Indian Institute of Technology Gandhinagar


# CS 432: Databases

## Assignment 4: DEPLOYING THE DBMS

Outlet Database Management System

## Team : The Pluto

*Yajurvedh Bodala - 19110077*
*Krish Raj - 20110160*
*Dharavath Mahesh - 22110073*
*Charan Teja - 22110136*
*Harsh Kumar Keshri - 22110094*
*Susmita R - 22110265*
*Shipra Kethwalia - 23210091*
*Shubham Kshirsagar - 23210097*

**Under The Guidance Of**
*Prof. Mayank Singh*

# 3. Tasks

## 3.1 Responsibility of G1:

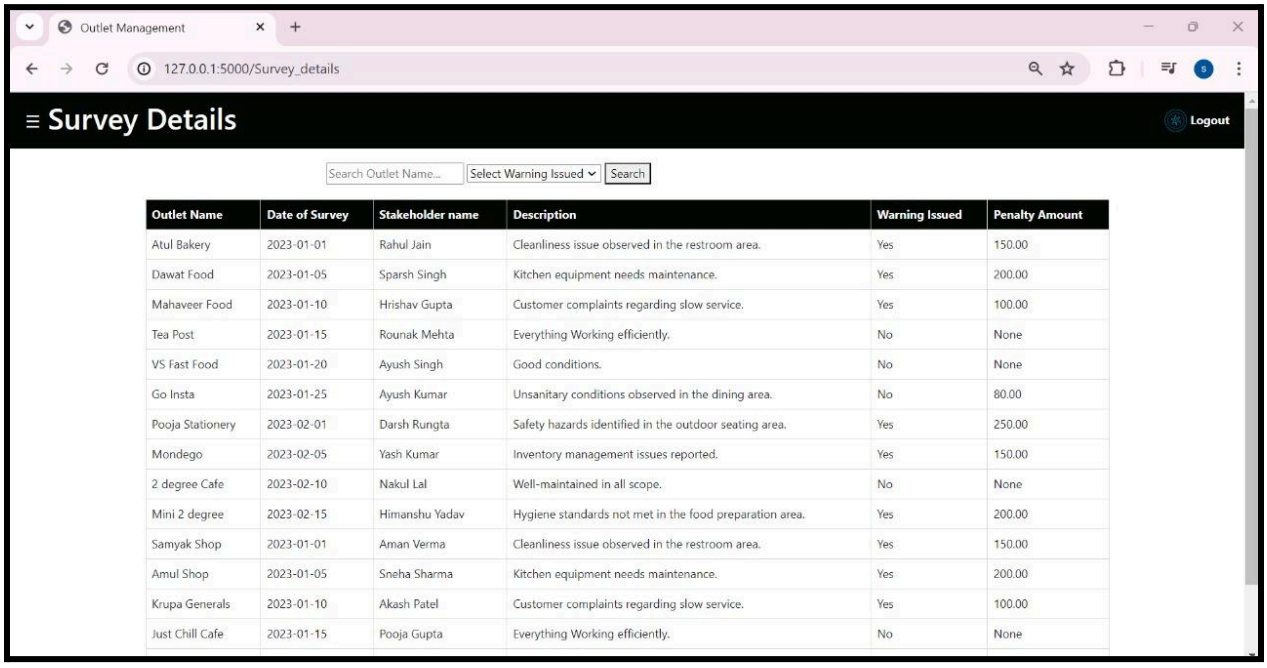
*1. The G1 takes two feedbacks from the stakeholders, one initial feedback (on or before 8th April 11:59 PM), and then makes relevant changes as suggested per the first feedback, then final feedback (on or before 11th April 11:59 PM) post changes. The write-up/documentation should have screenshots before the first feedback, after the first feedback, and after the second feedback. If a team discusses with multiple stakeholders, please fill out the forms again (Initial and final feedback forms).*

As per the stakeholder feedback we have made two changes

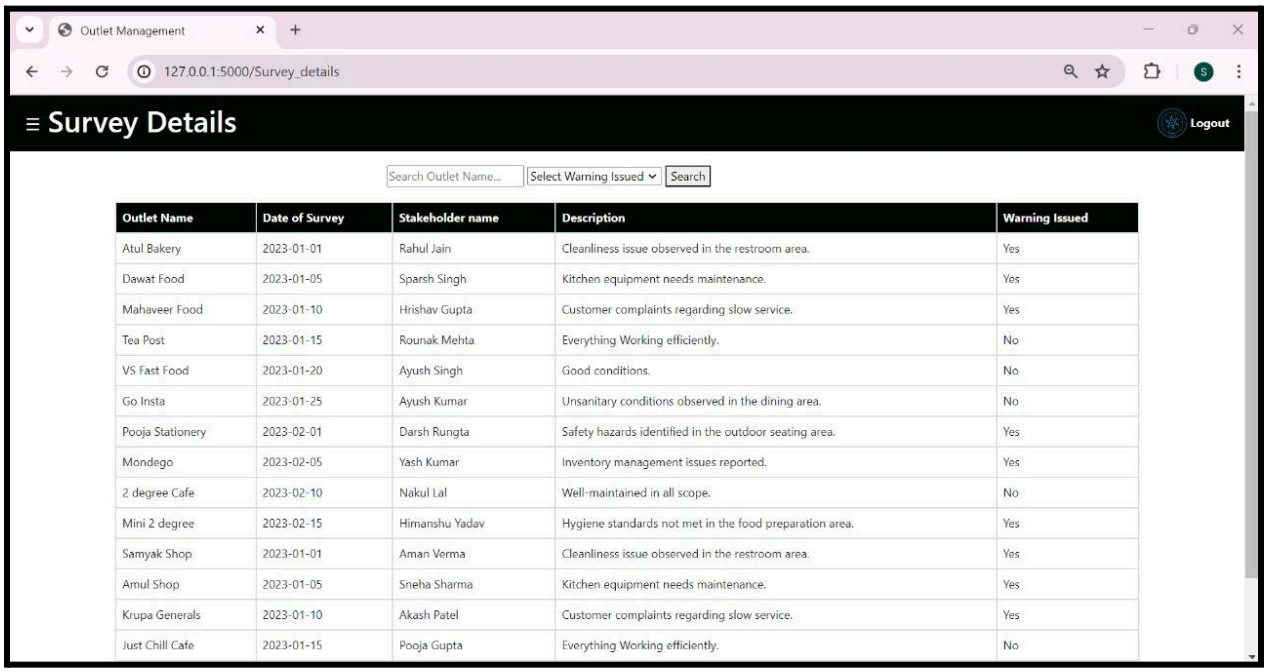
I. **Removing 'Penalty amount' column from the Survey details page from the 'Student view'**
II. **Adding multiple column search for the stakeholder table**

I . Removing 'Penalty amount' column from the Survey details page from the 'Student view'

***Survey page before the first feedback***



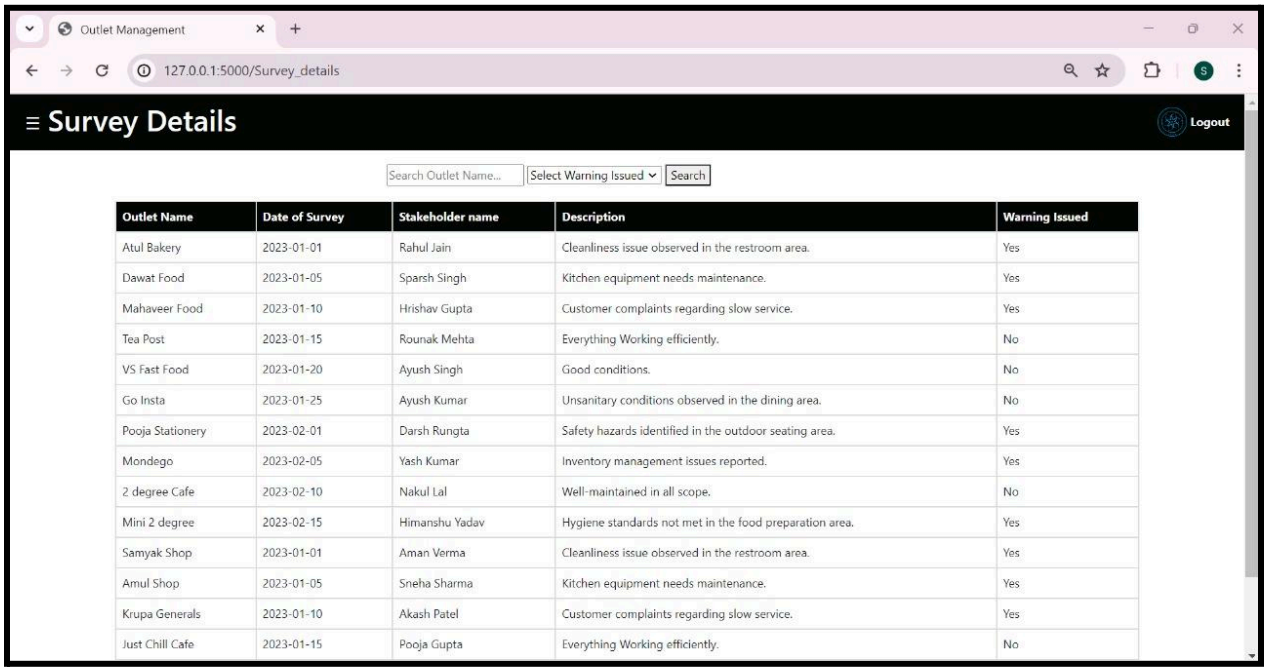
***Survey page after the first feedback***




| Outlet Name | Date of Survey | Stakeholder name | Description | Warning Issued |
|---|---|---|---|---|
| Atul Bakery | 2023-01-01 | Rahul Jain | Cleanliness issue observed in the restroom area. | Yes |
| Dawat Food | 2023-01-05 | Sparsh Singh | Kitchen equipment needs maintenance. | Yes |
| Mahaveer Food | 2023-01-10 | Hrishav Gupta | Customer complaints regarding slow service. | Yes |
| Tea Post | 2023-01-15 | Rounak Mehta | Everything Working efficiently. | No |
| VS Fast Food | 2023-01-20 | Ayush Singh | Good conditions. | No |
| Go Insta | 2023-01-25 | Ayush Kumar | Unsanitary conditions observed in the dining area. | No |
| Pooja Stationery | 2023-02-01 | Darsh Rungta | Safety hazards identified in the outdoor seating area. | Yes |
| Mondego | 2023-02-05 | Yash Kumar | Inventory management issues reported. | Yes |
| 2 degree Cafe | 2023-02-10 | Nakul Lal | Well-maintained in all scope. | No |
| Mini 2 degree | 2023-02-15 | Himanshu Yadav | Hygiene standards not met in the food preparation area. | Yes |
| Samyak Shop | 2023-01-01 | Aman Verma | Cleanliness issue observed in the restroom area. | Yes |
| Amul Shop | 2023-01-05 | Sneha Sharma | Kitchen equipment needs maintenance. | Yes |
| Krupa Generals | 2023-01-10 | Akash Patel | Customer complaints regarding slow service. | Yes |
| Just Chill Cafe | 2023-01-15 | Pooja Gupta | Everything Working efficiently. | No |

