Control Flow:-

1. **User Authentication:**

* Users can register as either an admin or a user using the registration form.
* Registered users can log in using their credentials (username and password).
* Upon successful login, admin users are redirected to the admin home page, while regular users are redirected to the user home page.
* User roles (admin or user) are stored in the **users** table.

1. **Admin Functionality:**
   * 1. **Manage Clients:**

* Admin users can view the list of clients in the **manage\_clients** page.
* They can add new clients using the **add\_client** form, specifying client details such as name, address, GSTIN, email, contact, issuer, and client type.
* Existing clients can be edited using the **edit\_client** form, allowing admins to update client information.
* Clients can be deleted using the **delete\_client** functionality.
* Client data is stored in the **clients** table.
  + 1. **Manage Issuers:**
* Admin users can view the list of issuers in the **manage\_issuers** page.
* They can add new issuers using the **add\_issuer** form, specifying the issuer name.
* Existing issuers can be edited using the **edit\_issuer** form, allowing admins to update the issuer name.
* Issuers can be deleted using the **delete\_issuer** functionality.
* Issuer data is stored in the **issuers** table.
  + 1. **Manage Fees:**
* Admin users can view the list of fees in the **manage\_fees** page.
* They can add new fees using the **add\_fee** form, specifying fee details such as name, type (Static or Dynamic), frequency (Monthly, Yearly, or One-time), and HSN code.
* Existing fees can be edited using the **edit\_fee** form, allowing admins to update fee information.
* Fees can be deleted using the **delete\_fee** functionality.
* Fee data is stored in the **fee\_master** table.
  + 1. **Manage Products:**
* Admin users can view the list of products in the **manage\_products** page.
* They can add new products using the **add\_product** form, specifying the product name and associated issuer.
* Existing products can be edited using the **edit\_product** form, allowing admins to update the product name and issuer.
* Products can be deleted using the **delete\_product** functionality.
* Product data is stored in the **products** table.
  + 1. **Map Client-Product-Fees:**
* Admin users can create mappings between clients, products, and fees using the **map\_client\_product\_fees** form.
* They can select a client, product, fee, unit price, start date, and end date for the mapping.
* The mapping data is stored in the **client\_product\_fee\_mapping** table.
  + 1. **Manage Interchange Fees:**
* Admin users can add interchange fees for clients using the **manage\_interchange\_fees** form.
* They can select a client, specify the start date, end date, interchange amount, and minimum interchange amount.
* Interchange fee data is stored in the **interchange\_fees** table.

1. **Invoice Generation:**
2. **Select Client and Date Range:**

* Admin users can select a client and specify the start date and end date for generating the invoice using the **generate\_client\_invoices** form.

1. **Retrieve Applicable Fees:**

* Based on the selected client and date range, the system retrieves the applicable fees from the **client\_product\_fee\_mapping** table.
* It excludes any fees that have already been charged based on the fee frequency (Monthly, Yearly, or One-time) and the presence of corresponding records in the **fee\_history** table.

1. **Calculate Fee Amounts:**

* For each applicable fee, the system calculates the fee amount based on the fee type and frequency
* Static fees have a fixed unit price, while Dynamic fees require the admin to enter the number of units consumed.
* The fee amount is calculated by multiplying the unit price by the number of units.
* If an interchange fee is applicable, it is calculated based on the interchange amount, minimum interchange amount, and interchange share percentage.

1. **Generate Invoice:**

* The system generates an invoice by creating an **Invoice** object with the calculated fee amounts, tax calculations, and total amounts.
* Invoice line items are created for each applicable fee and added to the invoice.
* The invoice data, including the invoice number, date, client details, issuer details, and line items, is stored in the **invoices** and **invoice\_line\_items** tables.

1. **Store Fee History:**

* For each fee included in the invoice, a corresponding entry is created in the **fee\_history** table to track the charging of fees.

1. **View and Download Invoice:**

* The generated invoice is displayed to the admin user, showing the invoice details, line items, and total amounts.
* Admin users have the option to download the invoice as a PDF file.

1. **User Functionality:**
2. **View Invoice History:**

* Regular users can view their own invoice history in the **user\_home** page.
* The system retrieves the invoices associated with the logged-in user's client and displays them.

1. **View and Download Invoice:**

* Users can view the details of a specific invoice by clicking on the invoice in the invoice history.
* They also have the option to download the invoice as a PDF file.

1. **Error Handling and Logging:**

* The system includes error handling mechanisms to gracefully handle and display error messages to users.
* Logging is implemented to capture important events, errors, and debugging information.
* Error pages (404 and 500) are provided to handle page not found and internal server errors, respectively.

1. **Database Models:**
2. The system uses **SQLAlchemy** as the ORM (Object-Relational Mapping) layer to interact with the database.
3. The database models include:

* **users:** Stores user information, including username, password, and role.
* **biller:** Stores biller details, including name, address, GSTIN, email, and contact.
* **issuers:** Stores issuer information, including name.
* **clients:** Stores client details, including name, issuer, address, GSTIN, email, contact, and client type.
* **products:** Stores product information, including name and associated issuer.
* **fee\_master:** Stores fee details, including name, type, frequency, and HSN code.
* **client\_product\_fee\_mapping:** Stores mappings between clients, products, and fees, including unit price and date range.
* **interchange\_fees:** Stores interchange fee details for clients, including interchange amount, minimum interchange amount, and date range.
* **invoices:** Stores invoice information, including biller, client, issuer, invoice number, date, amounts, and other relevant details.
* **invoice\_line\_items:** Stores invoice line item details, including associated invoice, fee, units, unit price, and amounts.
* **fee\_history:** Stores the history of charged fees for clients, including client, issuer, fee, charge date, units, and total amount.