# ELECTRICITY BILL GENERATION DOCUMENTATION

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## Modularization

Modularization is the process of dividing a software system into **independent, manageable, and reusable modules**, where each module performs a specific task.

```
Electricity_Bill_System/
|
├── config/
|   └── config.php
|
├── database/
|   └── database.sql
|
├── public/
|   ├── index.html
|   ├── user_dashboard.php
|   ├── employee_dashboard.php
|   └── admin_dashboard.php
|
├── modules/
|   ├── register_user.php
|   ├── generate_bill.php
|   └── view_bill.php
|
├── assets/
|   ├── css/
|   |   └── style.css
|   └── images/
|
└── README.md
```

## MODULE SPECIFICATIONS

**Module 1: index.html**

- **Module Name:** Home / Login Page
- **Purpose:** Entry point of the Electricity Bill System
- **Input:** User credentials (login selection)
- **Preconditions:** Web server must be running
- **Logic:**
    1. Display homepage
    2. Provide links to login/register
- **Output:** Redirects user to respective dashboard or login page

**Module 2: config.php**

- **Module Name:** Database Configuration
- **Purpose:** Establish database connection
- **Input:** Database host, username, password, database name
- **Preconditions:** MySQL server should be active
- **Logic:**
    1. Define database credentials
    2. Create connection using MySQLi
    3. Handle connection errors
- **Output:** Active database connection object.

**Module 3: register_user.php**

- **Module Name:** User Registration
- **Purpose:** Register new electricity consumers
- **Input:** Username, meter number, password
- **Preconditions:** User should not already exist
- **Logic:**
    1. Accept user details from form

2. Validate inputs
3. Insert data into users table

- **Output:** Successful registration message

**Module 4: admin_dashboard.php**

- **Module Name:** Admin Dashboard
- **Purpose:** Manage system users and employees
- **Input:** Admin login credentials
- **Preconditions:** Admin must be authenticated
- **Logic:**
    1. Display admin controls
    2. View users and employees
    3. Manage system data
- **Output:** Admin management interface

**Module 5: employee_dashboard.php**

- **Module Name:** Employee Dashboard
- **Purpose:** Generate and manage electricity bills
- **Input:** User ID, units consumed
- **Preconditions:** Employee must be logged in
- **Logic:**
    1. Fetch user details
    2. Enter units consumed
    3. Redirect to bill generation
- **Output:** Bill generation request processed

**Module 6: generate_bill.php**

- **Module Name:** Bill Generation
- **Purpose:** Calculate electricity bill
- **Input:** Units consumed, tariff details
- **Preconditions:** Valid user ID exists
- **Logic:**

1. Read units consumed
2. Apply tariff slabs
3. Calculate total amount
4. Store bill in database

- **Output:** Generated bill stored successfully

**Module 7: view_bill.php**

- **Module Name:** View Bill
- **Purpose:** Display electricity bill to user
- **Input:** User ID
- **Preconditions:** Bill must already be generated
- **Logic:**
    1. Fetch bill details from database
    2. Display units, amount, and date
- **Output:** Bill details shown on screen

**Module 8: user_dashboard.php**

- **Module Name:** User Dashboard
- **Purpose:** Allow users to view their bills
- **Input:** User login credentials
- **Preconditions:** User must be authenticated
- **Logic:**
    1. Display user information
    2. Provide option to view bills
- **Output:** User billing information displayed

**Module 9: database.sql**

- **Module Name:** Database Schema
- **Purpose:** Define database structure
- **Input:** SQL commands
- **Preconditions:** MySQL installed
- **Logic:**

1. Create database
2. Create tables (users, bills, employees)

- **Output:** Database schema created successfully

## Algorithm Name: Electricity Bill Calculation

- **Objective:**
- To calculate the electricity bill amount based on the number of units consumed using slab-wise tariff rates and store the bill details in the database.