***After the second feedback***

Since no changes are required as per the Stakeholder's second feedback. We haven't changed on this page.




| Outlet Name | Date of Survey | Stakeholder name | Description | Warning Issued |
|---|---|---|---|---|
| Atul Bakery | 2023-01-01 | Rahul Jain | Cleanliness issue observed in the restroom area. | Yes |
| Dawat Food | 2023-01-05 | Sparsh Singh | Kitchen equipment needs maintenance. | Yes |
| Mahaveer Food | 2023-01-10 | Hrishav Gupta | Customer complaints regarding slow service. | Yes |
| Tea Post | 2023-01-15 | Rounak Mehta | Everything Working efficiently. | No |
| VS Fast Food | 2023-01-20 | Ayush Singh | Good conditions. | No |
| Go Insta | 2023-01-25 | Ayush Kumar | Unsanitary conditions observed in the dining area. | No |
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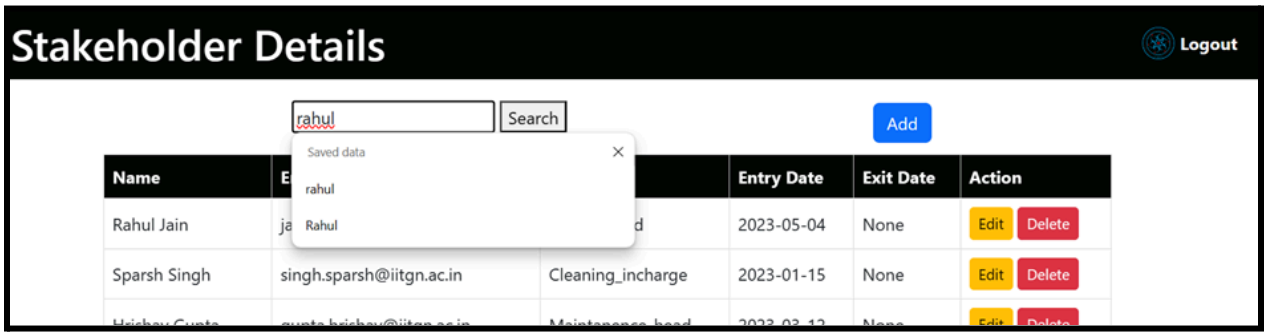
| Just Chill Cafe | 2023-01-15 | Pooja Gupta | Everything Working efficiently. | No |

II. A multiple-column search for the stakeholder table is added.

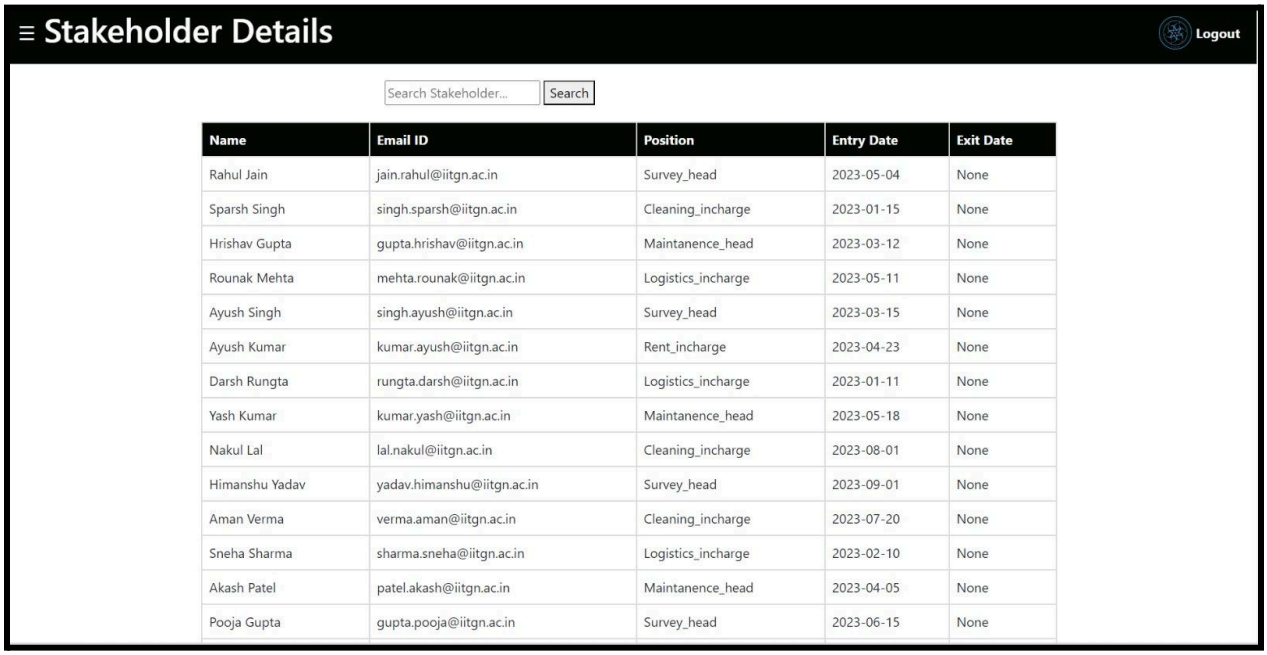
***Before the first feedback***

Before the first feedback on the stakeholder page stakeholder table had only one column search option.

**Stakeholder's View**



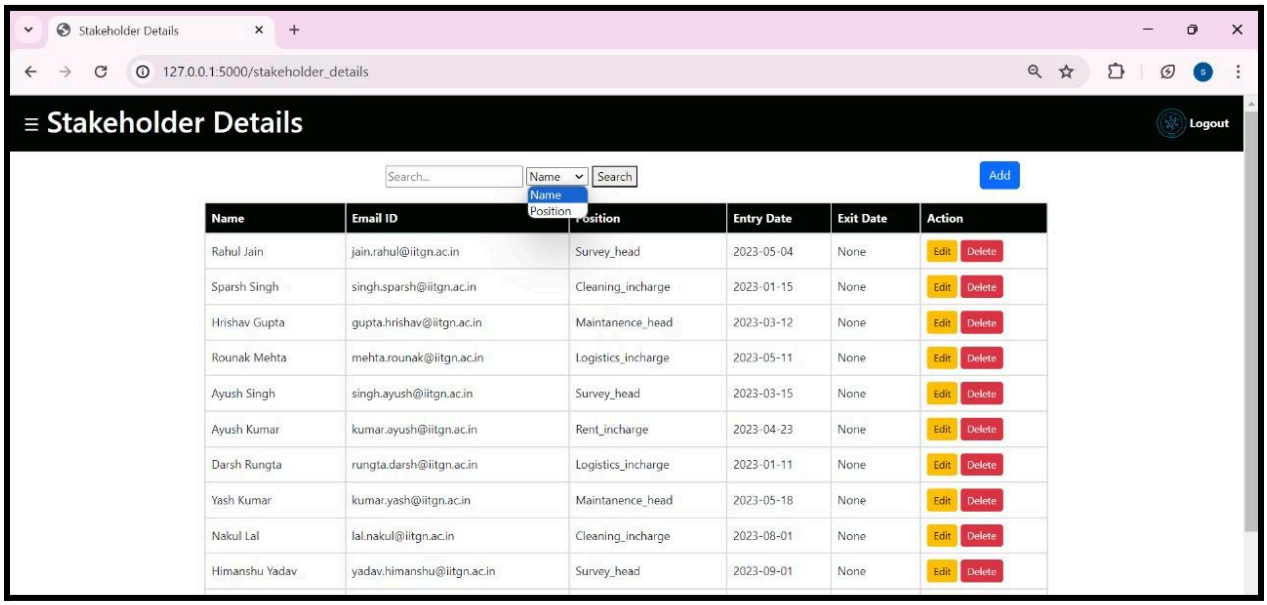

**Student's view**



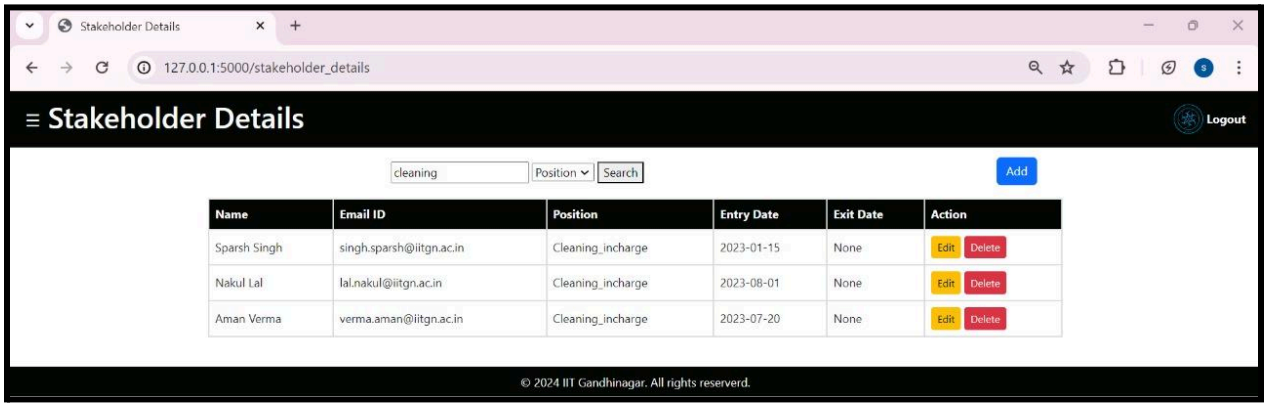
***After the first feedback***

After the first feedback from the stakeholder we added multiple column searches for the stakeholder table. Now we can search with both Name and Position.

