A

PROJECT REPORT ON

"Electicity Billing System"

SUBMITTED BY

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SUBMITTED TO

SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN PARTIAL FULFILLMENT OF DEGREE

MASTER OF COMPUTER APPLICATION[SEM-1]

UNDER THE GUIDANCE OF

Dr. Deepali Gavhane Mam

Through,

Sadhu Vaswani Institute OF Management Studies For Girls

Koregaon Park,Pune-411001

2024-2025

CERTIFICATE

This is to certified that the mini project report entitled, **"Electricity Management System"** being submitted here with in partial fulfilment of the requirement of the award of the degree of **MASTER OF COMPUTER APPLICATION[SEM-II]** to Savitribai Phule Pune University, Pune is the result of the original project work completed by **Mohini Gangaram Bhatane.** under my supervision and guidance and to the best of my knowledge and belief, the work embodied in this project has not formed earlier the basis for the award of any degree of similar title or any other University or examining body.

Date:

Place: Pune

Dr. Deepali Gavhane	**Neeta Rasker**	**Dr. B.H. Nanwani**
(Project Guide)	(HOD)	(Director)

DECLARATION BY STUDENT

To,

The Director,

SVIMS, Koregaon Park, Pune

I undersigned hereby declare that this project titled, **"Electricity Billing System**" written and submitted by me to SPPU, Pune, in partial fulfilment of the requirement of the award of the degree of **MASTER OF COMPUTER APPLICATION (MCA-I)** under the guidance of **Dr. Deepali Gavhane,** is my original work.

I further declare that to the best of my knowledge and belief, this project has not been submitted to this or any other University or Institution for the award of my degree.

Place: Pune

Date: **(Mohini Gangaram Bhatane)**

ACKNOWLEDGEMENT

I extend my sincere gratitude to Dr. B. H. Nanwani, Dr. Neeta Raskar and Dr. Deepali Gavhane for allowing me to carry out the study and for their constant encouragement, valuable suggestions, and guidance during the research work.

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I extend my special gratitude to my dearest family members and friends who encouraged and motivated me to complete the project report.

Place: Pune

Date: (Mohini Gangaram Bhatane)

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CHAPTER 1 : INTRODUCTION

1.1 Client/Organization Profile :

Organization Name: XYZ Electricity

Type of Organization: Government/Public Utility Service Provider

Industry: Power & Energy Distribution

Location: Pune

XYZ Electricity Board is a government-regulated organization responsible for the distribution and billing of electricity to residential, commercial, and industrial sectors within its designated region. The organization manages a large volume of consumer data and conducts monthly billing operations based on electricity usage.

1.2 Need For System :

1. In today's rapidly growing technological era, managing electricity billing manually has become inefficient, time-consuming, and prone to errors. Traditional paper-based or spreadsheet-based systems used by many electricity boards result in delays in bill generation, difficulty in maintaining consumer data, and increased chances of miscalculations.

- There is a strong need for an automated Electricity Billing System that ensures accurate, timely, and efficient billing processes.
- electricity providers can streamline operations, reduce manual workload, and enhance data security.

1. **Elimination of Manual Errors:**
   In manual billing systems, there is a high chance of human errors in meter reading entries, bill calculation, and customer details management. An automated system significantly reduces such errors by performing accurate and consistent computations based on predefined logic and formulas.
2. **Faster and Efficient Bill Generation:**
   Manual billing is time-consuming, especially when dealing with a large number of customers. This system enables rapid processing of billing data, which allows bills to be generated and printed quickly, thus saving time and increasing productivity for the billing department.
3. **Centralized Data Management:**
   With the use of MySQL as a back-end database, all customer information, meter readings, and billing history are stored in a centralized and structured format. This allows for easy access, modification, and retrieval of data, ensuring better organization and record-keeping.
4. **User-Friendly Interface for Staff:**
   The desktop application developed in Java provides a graphical user interface (GUI) that simplifies the usage of the system. Even users with minimal technical skills can navigate the system easily to manage records, generate bills, and view reports.
5. **Secure Data Handling:**
   Sensitive customer data and billing information are protected through user authentication and role-based access. This ensures that only authorized personnel can access or modify critical records, enhancing the security and confidentiality of the system.

6. **Automated Billing Calculations:**
   The system automatically calculates the number of units consumed, applies the correct rates, adds applicable taxes, and generates the final bill amount. This eliminates the need for manual calculations and ensures billing consistency and accuracy.
7. **Detailed Report Generation:**
   The system supports the generation of various reports such as monthly consumption summaries, unpaid bill lists, and payment histories. These reports help in better decision-making, tracking of defaulters, and monitoring overall usage patterns.
8. **Reduction in Paperwork and Operational Costs:**
   Digital storage and automated processes reduce the dependency on paper-based records and manual effort. This leads to a decrease in operational costs, supports environmental sustainability, and makes the office workflow more efficient.
9. **Improved Customer Service:**
   With faster access to customer data and billing history, the staff can respond to customer queries more effectively. Quick and accurate bill generation also enhances customer satisfaction and trust in the organization.
10. **Scalability and Future Expansion:**
    The system is designed to be scalable, allowing future enhancements such as online payment integration, mobile app support, or expansion to handle more users and features. This makes it a long-term solution for electricity billing needs.

1.3 Feasibility of work :

- **Technical Feasibility**

Definition: This assesses whether the proposed project can be developed with the current technology, expertise, and resources available. It evaluates whether the technical aspects of the project are achievable.

Focus:

- Availability and maturity of technology
- Technical skills and expertise of the team
- Hardware, software, and infrastructure requirements
- Potential technical risks and challenges

- **Economic Feasibility**

Definition: Economic feasibility evaluates the financial aspects of a project. It assesses whether the benefits of the project outweigh the costs involved and if the project is financially viable.

Focus:

- Total project cost (initial and ongoing):
- Return on investment (ROI):
- Financial risks:
- Revenue projections, savings, or benefits:

- **Operational Feasibility**

Definition: Operational feasibility assesses whether the organization has the resources, processes, and operational capabilities to implement and sustain the project. It focuses on how well the project will fit into the existing organizational structure and daily operations.