**Input:**

- Number of units consumed

**Output:**

- Total electricity bill amount

**Algorithm Steps:**

1. **Start**
2. **Read** the number of units consumed by the consumer.
3. **Initialize** tariff rates rate1, rate2, and rate3 according to the electricity board rules.
4. **If** the number of units consumed is less than or equal to 100, **then**
    - Calculate
      Bill = units × rate1
5. **Else if** the number of units consumed is greater than 100 **and** less than or equal to 200, **then**
    - Calculate
      Bill = (100 × rate1) + (units − 100) × rate2
6. **Else**
    - Calculate
      Bill = (100 × rate1) + (100 × rate2) + (units − 200) × rate3
7. **Display** the total electricity bill amount to the user.
8. **Store** the calculated bill details in the database for future reference.
9. **Stop**

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# TEST PLAN

**Function 1: sanitize_input($data):**

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_01 |
| **Functionality** | Sanitize user input |
| **Input** | <script>alert(1)</script> |
| **Expected Output** | Sanitized safe string |
| **Actual Output** | Input sanitized successfully |
| **Test Result** | Pass |

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_02 |
| **Functionality** | Remove SQL injection characters |
| **Input** | ' OR 1=1 -- |
| **Expected Output** | Escaped and safe string |
| **Actual Output** | Input escaped successfully |
| **Test Result** | Pass |

**Function 2: generateServiceNo($category_id):**

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_03 |
| **Functionality** | Generate unique service number |
| **Input** | Category ID = 1 |
| **Expected Output** | 10-digit unique service number |
| **Actual Output** | Unique service number generated |
| **Test Result** | Pass |

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_04 |
| **Functionality** | Prevent duplicate service numbers |
| **Input** | Existing service number |
| **Expected Output** | New unique service number |
| **Actual Output** | Duplicate avoided successfully |
| **Test Result** | Pass |

**Function 3: generateBillNo():**

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_05 |
| **Functionality** | Generate bill number when bills exist |
| **Input** | Existing bill records |
| **Expected Output** | Incremented bill number |
| **Actual Output** | Bill number generated correctly |
| **Test Result** | Pass |

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_06 |
| **Functionality** | Generate first bill number |
| **Input** | Empty bills table |
| **Expected Output** | BILL-YYYY-000001 |
| **Actual Output** | First bill number generated |
| **Test Result** | Pass |

**Function 4: isAdminLoggedIn() :**

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_07 |
| **Functionality** | Check admin login status |
| **Input** | Admin session set |
| **Expected Output** | Returns true |
| **Actual Output** | True |
| **Test Result** | Pass |