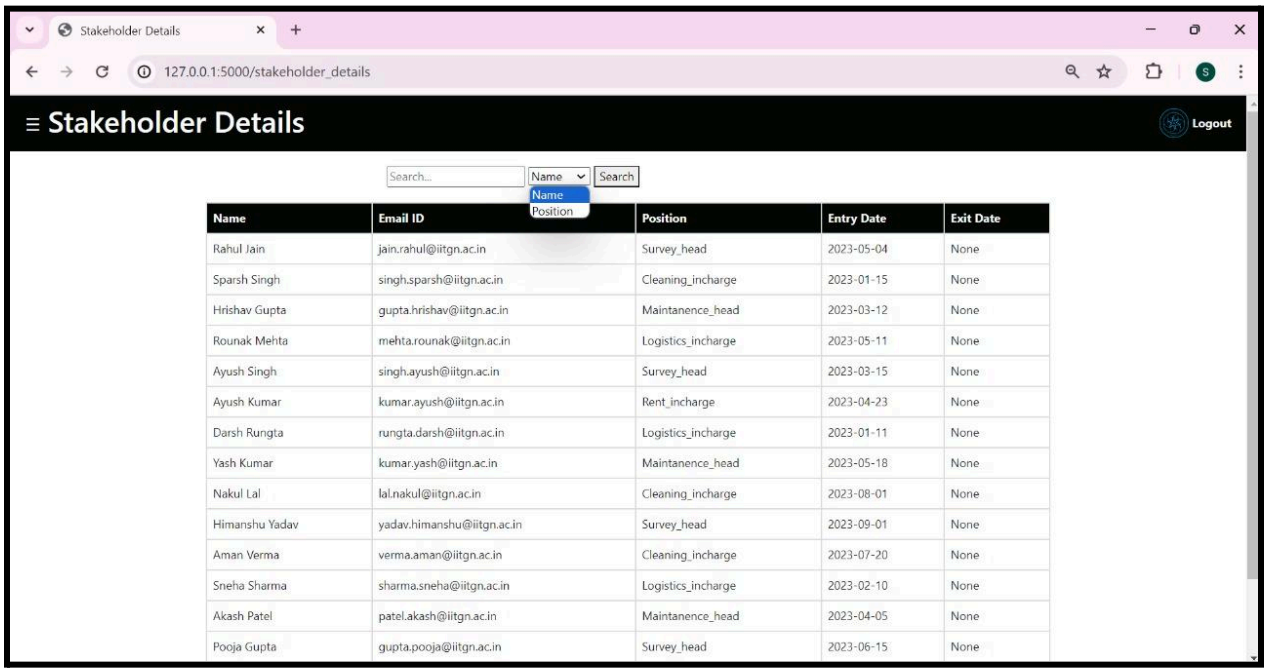
**Stakeholder's View**



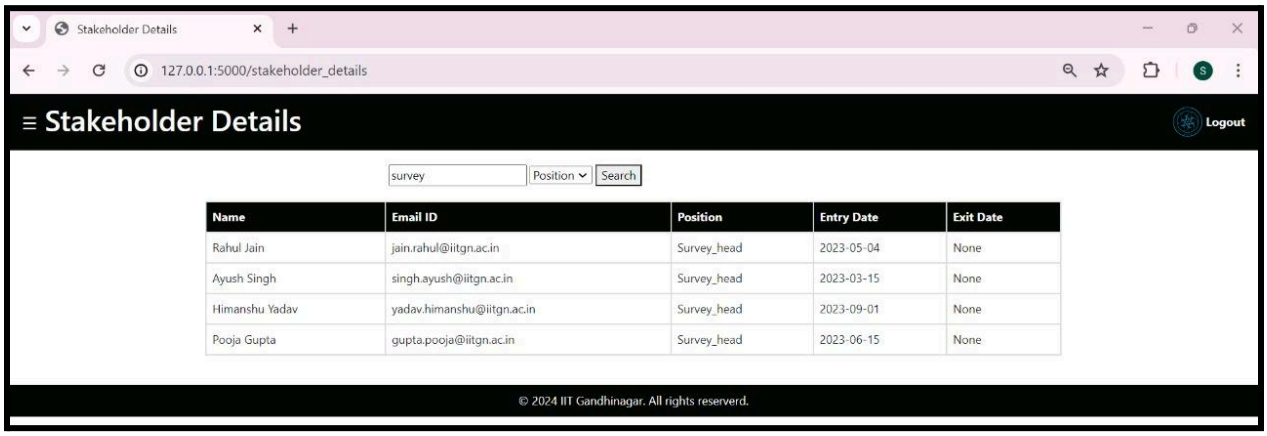




**Student's view**

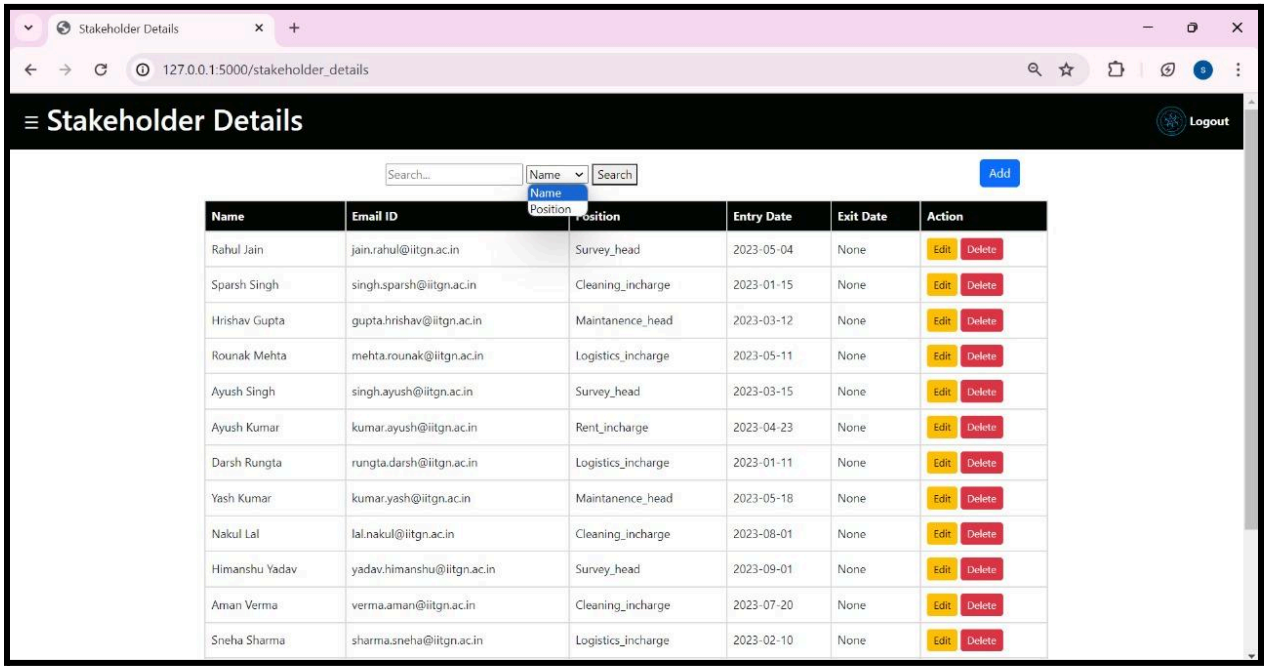


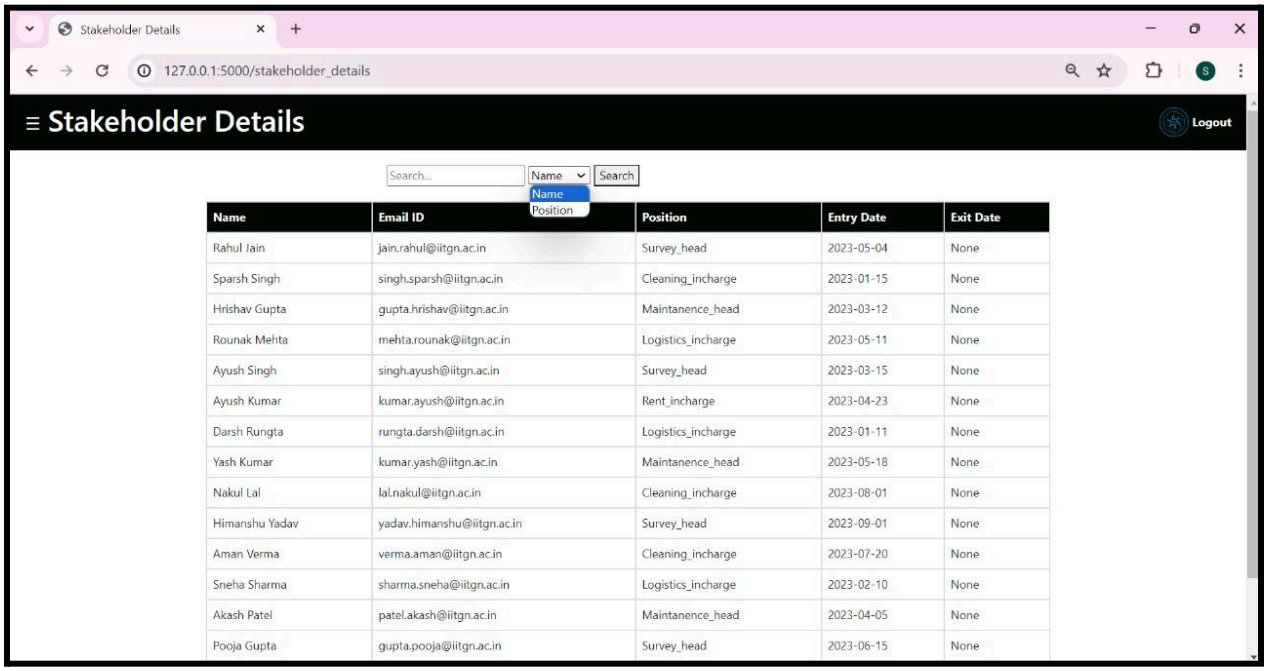




***After the second feedback***

Since no changes are required as per the Stakeholder's second feedback. We haven't changed on this page for the both views.

