DSA Project Report

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**Report for Banking System Management Project using - (DSA)**

**Project Overview:**

The Banking System Management project is designed to simulate the core functionalities of a banking system using Data Structures and Algorithms (DSA). The project aims to provide a comprehensive solution to manage banking operations efficiently, covering both ATM-based services and in-bank operations.

**Key Features:**

**1. ATM Module:**

The ATM module focuses on self-service banking functionalities that cater to customer needs outside the bank premises. Key functionalities include:

* **Cash Withdrawal:**
  + Validation of account details.
  + Checking account balance before dispensing cash.
  + Deducting the amount from the account balance.
* **Balance Inquiry:**
  + Fetching and displaying account balance.
* **PIN Change:**
  + Secure validation of the current PIN.
  + Updating the PIN in the system.
* **Mini-Statement Generation:**
  + Displaying the last 5-10 transactions.
* **Error Handling:**
  + Insufficient funds.
  + Incorrect PIN.
  + Transaction timeouts.

**Data Structures for ATM Module:**

* **Queue:** For managing transaction requests.
* **Array/Linked List:** For storing transaction history (mini-statements).
* **Hashing:** For quick PIN validation.

**2. In-Bank Operations Module:**

This module handles comprehensive banking operations that require customer interaction within the bank premises. Key functionalities include:

* **Account Creation:**
  + Capturing and storing customer details such as name, address, contact details, and initial deposit.
  + Assigning a unique account number.
* **Cash Deposit:**
  + Validating account details.
  + Updating the account balance.
* **Cash Withdrawal:**
  + Similar to the ATM module with additional in-bank authentication.
* **Account Closure:**
  + Verification of account details and pending transactions.
  + Calculating the final payout to the customer.
* **Loan Services:**
  + Recording loan applications.
  + Calculating loan eligibility and repayment schedules.
* **Report Generation:**
  + Generating customer account details.
  + Providing financial summaries for the bank.

**Data Structures for In-Bank Operations Module:**

* **Linked List:** For dynamic storage of customer accounts.
* **Tree (e.g., Binary Search Tree):** For quick search and retrieval of account information.
* **Graph:** For representing relationships in loan services (e.g., dependencies in joint accounts).
* **Hash Map:** For storing customer details and providing efficient lookups.

**Additional Features:**

* **Security and Authentication:**
  + Implementation of encryption for sensitive data like PINs and passwords.
  + Role-based access control (e.g., admin, cashier, customer).
* **Transaction Logging:**
  + Maintaining a log of all transactions for audit purposes.
* **Error and Exception Handling:**
  + Ensuring system robustness against input errors, server downtime, or hardware issues.
* **Scalability:**
  + Design the system to handle large volumes of accounts and transactions efficiently.

**Technology Stack:**

* **Programming Language:** C++ (preferred for DSA-intensive projects).
* **Libraries:** STL (Standard Template Library) for implementing data structures and algorithms.
* **Database (optional):** SQLite or file-based storage for persistence.

**Expected Outcomes:**

* A fully functional prototype simulating a banking system with modular components for ATM and in-bank operations.
* Efficient use of data structures and algorithms to ensure optimal performance.
* Enhanced understanding of how DSA concepts apply to real-world applications.

This project demonstrates how Data Structures and Algorithms can be applied to simulate real-world scenarios, providing a hands-on experience of working with advanced data structures and algorithms in the context of an essential and familiar domain—banking.