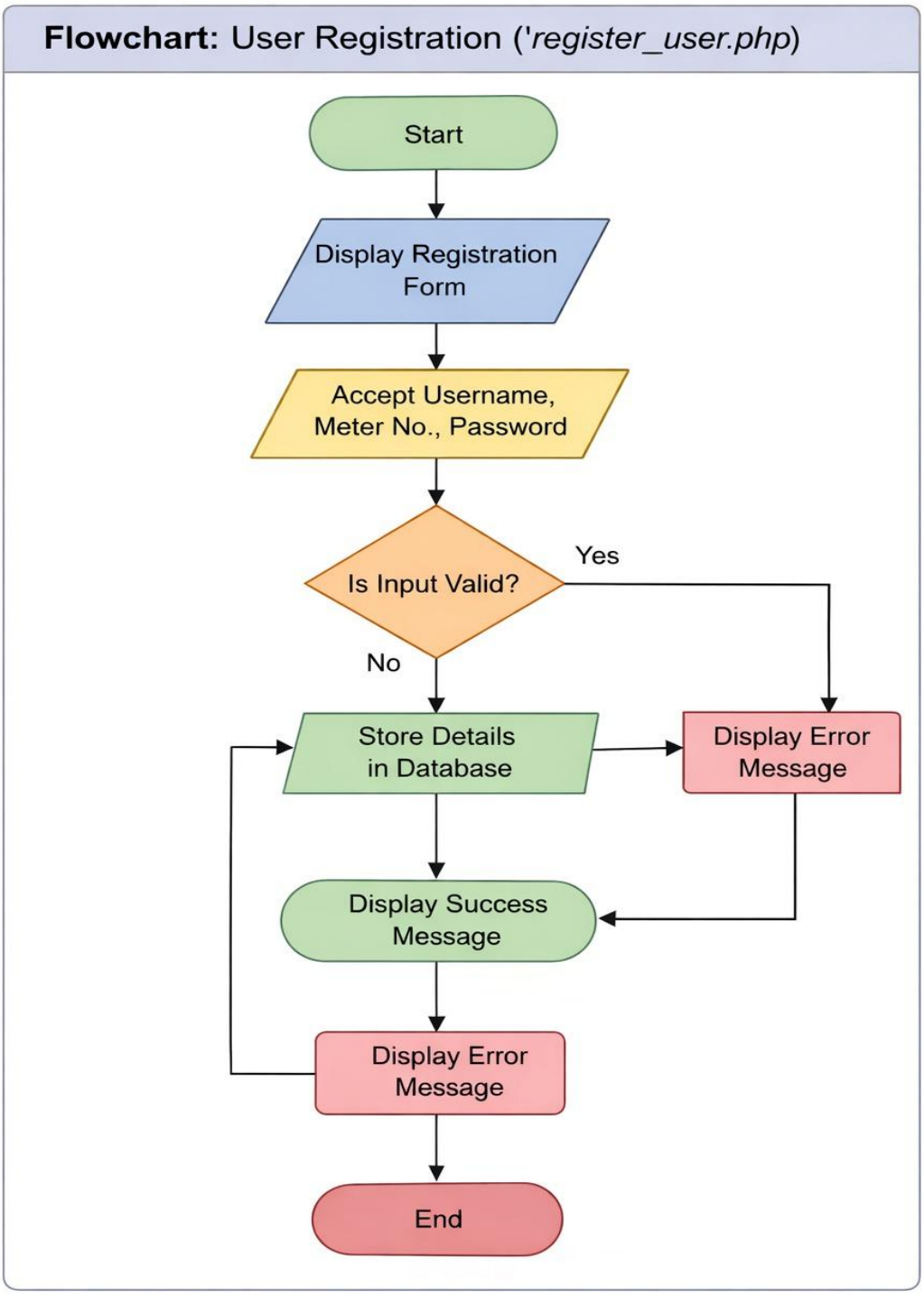
**Function 5: isEmployeeLoggedIn() :**

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_8 |
| **Functionality** | Check employee login status |
| **Input** | Employee session set |
| **Expected Output** | Returns true |
| **Actual Output** | True |
| **Test Result** | Pass |

**Function 6: isUserLoggedIn() :**

| Field | Description |
|---|---|
| **Test ID** | TC_CFG_9 |
| **Functionality** | Check user login status |
| **Input** | User session set |
| **Expected Output** | Returns true |
| **Actual Output** | True |
| **Test Result** | Pass |

**USING DRAW.IO:**

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## QUALITY CHARACTERISTICS

**Usability (Easy to Use)**

- Simple and intuitive user interface
- Separate dashboards for Admin, Employee, and User
- Clear navigation and readable forms
- Error messages guide the user properly

**Example:**
Users can view bills with a single click, and employees can generate bills without technical knowledge.

**Efficiency (Optimal Use of Resources)**

- Single database connection reused using config.php
- Optimized SQL queries reduce processing time
- Minimal memory usage by avoiding redundant data storage
- Server-side validation reduces unnecessary page reloads

**Result:**
Fast response time and low server load.

**Reusability**

- Database connection module reused across all PHP files
- Bill calculation logic reused wherever required
- Authentication logic reused for different roles

**Benefit:**
Same modules can be reused in other billing or utility-based applications

**Interoperability**

- Uses PHP, MySQL, HTML, CSS
- Can run on different platforms (Windows, Linux)
- Works on multiple browsers
- Can be extended to mobile or API-based systems

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