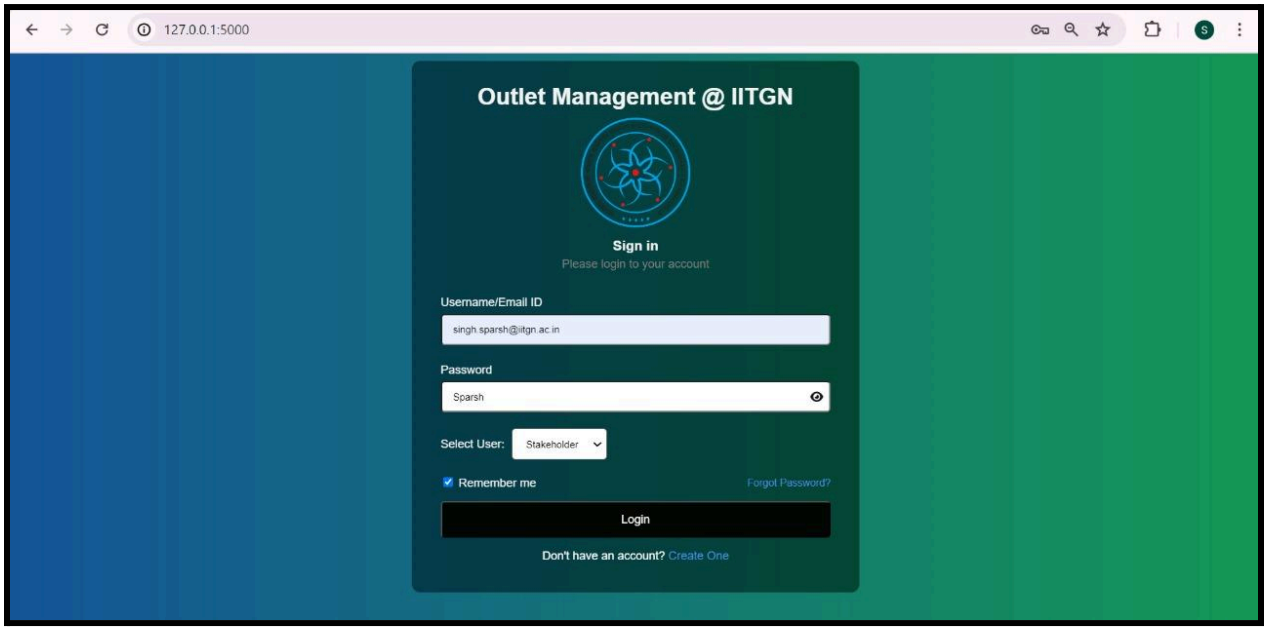


*2. Attach screenshots of different views [along with a write-up on their privileges] of the database as seen by different classes of users.*

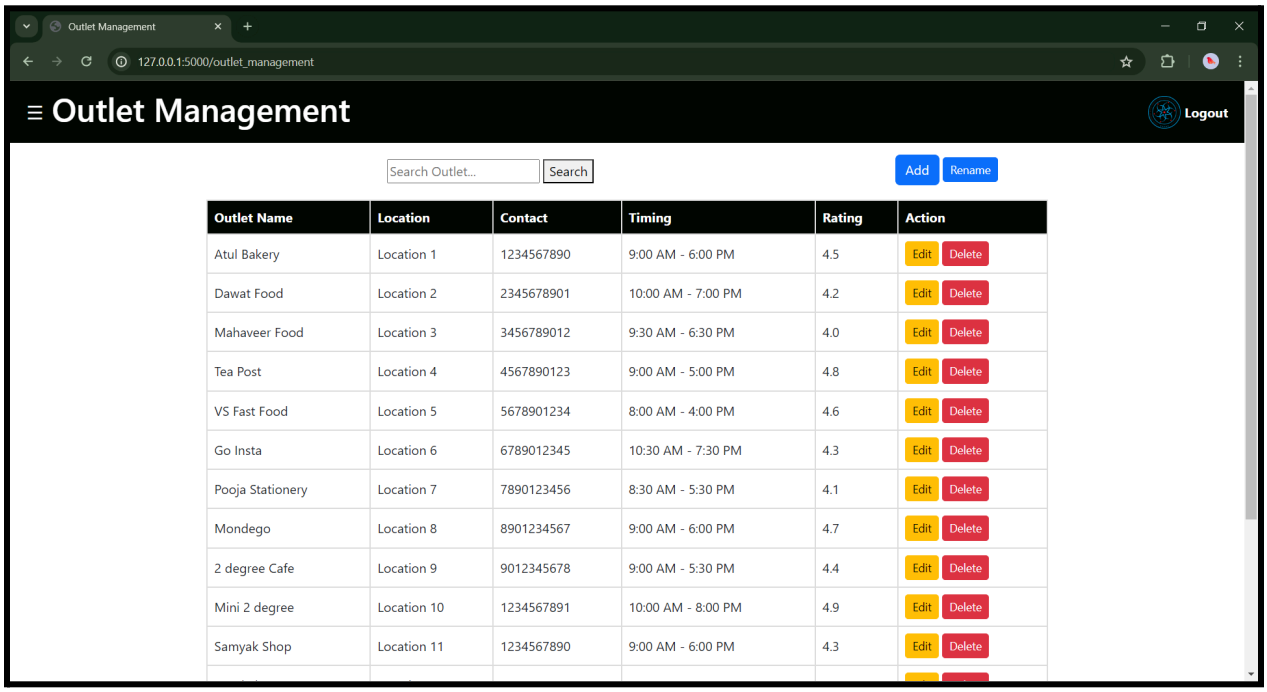
Privileges were added for ensuring the right users can access only particular tables in the Website. For the Outlet Management system website, we made let's outline the privileges and views for the two classes of users: Stakeholder and Student view. Stakeholders, have access to detailed information about outlets and other relevant data. Students have limited access compared to stakeholders.

## Stakeholder View:

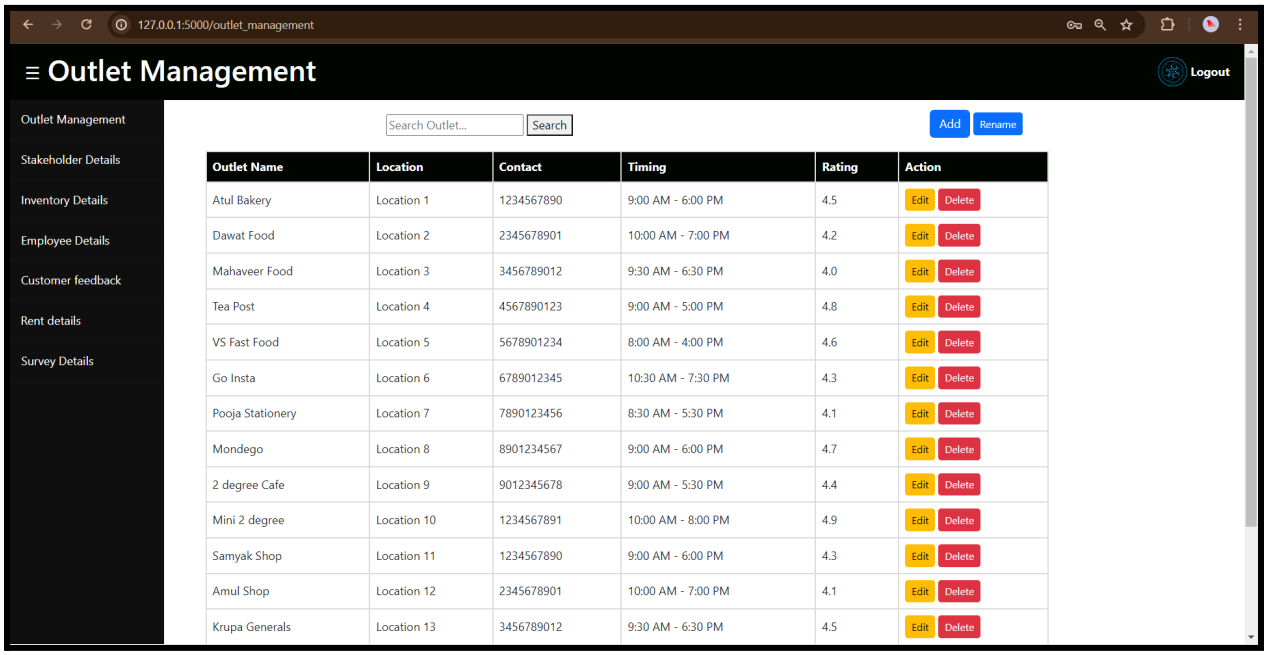



Now once the login is done, we are open with the home page for the stakeholder view, which by default contains the Outlet Management Page. The stakeholder view can add, edit, delete, and rename any of the details among all the tables it can add any new outlet information, add new stakeholder details, view a complete history of rent payments, can take actions based on the customer feedback and many more operations based on the fundamental CRUD (Create, Read, Update, Delete) operation.

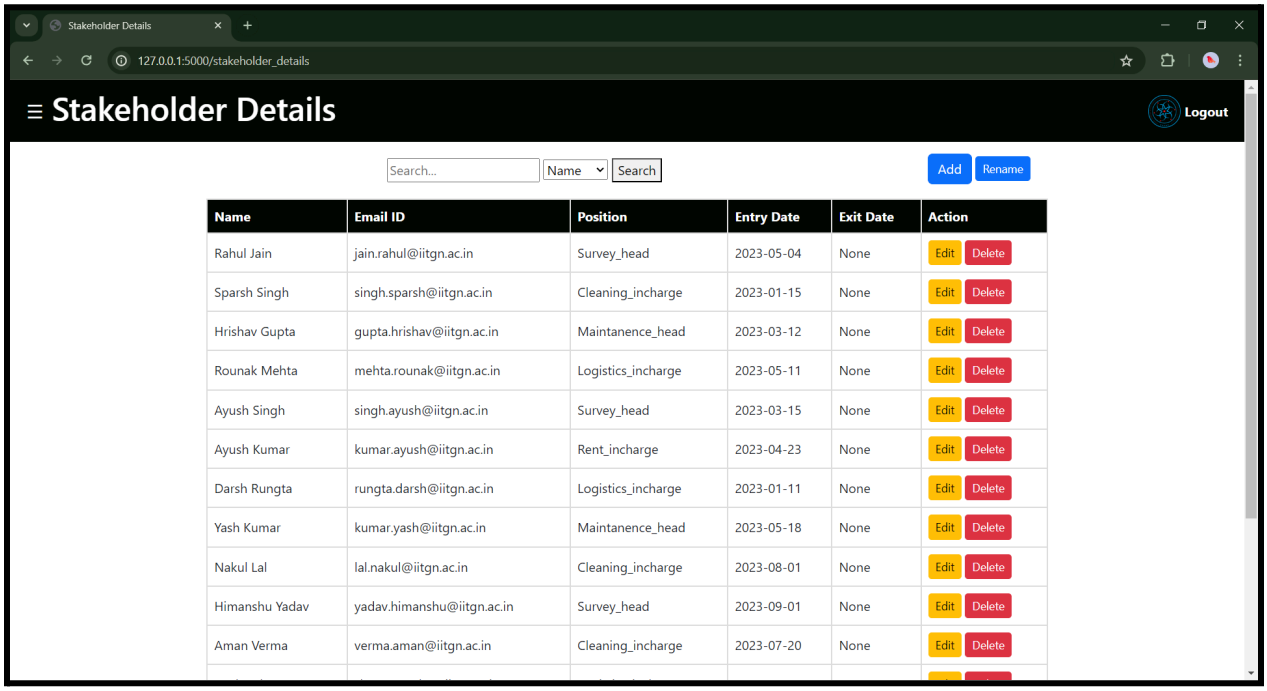
We have created add, edit, delete and rename buttons on all the web pages, providing stakeholders access to all the operations. The stakeholder view ensures that only authorized individuals can access and manipulate sensitive data. Permissions are set to restrict unauthorized actions.