Focus:

- Alignment with organizational goals and processes:
- Availability of human resources and skills:
- Impact on daily operations and workflow:
-

1.4 Operating Environment :

Client-Side System Specification

Hardware:

Item name	Specification
Laptop/Desktop	Minimum Intel CORE i3 or above Minimum RAM:8192 MB or more Minimum Hard disk:1GB free space

Software:

Particular	Specification
Operating system	Minimum windows 10 or above.
Database	MySql

Developer-Side System Specification

Hardware:

Item name	Specification
Laptop/Desktop	Intel CORE i3 12^{th} Gen RAM 4 GM Hard Disk: 512 GB

Software:

Particular	Specification
Operating System	Windows 10, Intel CORE i3
Documentation	Microsoft office 2010 or higher
Database	MySQL 8.0.x

1.5. Architecture of System:

The architecture of the Electricity Billing System is based on a three-layer architecture, consisting of the User Interface Layer, Application Layer, and Database Layer. This architecture ensures modularity, scalability, and ease of maintenance.

1. User Interface Layer (Frontend):

This layer allows users (such as billing staff, administrators, and support personnel) to interact with the system. Since this is a desktop application developed in Java, the interface is built using Java Swing/JavaFX.

Includes:

- Java-based GUI:

  Developed using Java Swing or JavaFX, providing a desktop interface that is responsive and user-friendly.
- User Authentication & Authorization:

  Includes login screens and access management for different roles such as Admin and Billing Staff.
- Input Forms:

  Forms for customer registration, meter reading input, bill generation, and payment updates.
- Navigation Menus:

  GUI menus for accessing billing history, customer database, reports, and system settings.

2. Application Layer (Backend):

This layer contains the business logic of the system. It is responsible for processing user inputs, applying business rules, generating bills, and interacting with the database.

Components:

- Business Logic Controller:
  Handles bill calculation based on units consumed, applies tariffs, taxes, and generates final billing statements.
- Session Management:
  Manages login sessions and user access rights for different modules of the system.
- Data Validation Module:
  Validates user inputs (e.g., numeric fields for meter readings, non-empty values, etc.) before saving to the database.
- Report Generator:
  Generates printable reports like monthly billing summaries, customer payment records, and defaulters list.
- Notification Module (optional):
  Can be extended to provide notifications or alerts for due bills or payment confirmations.

3. Database Layer (Data Storage):

This layer is responsible for storing all the structured data related to the electricity billing process. The database used is MySQL.

Components:

- Relational Database (MySQL):
  Stores structured data such as:
  - Customer details (name, address, meter number)
  - Meter readings and billing records
  - User login and role information

1. System Flow:

1. System Login:

- User opens the desktop application.
- Login screen appears.
- User enters username and password.
- System verifies credentials from the MySQL database.
- If valid → Redirects to dashboard based on user role (Admin / Staff).
- If invalid → Shows error message.

2. Customer Registration / Management:

- Admin or Staff selects "Add New Customer."
- Enters customer details (name, meter number, address, contact info).
- Data is validated and saved to the customer table in MySQL.
- Existing customer details can be viewed, updated, or deleted.

3. Meter Reading Entry:

- Staff selects "Enter Meter Reading."
- Selects the customer by meter number or name.
- Inputs current reading.
- System automatically calculates units consumed by subtracting the previous reading from the current reading.
- Reading and consumption details are saved in the database.

4. Bill Generation:

- System calculates the bill amount based on:
  - Units consumed
  - Predefined tariff rates
  - Applicable taxes or surcharges
- Generates a bill summary:
  - Customer details
  - Units consumed
  - Cost per unit

5. Payment Update:

- Staff selects "Update Payment."
- Enters payment details such as amount paid, payment mode (cash/card/online).
- System updates the payment status in the billing table.
- Balance amount, if any, is also recorded.

6. Report Generation:

- Admin or authorized staff can generate:
    - Monthly usage reports
    - Payment history
    - List of unpaid bills (defaulters)

6. User Logout:

- User can safely log out from the application.
- Session is closed, and the user is returned to the login screen.

1.5 Detail Of Technology Used :

1.Java:

- **Introduction:**

  Java is a powerful, object-oriented programming language known for its platform independence, scalability, and security features. It is commonly used for developing desktop, web, and mobile applications. Java provides robust tools for building user interfaces and handling business logic efficiently.

- **Role in the Project:**

  - Java is used to design the Graphical User Interface (GUI) of the desktop application using Swing or JavaFX.
  - It handles all user interactions, such as logging in, entering meter readings, and generating bills.
  - Java manages the application logic, including bill calculations, validations, and data processing.
  - It enables connectivity to the MySQL database through JDBC (Java Database Connectivity), allowing real-time reading and writing of data.
  - Java also supports report generation and data visualization within the application.

- **MySQL:**

- **Introduction:**

  MySQL is a widely-used open-source Relational Database Management System (RDBMS). It is known for its speed, reliability, and ease of use. MySQL is ideal for storing structured data and supports powerful SQL queries for data retrieval and manipulation.

- **Role in the Project:**

  - MySQL is used to store all the application data, including:
    - Customer details
    - Meter readings
    - Billing records
    - Payment history
    - User login information

- MySQL supports secure data access, allowing only authenticated users to access or modify records.
- It enables efficient querying and reporting, which is essential for generating monthly reports, tracking payments, and identifying defaulters.
- The database can be easily backed up and restored, ensuring data safety.

CHAPTER 2: PROPOSED SYSTEM

2.1 Proposed System:

The proposed Electricity Billing System (EBS) is a desktop-based application designed to automate and manage the process of electricity billing. It provides a centralized, secure, and efficient platform to handle customer records, meter readings, bill generation, payment updates, and report generation. The system replaces the traditional manual billing methods with an automated solution, reducing human error, improving data accuracy, and ensuring faster service delivery.

- Customer Registration and Management
- Meter Reading Entry
- Automated Bill Generation
- Payment Recording and Tracking
- Bill History and Usage Reports
- User Roles and Access Control
- Secure Data Management
- Scalability and Maintainability

2.2 Objective of System:

The core objectives of the proposed Electricity Billing System are outlined below:

- Automate Billing Operations
- Ensure Accuracy and Transparency
- Centralize Consumer and Billing Data
- Improve Workflow Efficiency
- Enhance User Access Control
- Generate Timely Reports
- Provide Long-Term Scalability

