** for each TransactionType.
* Provide a list of **distinct account types** from the Transactions table.

**2. Time Series Analysis:**

* Calculate the **monthly total transaction volume** for each account type over the past 2 years.
* Find the **average transaction amount per month** for each transaction type.
* Identify **seasonal trends** by analyzing the transaction amounts during different months or quarters.
* Find customers who **haven't made any transactions** in the last 6 months.

**3. Fraud Detection and Anomaly Analysis:**

* Identify **potential duplicate transactions**: transactions that occur within a **short time frame** (e.g., within 1 minute) for the **same customer** and with the **same amount**.
* Detect **suspiciously large transactions**: transactions where the TransactionAmount is more than **10 times** the customer's average transaction amount.
* Find all **failed transactions** and analyze their patterns (e.g., frequency of failed transactions per customer).
* Identify **customers with sudden large withdrawals**: withdrawals where the TransactionAmount is greater than **30%** of their AccountBalance.

**4. Customer Behavior Insights:**

* Rank customers based on their **total transaction volume** over the last year.
* Identify customers who have **high account balances** but **low transaction activity** (e.g., fewer than 3 transactions in the past year).
* Calculate the **average time** between transactions for each customer.
* Determine the **most popular transaction types** based on the frequency of transactions by customer.

**5. Segmentation and Clustering:**

* Segment customers into **three categories** based on their average transaction size:
  + Small: Transaction amount < $1,000
  + Medium: $1,000 <= Transaction amount <= $10,000
  + Large: Transaction amount > $10,000
* For each segment, calculate:
  + **Total number of customers**
  + **Total transaction volume**
  + **Average number of transactions per customer**
* Identify which segments show the **highest account growth** and the **highest risk of fraud** (based on large or suspicious transactions).

**6. Custom Reports:**

* Generate a **monthly report** that shows the following:
  + Total number of transactions.
  + Total transaction volume.
  + Number of failed transactions.
  + Number of customers making transactions.
* Create a **report of inactive customers**, those who haven’t made any transactions in the last year, and their current account balance.
* Build a query that tracks customers who **make more than 10 transactions per week** and flag those with a sudden increase in transaction volume.

**7. Forecasting and Predictions:**

* Calculate the **moving average** of monthly transaction volume for the last 2 years.
* Predict the **total transaction volume** for the next quarter based on historical trends.
* Find customers who have had a **significant increase in transaction volume** compared to their historical average and might require further attention or monitoring.