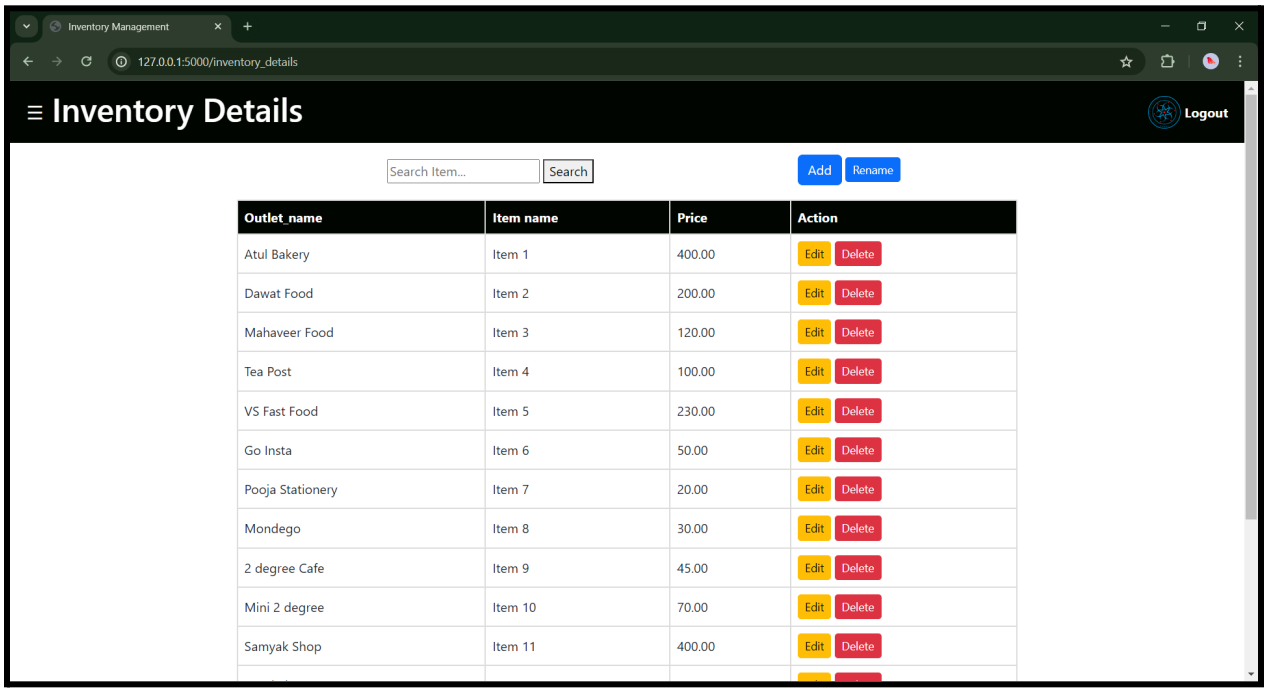


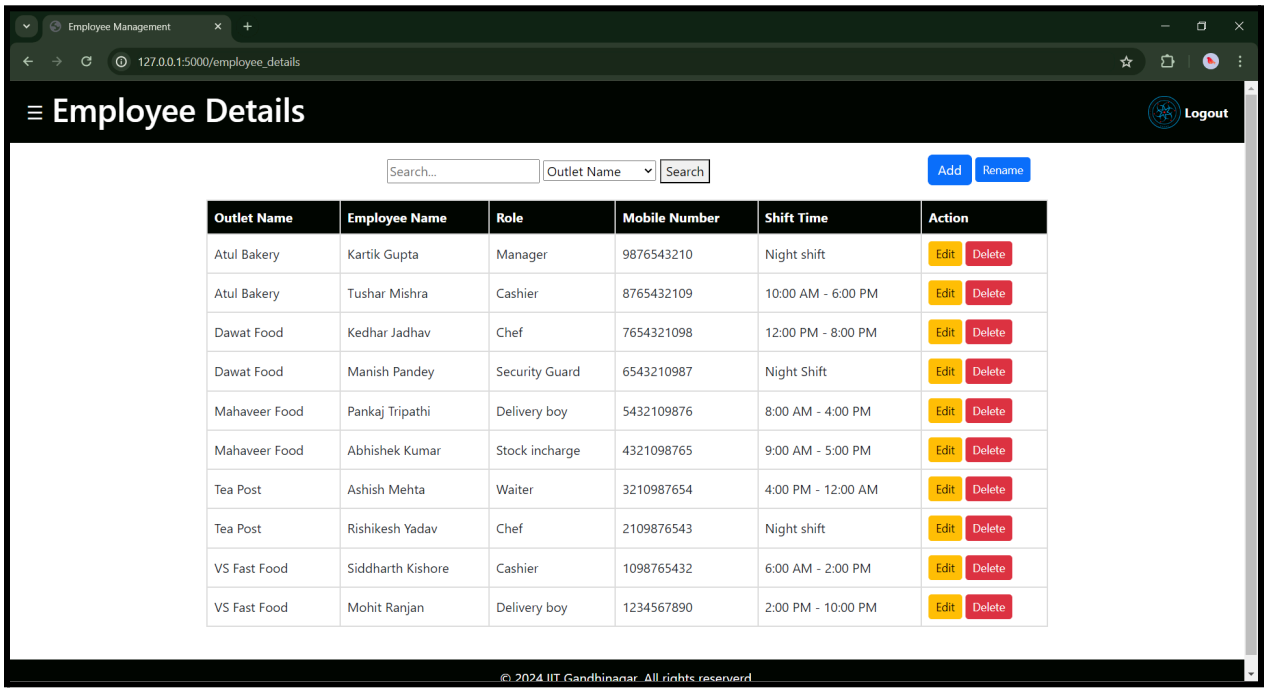

This is the home page with a sidebar having a dashboard displaying key metrics related to the outlet management, stakeholder details, rent payments, customer feedback, survey details, and employee details opens where the stakeholder view has full CRUD privileges on the tables mentioned.



Now navigating through the sidebar will give different pages as shown.