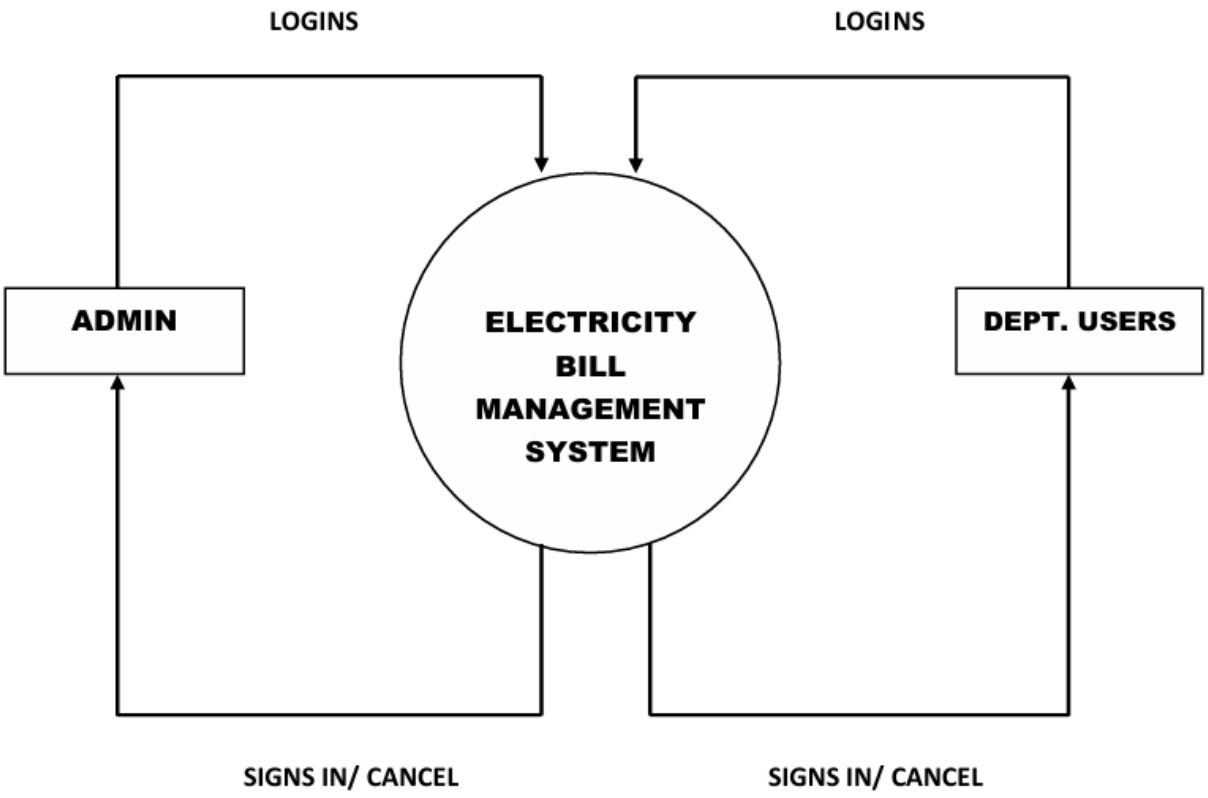
- **User Requirements:**

  To meet the functional needs of different users, the system includes the following requirements:

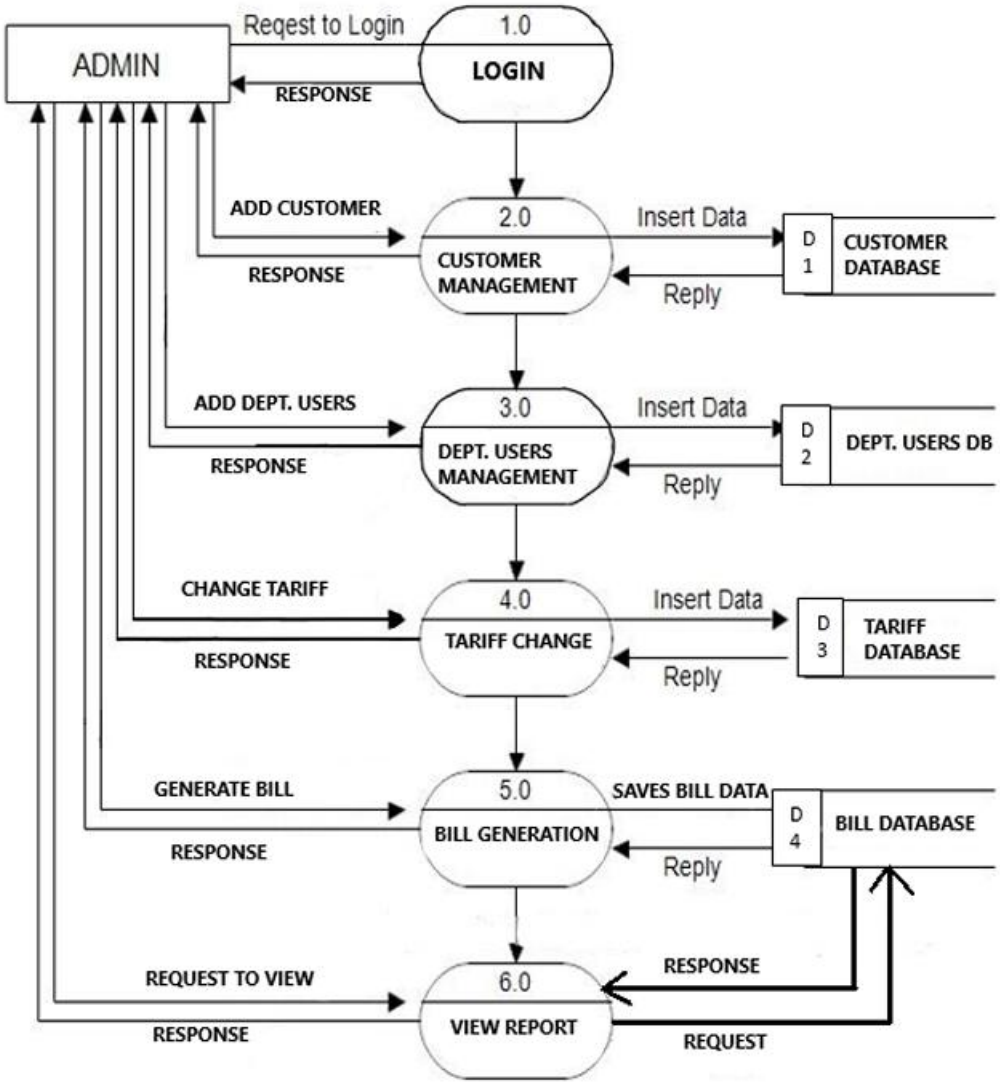
- User Roles and Permissions
- Customer Management
- Meter Reading and Billing
- Payment Management
- Communication and Notifications *(optional/future scope)*
- Report Generation
- System Usability

CHAPTER 3 : ANALYSIS & DESIGN

DFD:



- **Zero Level DFD :**



3.2 Table Specifications :

Table Bill:

Column Name	Data Type	Description
meter	VARCHAR(50) (PK)	Unique ID for each meter
units	VARCHAR(45)	Unit
month	VARCHAR(50)	How many month electicity used
Total bill	VARCHAR(50)	Calculating total bill
status	VARCHAR(50)	Bill paid or not