Employee Management
127.0.0.1:5000/employee_details
Employee Details
Logout
Search...
Outlet Name
Search
Add
Rename
Outlet Name | Employee Name | Role | Mobile Number | Shift Time | Action
Atul Bakery | Kartik Gupta | Manager | 9876543210 | Night shift | Edit Delete
Atul Bakery | Tushar Mishra | Cashier | 8765432109 | 10:00 AM - 6:00 PM | Edit Delete
Dawat Food | Kedhar Jadhav | Chef | 7654321098 | 12:00 PM - 8:00 PM | Edit Delete
Dawat Food | Manish Pandey | Security Guard | 6543210987 | Night Shift | Edit Delete
Mahaveer Food | Pankaj Tripathi | Delivery boy | 5432109876 | 8:00 AM - 4:00 PM | Edit Delete
Mahaveer Food | Abhishek Kumar | Stock incharge | 4321098765 | 9:00 AM - 5:00 PM | Edit Delete
Tea Post | Ashish Mehta | Waiter | 3210987654 | 4:00 PM - 12:00 AM | Edit Delete
Tea Post | Rishikesh Yadav | Chef | 2109876543 | Night shift | Edit Delete
VS Fast Food | Siddharth Kishore | Cashier | 1098765432 | 6:00 AM - 2:00 PM | Edit Delete
VS Fast Food | Mohit Ranjan | Delivery boy | 1234567890 | 2:00 PM - 10:00 PM | Edit Delete
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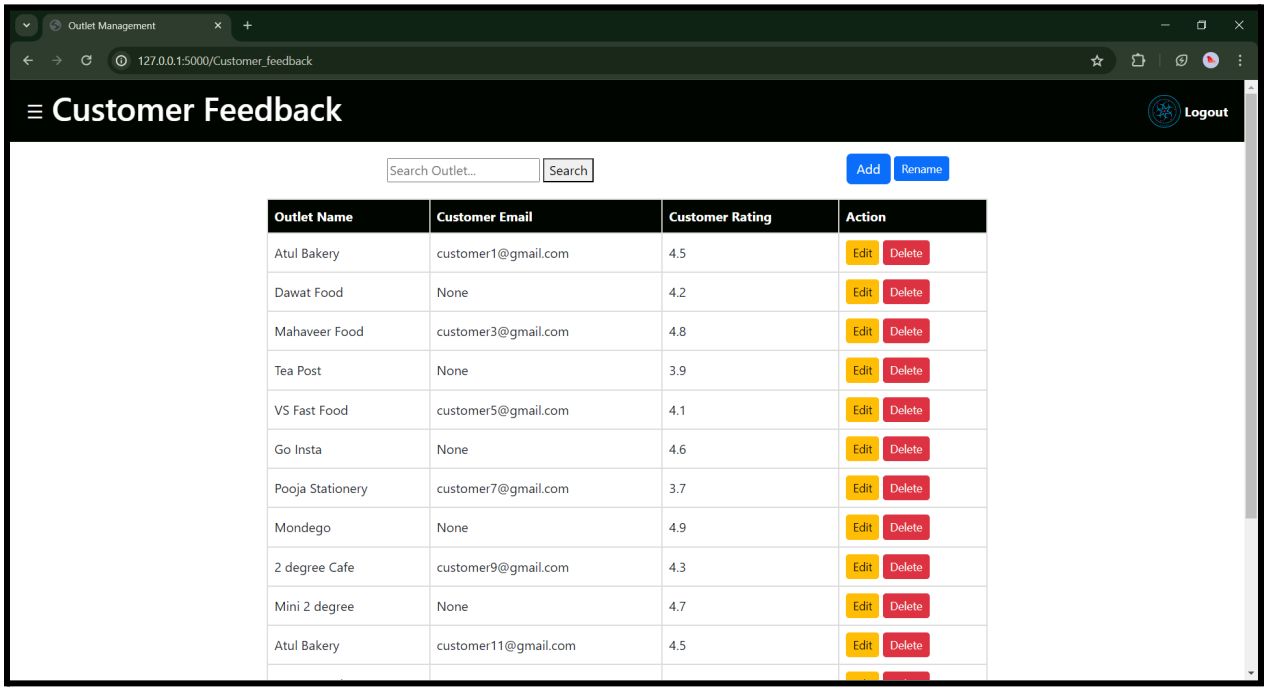
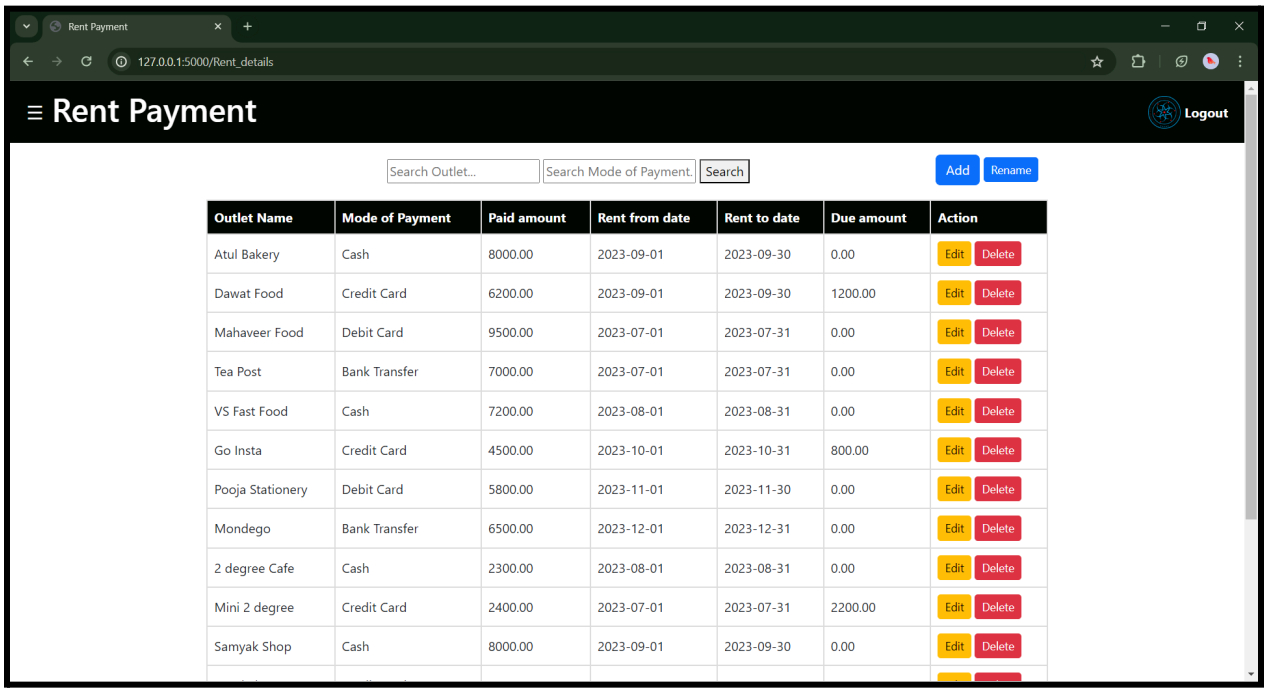
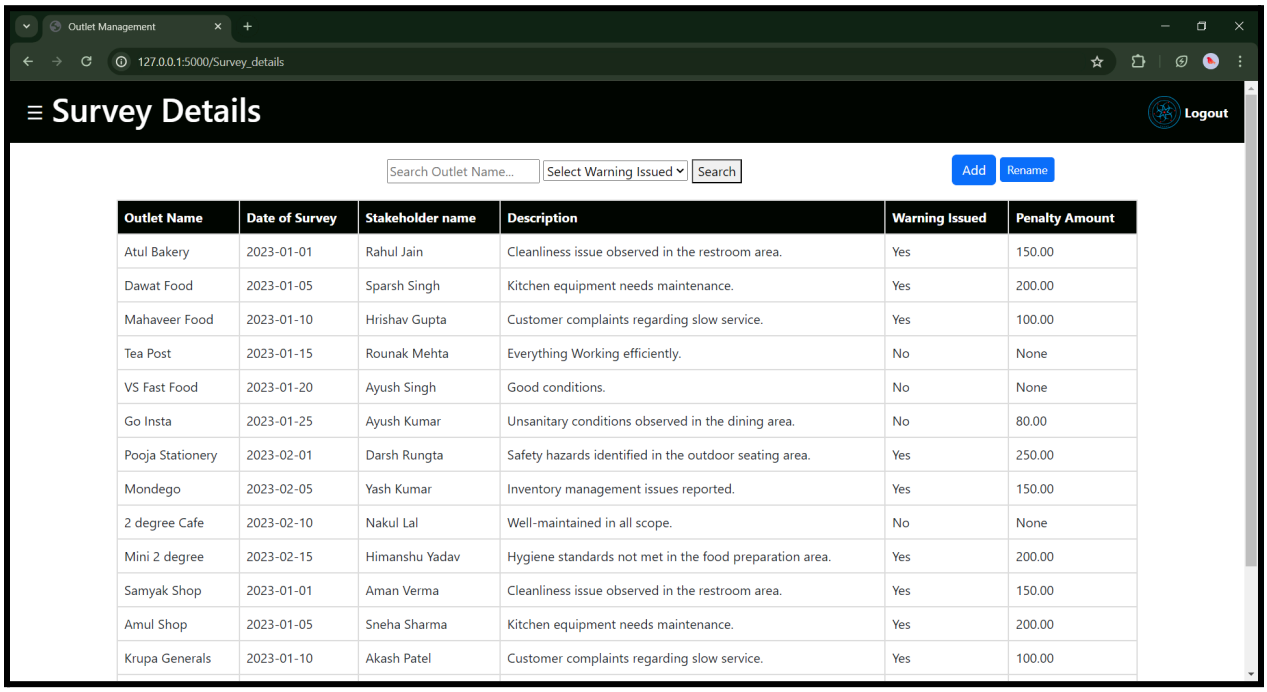

Outlet Management
127.0.0.1:5000/Customer_feedback
Customer Feedback
Logout
Search Outlet...
Search
Add
Rename
Outlet Name | Customer Email | Customer Rating | Action
Atul Bakery | customer1@gmail.com | 4.5 | Edit Delete
Dawat Food | None | 4.2 | Edit Delete
Mahaveer Food | customer3@gmail.com | 4.8 | Edit Delete
Tea Post | None | 3.9 | Edit Delete
VS Fast Food | customer5@gmail.com | 4.1 | Edit Delete
Go Insta | None | 4.6 | Edit Delete
Pooja Stationery | customer7@gmail.com | 3.7 | Edit Delete
Mondego | None | 4.9 | Edit Delete
2 degree Cafe | customer9@gmail.com | 4.3 | Edit Delete
Mini 2 degree | None | 4.7 | Edit Delete
Atul Bakery | customer11@gmail.com | 4.5 | Edit Delete

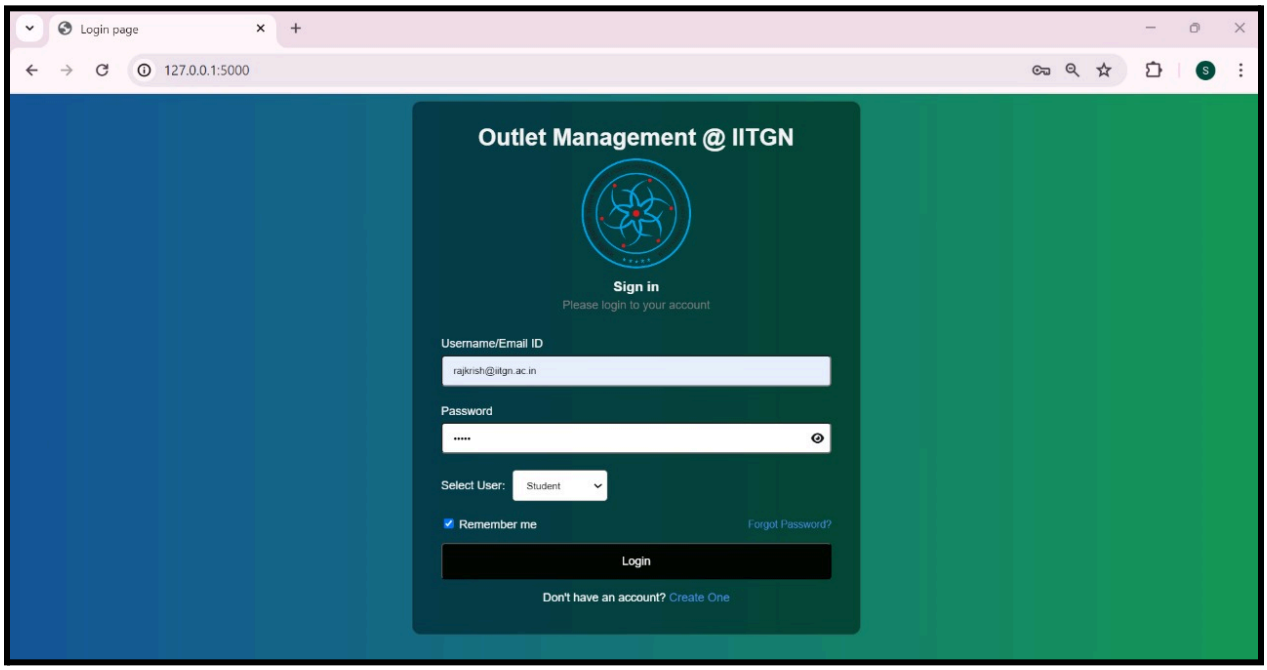



| Outlet Name | Mode of Payment | Paid amount | Rent from date | Rent to date | Due amount | Action |
|---|---|---|---|---|---|---|
| Atul Bakery | Cash | 8000.00 | 2023-09-01 | 2023-09-30 | 0.00 | Edit Delete |
| Dawat Food | Credit Card | 6200.00 | 2023-09-01 | 2023-09-30 | 1200.00 | Edit Delete |
| Mahaveer Food | Debit Card | 9500.00 | 2023-07-01 | 2023-07-31 | 0.00 | Edit Delete |
| Tea Post | Bank Transfer | 7000.00 | 2023-07-01 | 2023-07-31 | 0.00 | Edit Delete |
| VS Fast Food | Cash | 7200.00 | 2023-08-01 | 2023-08-31 | 0.00 | Edit Delete |
| Go Insta | Credit Card | 4500.00 | 2023-10-01 | 2023-10-31 | 800.00 | Edit Delete |
| Pooja Stationery | Debit Card | 5800.00 | 2023-11-01 | 2023-11-30 | 0.00 | Edit Delete |
| Mondego | Bank Transfer | 6500.00 | 2023-12-01 | 2023-12-31 | 0.00 | Edit Delete |
| 2 degree Cafe | Cash | 2300.00 | 2023-08-01 | 2023-08-31 | 0.00 | Edit Delete |
| Mini 2 degree | Credit Card | 2400.00 | 2023-07-01 | 2023-07-31 | 2200.00 | Edit Delete |
| Samyak Shop | Cash | 8000.00 | 2023-09-01 | 2023-09-30 | 0.00 | Edit Delete |



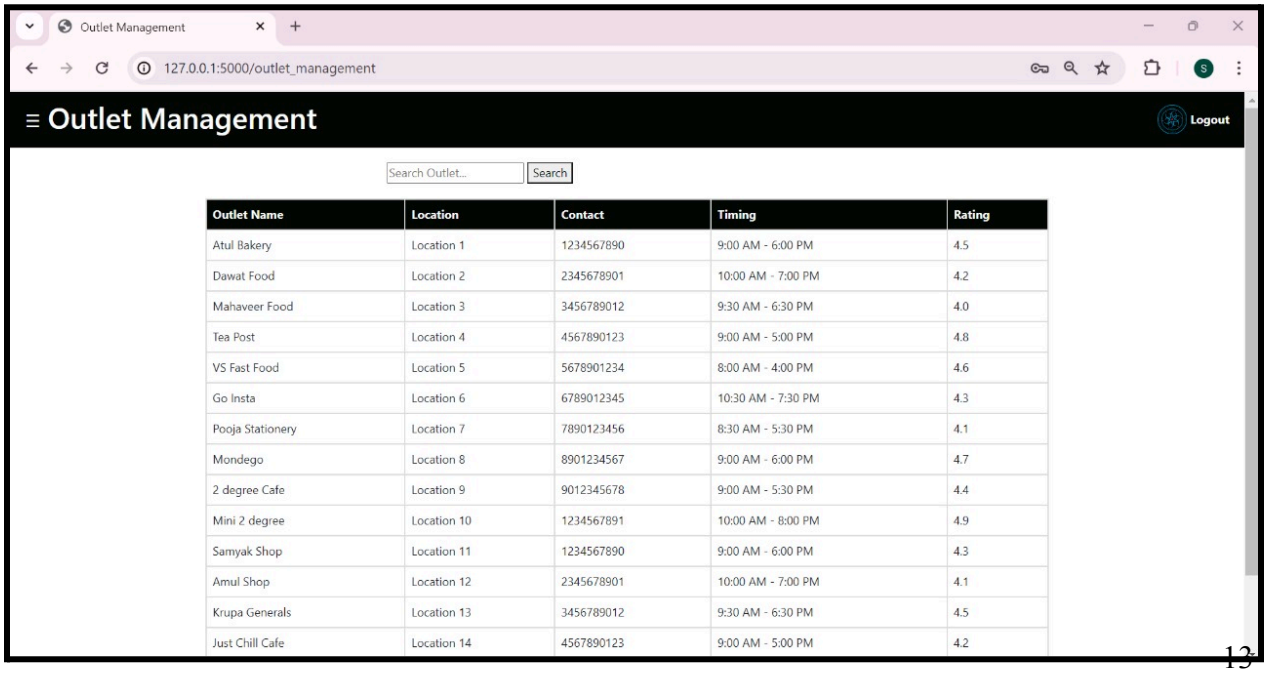

| Outlet Name | Date of Survey | Stakeholder name | Description | Warning Issued | Penalty Amount |
|---|---|---|---|---|---|
| Atul Bakery | 2023-01-01 | Rahul Jain | Cleanliness issue observed in the restroom area. | Yes | 150.00 |
| Dawat Food | 2023-01-05 | Sparsh Singh | Kitchen equipment needs maintenance. | Yes | 200.00 |
| Mahaveer Food | 2023-01-10 | Hrishav Gupta | Customer complaints regarding slow service. | Yes | 100.00 |
| Tea Post | 2023-01-15 | Rounak Mehta | Everything Working efficiently. | No | None |
| VS Fast Food | 2023-01-20 | Ayush Singh | Good conditions. | No | None |
| Go Insta | 2023-01-25 | Ayush Kumar | Unsanitary conditions observed in the dining area. | No | 80.00 |
| Pooja Stationery | 2023-02-01 | Darsh Rungta | Safety hazards identified in the outdoor seating area. | Yes | 250.00 |
| Mondego | 2023-02-05 | Yash Kumar | Inventory management issues reported. | Yes | 150.00 |
| 2 degree Cafe | 2023-02-10 | Nakul Lal | Well-maintained in all scope. | No | None |
| Mini 2 degree | 2023-02-15 | Himanshu Yadav | Hygiene standards not met in the food preparation area. | Yes | 200.00 |
| Samyak Shop | 2023-01-01 | Aman Verma | Cleanliness issue observed in the restroom area. | Yes | 150.00 |
| Amul Shop | 2023-01-05 | Sneha Sharma | Kitchen equipment needs maintenance. | Yes | 200.00 |
| Krupa Generals | 2023-01-10 | Akash Patel | Customer complaints regarding slow service. | Yes | 100.00 |

## Student View:

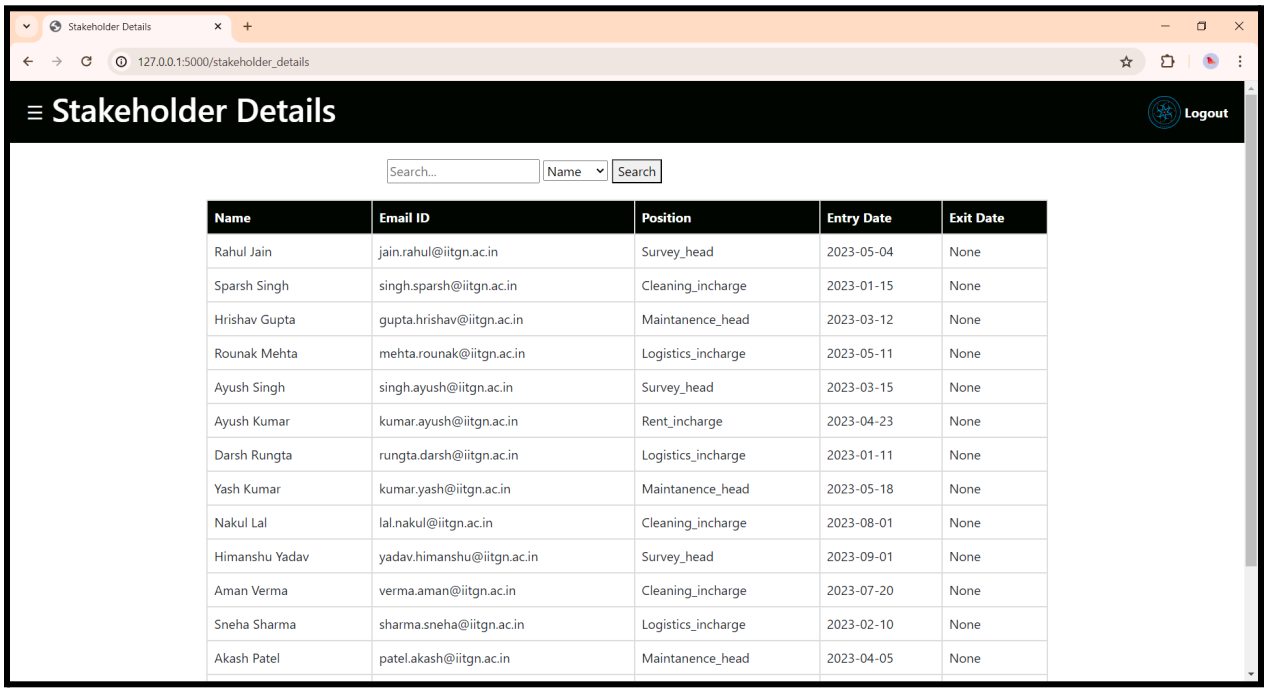



Student view has a simplified dashboard with the basic information required. It includes outlet details, stakeholder details, and customer feedback. Student view is restricted to viewing rent payments, survey details, and employee details. Students can view the list of available outlets, stakeholder information assigned to a particular outlet and the feedback details.

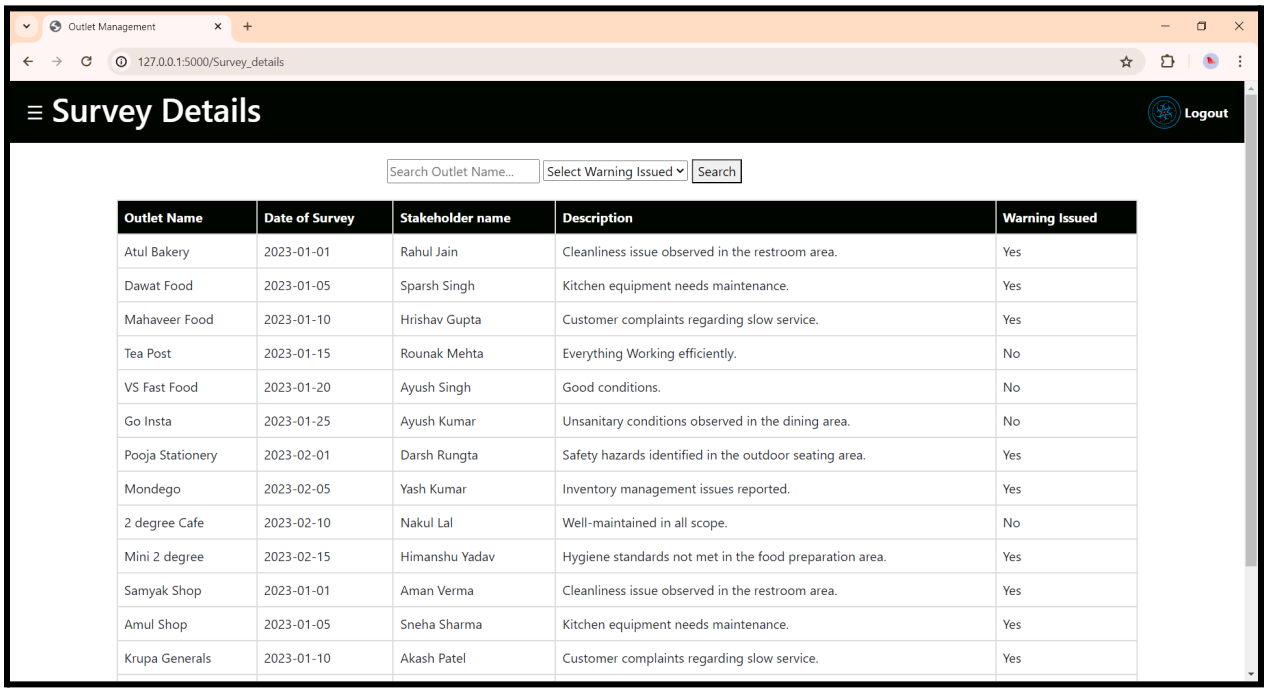
Student view has access to the search bar, and they can sort the information as per their requirements.