Table User:

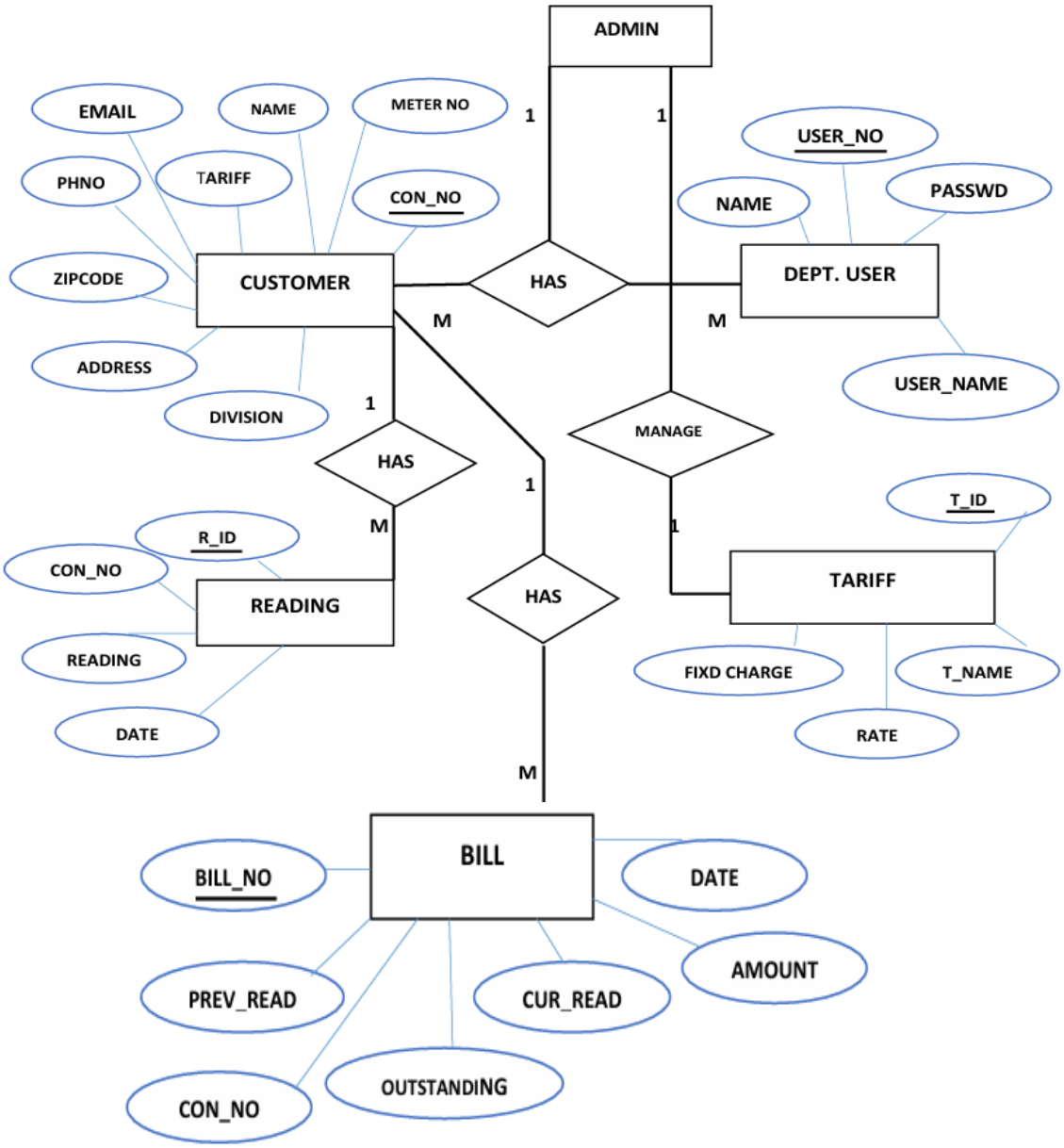
Column Name	Data Type	Description
Name	VARCHAR(150) (PK)	Name of customer having unique id
meter	VARCHAR(50)	How many meter is used
address	VARCHAR(145)	Address of customer
city	VARCHAR(50)	City of customer
state	VARCHAR(50)	Status of customer
email	VARCHAR(150)	Email of customer
phone	VARCHAR(50)	Phone number of customer

Table Login:

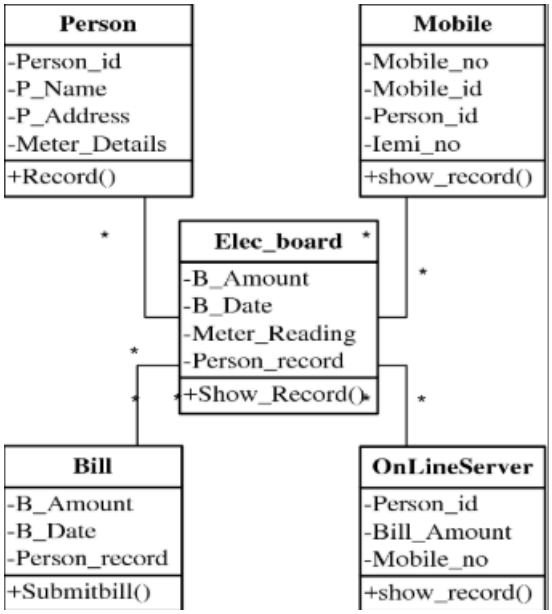
Column Name	Data Type	Description
Username	VARCHAR(150) (PK)	Name of customer having unique id
password	VARCHAR(50)	Password for security purpose
name	VARCHAR(145)	name of customer
Meter_no	VARCHAR(50) (PK)	Meter no. of customer
user	VARCHAR(50)	Any user,customer

Table meter_info:

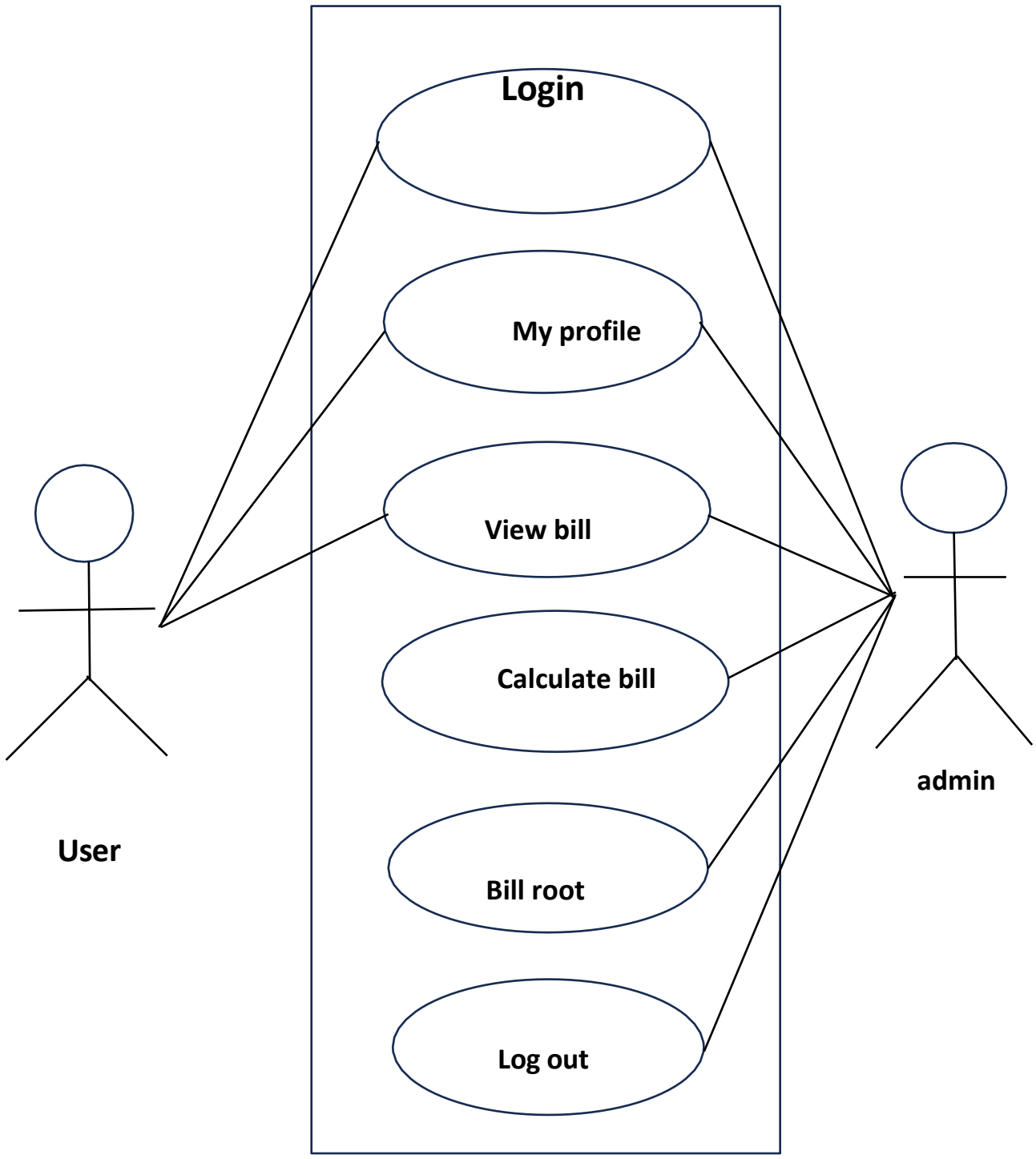
Column Name	Data Type	Description
Meter_no	VARCHAR(50) (PK)	Meter no. of customer having unique id
Meter_location	VARCHAR(50)	Location of customer
Meter_type	VARCHAR(145)	Meter type
Meter_no	VARCHAR(50)	Number of meter
Phasse_code	VARCHAR(50)	Customer phase code
Bill_type	VARCHAR(50)	Type of bill
Days	VARCHAR(50)	How many days electricity used


ADMIN
EMAIL
NAME
METER NO
PHNO
TARIFF
CON_NO
ZIPCODE
CUSTOMER
ADDRESS
DIVISION
HAS
1
1
M
USER_NO
NAME
PASSWD
DEPT. USER
M
USER_NAME
MANAGE
1
1
HAS
M
R_ID
CON_NO
READING
READING
DATE
HAS
1
T_ID
TARIFF
FIXD CHARGE
T_NAME
RATE
M
BILL
BILL_NO
DATE
AMOUNT
PREV_READ
CUR_READ
OUTSTANDING
CON_NO

3.3 Class Diagram :

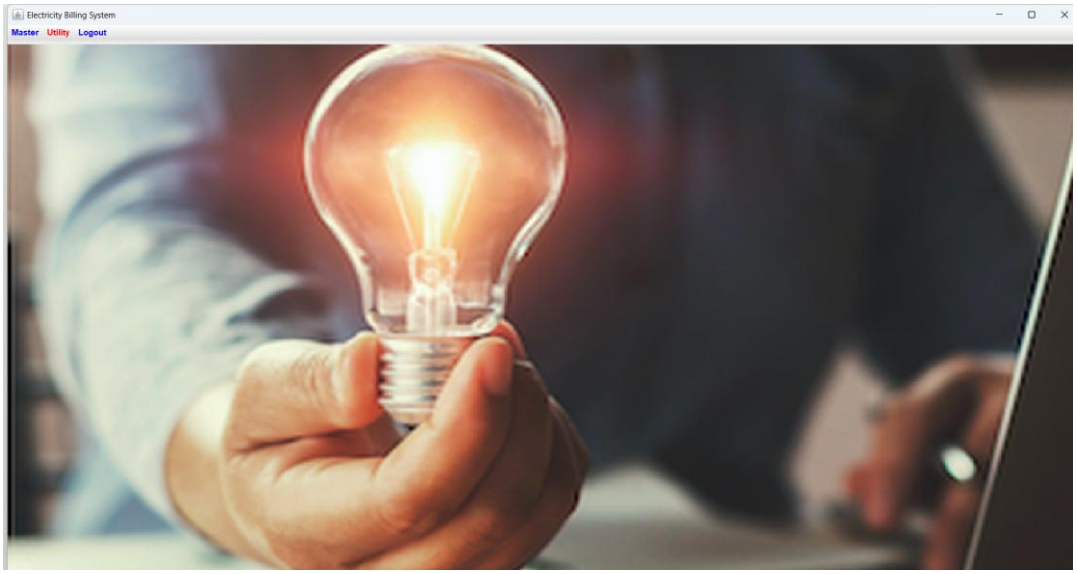


3.4 Use Case Diagram :

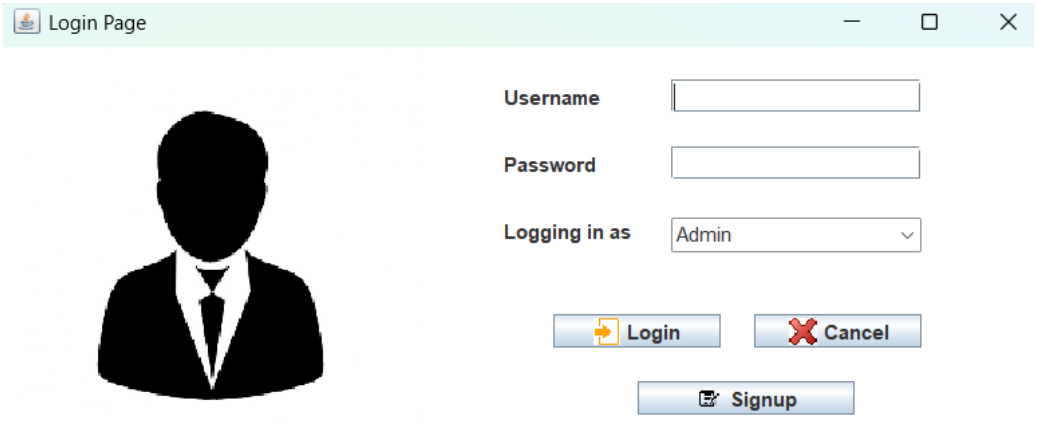


CHAPTER 4 : USER MANUAL

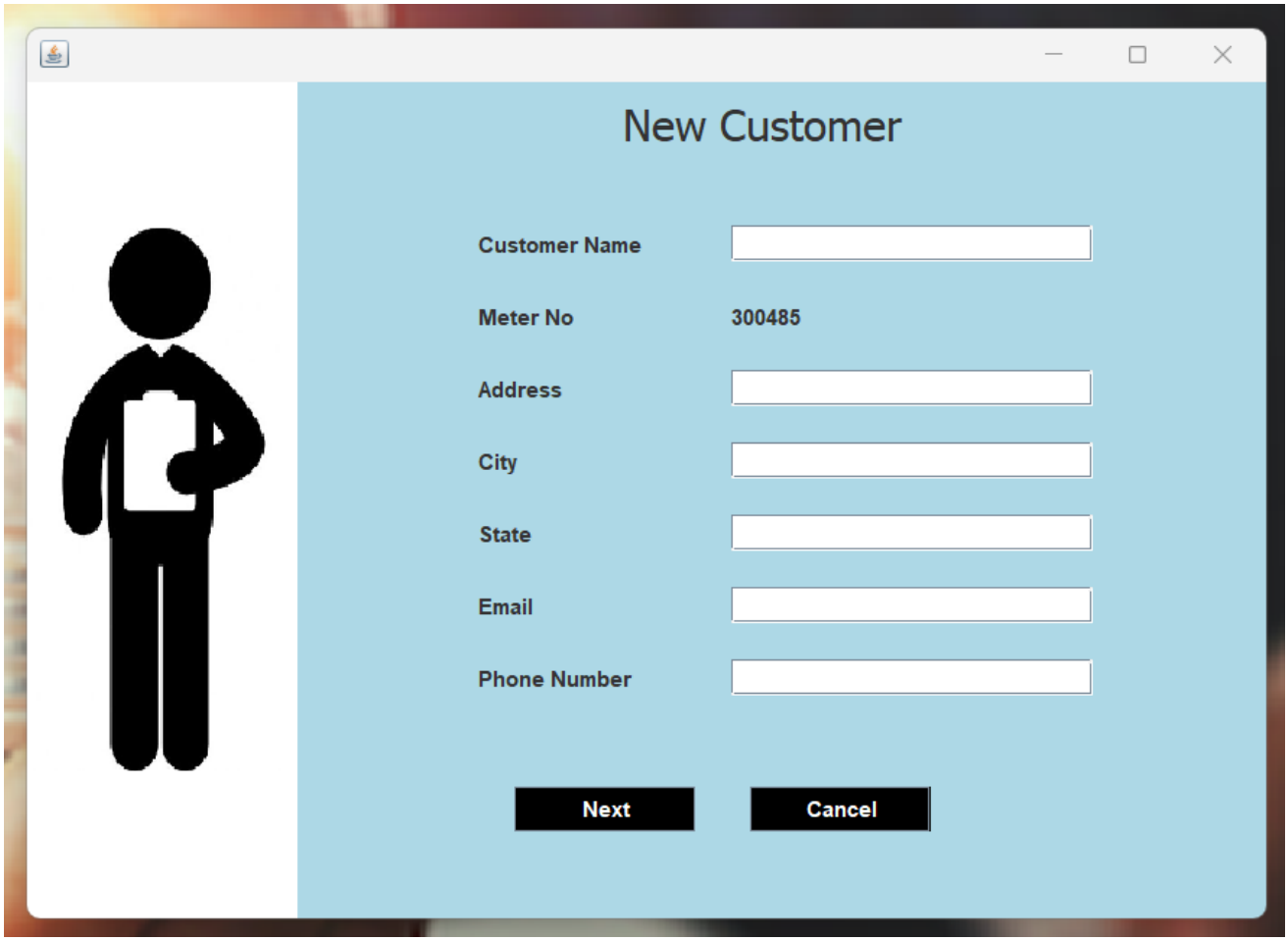
Home Page:



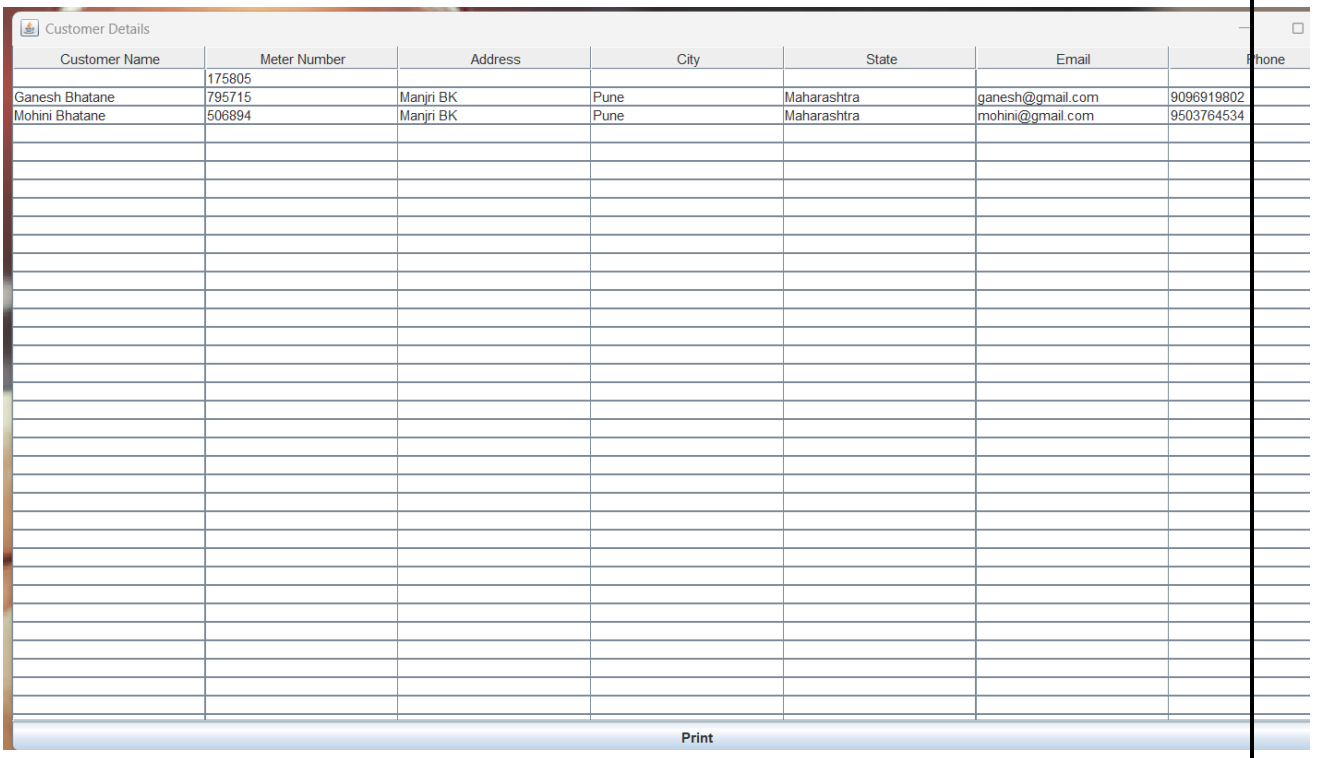
Login Page :



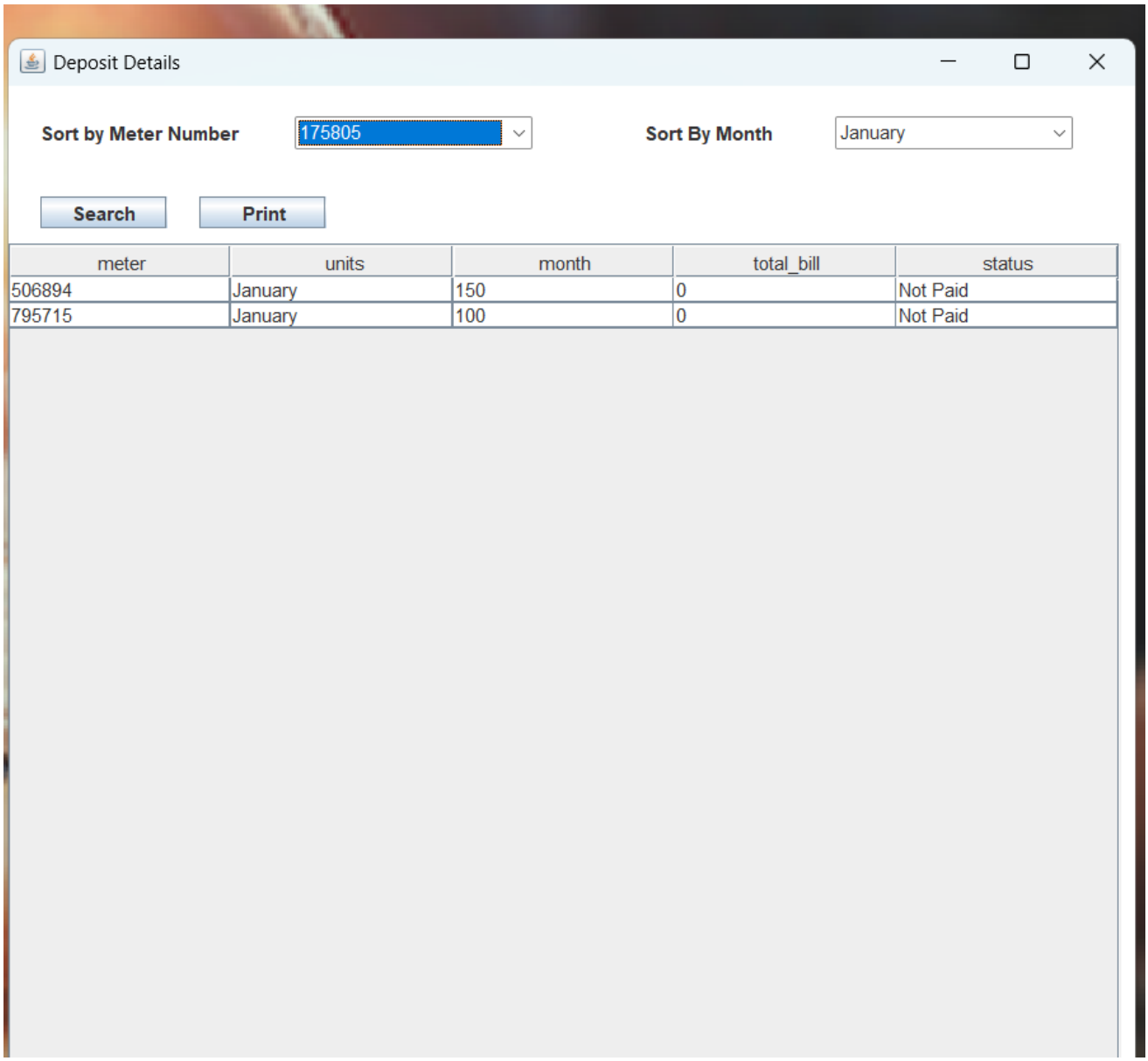
- **New customer :**



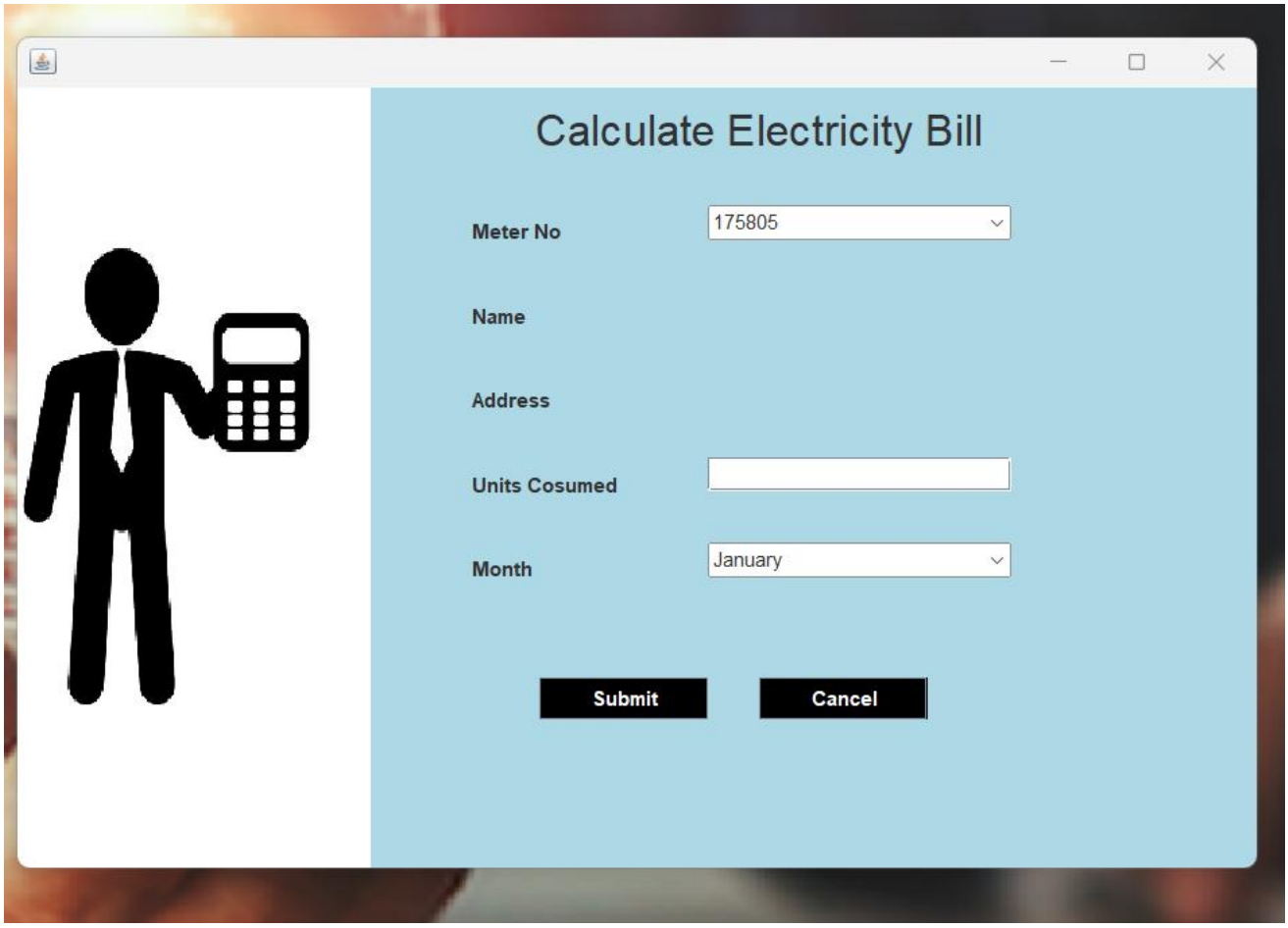
- **Customer Details :**



- **Deposit Details:**



- **Electricity Bill:**



6.2 Limitations :

While the Electricity Billing System (EBS) offers numerous advantages such as automation, accuracy, and improved efficiency, it also has several limitations that should be considered during implementation and day-to-day use. Below are some common limitations associated with electricity billing system projects:

1. Initial Setup and Integration Costs

   Implementing an electricity billing system may involve significant initial investment in infrastructure, software, training, and integration with existing utility services.

2. Technical Maintenance and Support

   Regular updates, bug fixes, and technical support are required to ensure smooth system performance. A lack of reliable IT support can lead to disruptions.

3. Limited Flexibility for Custom Tariff Structures

   Some systems may not fully support complex or dynamic billing structures (like time-of-use rates or seasonal tariffs), requiring manual interventions.

4. System Downtime and Data Loss Risks

   In the event of system failures, power outages, or cyberattacks, there is a risk of data loss or delayed billing and payments.

5. Dependency on Internet and Digital Infrastructure

   The system relies heavily on stable internet connectivity and hardware infrastructure, which may be lacking in rural or underdeveloped areas.

6. Security and Privacy Concerns

   Handling sensitive user data like payment information and personal details requires robust security measures, and any lapse can lead to data breaches.

7. Resistance to Technology Adoption

   Some users or employees may resist transitioning from manual to automated systems due to lack of technical knowledge or preference for traditional methods.

8. Vendor Dependency

   Organizations may become dependent on specific software vendors for ongoing support, updates, and customization, leading to potential vendor lock-in.

6.3 Future Enhancement :

The **Electricity Billing System** has the potential for significant improvement with the adoption of modern technologies and evolving user expectations. Future enhancements can increase automation, accuracy, user engagement, and operational efficiency. Some key areas for future enhancement include:

1. Smart Meter Integration
2. Artificial Intelligence (AI) and Machine Learning (ML)
3. Blockchain Technology
4. Cloud-Based System.
5. Mobile Application Support
6. Automated Notifications and Alerts
7. Advanced Reporting and Analytics

BIBLIOGRAPHY

- **REFERANCE BOOK :**

1. Java: The Complete Reference

2. Learning mysql

3. Software Engineering.

4. Database Management System.

- **WEBSITE :**

http://www.w3school.com

http://www.codeacademy.com

http://github.com

ANNEXTURE:

```
package Electricity;


import java.awt.*;
import java.awt.event.*;
import javax.swing.*;
import java.sql.*;


public class Login extends JFrame implements ActionListener{
   JLabel l1,l2,l3, l4;
   JTextField tf1;
   JPasswordField pf2;
   JButton b1,b2, b3;
   JPanel p1,p2,p3,p4;
   Choice c1;
   Login(){
      super("Login Page");
      setLayout(null);
      getContentPane().setBackground(Color.WHITE);


      l1 = new JLabel("Username");
      l1.setBounds(300, 20, 100, 20);
      add(l1);
      l2 = new JLabel("Password");
```

```
l2.setBounds(300, 60, 100, 20);

add(l2);


tf1 = new JTextField(15);

tf1.setBounds(400, 20, 150, 20);

add(tf1);

pf2 = new JPasswordField(15);

pf2.setBounds(400, 60, 150, 20);

add(pf2);


l4 = new JLabel("Logging in as");

l4.setBounds(300, 100, 100, 20);

add(l4);


c1 = new Choice();

c1.add("Admin");

c1.add("Customer");

c1.setBounds(400, 100, 150, 20);

add(c1);
```