| Outlet Name | Location | Contact | Timing | Rating |
|---|---|---|---|---|
| Atul Bakery | Location 1 | 1234567890 | 9:00 AM - 6:00 PM | 4.5 |
| Dawat Food | Location 2 | 2345678901 | 10:00 AM - 7:00 PM | 4.2 |
| Mahaveer Food | Location 3 | 3456789012 | 9:30 AM - 6:30 PM | 4.0 |
| Tea Post | Location 4 | 4567890123 | 9:00 AM - 5:00 PM | 4.8 |
| VS Fast Food | Location 5 | 5678901234 | 8:00 AM - 4:00 PM | 4.6 |
| Go Insta | Location 6 | 6789012345 | 10:30 AM - 7:30 PM | 4.3 |
| Pooja Stationery | Location 7 | 7890123456 | 8:30 AM - 5:30 PM | 4.1 |
| Mondego | Location 8 | 8901234567 | 9:00 AM - 6:00 PM | 4.7 |
| 2 degree Cafe | Location 9 | 9012345678 | 9:00 AM - 5:30 PM | 4.4 |
| Mini 2 degree | Location 10 | 1234567891 | 10:00 AM - 8:00 PM | 4.9 |
| Samyak Shop | Location 11 | 1234567890 | 9:00 AM - 6:00 PM | 4.3 |
| Amul Shop | Location 12 | 2345678901 | 10:00 AM - 7:00 PM | 4.1 |
| Krupa Generals | Location 13 | 3456789012 | 9:30 AM - 6:30 PM | 4.5 |
| Just Chill Cafe | Location 14 | 4567890123 | 9:00 AM - 5:00 PM | 4.2 |




| Name | Email ID | Position | Entry Date | Exit Date |
|---|---|---|---|---|
| Rahul Jain | jain.rahul@iitgn.ac.in | Survey_head | 2023-05-04 | None |
| Sparsh Singh | singh.sparsh@iitgn.ac.in | Cleaning_incharge | 2023-01-15 | None |
| Hrishav Gupta | gupta.hrishav@iitgn.ac.in | Maintanence_head | 2023-03-12 | None |
| Rounak Mehta | mehta.rounak@iitgn.ac.in | Logistics_incharge | 2023-05-11 | None |
| Ayush Singh | singh.ayush@iitgn.ac.in | Survey_head | 2023-03-15 | None |
| Ayush Kumar | kumar.ayush@iitgn.ac.in | Rent_incharge | 2023-04-23 | None |
| Darsh Rungta | rungta.darsh@iitgn.ac.in | Logistics_incharge | 2023-01-11 | None |
| Yash Kumar | kumar.yash@iitgn.ac.in | Maintanence_head | 2023-05-18 | None |
| Nakul Lal | lal.nakul@iitgn.ac.in | Cleaning_incharge | 2023-08-01 | None |
| Himanshu Yadav | yadav.himanshu@iitgn.ac.in | Survey_head | 2023-09-01 | None |
| Aman Verma | verma.aman@iitgn.ac.in | Cleaning_incharge | 2023-07-20 | None |
| Sneha Sharma | sharma.sneha@iitgn.ac.in | Logistics_incharge | 2023-02-10 | None |
| Akash Patel | patel.akash@iitgn.ac.in | Maintanence_head | 2023-04-05 | None |

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| VS Fast Food | 2023-01-20 | Ayush Singh | Good conditions. | No |
| Go Insta | 2023-01-25 | Ayush Kumar | Unsanitary conditions observed in the dining area. | No |
| Pooja Stationery | 2023-02-01 | Darsh Rungta | Safety hazards identified in the outdoor seating area. | Yes |
| Mondego | 2023-02-05 | Yash Kumar | Inventory management issues reported. | Yes |
| 2 degree Cafe | 2023-02-10 | Nakul Lal | Well-maintained in all scope. | No |
| Mini 2 degree | 2023-02-15 | Himanshu Yadav | Hygiene standards not met in the food preparation area. | Yes |
| Samyak Shop | 2023-01-01 | Aman Verma | Cleanliness issue observed in the restroom area. | Yes |
| Amul Shop | 2023-01-05 | Sneha Sharma | Kitchen equipment needs maintenance. | Yes |
| Krupa Generals | 2023-01-10 | Akash Patel | Customer complaints regarding slow service. | Yes |

The student does not have any privileges beyond accessing the tables and using the search button. They have no rights to add, delete, and edit. They can view and query records using the search option.

# 3.2 Responsibility of G2:

*1. Concurrent multi-user access: Multiple users with different roles can access and update the database concurrently. In such a scenario, the same item can not be updated by two different users. For example, locks can be applied to tables in MySQL.*

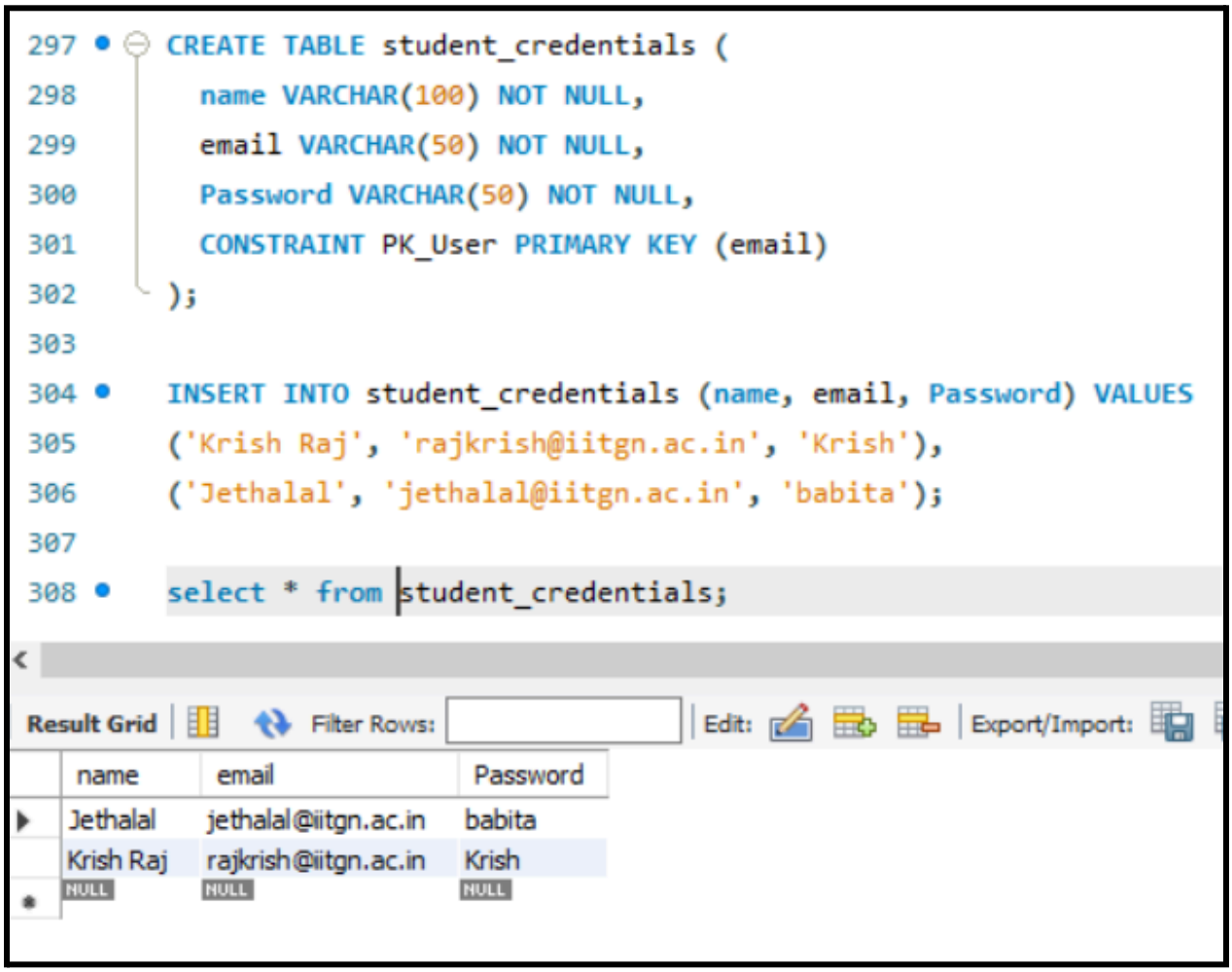
***Multi-user lock table***

```
def update():

        if outlet:
            # Update the outlet details
            cursor.execute("""
                LOCK TABLES Outlet WRITE;
                UPDATE Outlet
                SET Outlet_name = %s, Location_name = %s, Contact_No = %s, timings = %s, Ratings = %s
                WHERE Outlet_ID = %s
                UNLOCK TABLES;
            """, (name, location, contact, timings, rating, outlet_id))

            # Commit the transaction
            conn.commit()
```

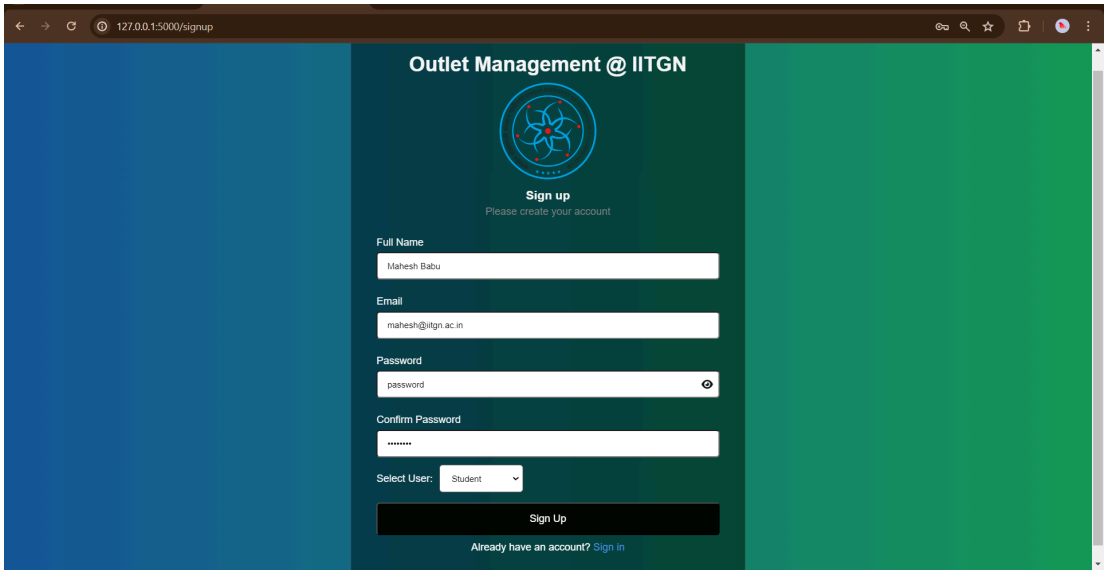
Concurrent multi-user access in the MySQL database can be given by using table locks in order to ensure that only one user can update a specific item at a time. Here, the update() function in the code snippet locks the Outlet table for write access, updates a specific record with provided data, and then releases the table lock. This prevents conflicts when multiple users try to update the same record simultaneously. The SQL query is parameterized to prevent SQL injection attacks, and the changes are committed to the database after the update.

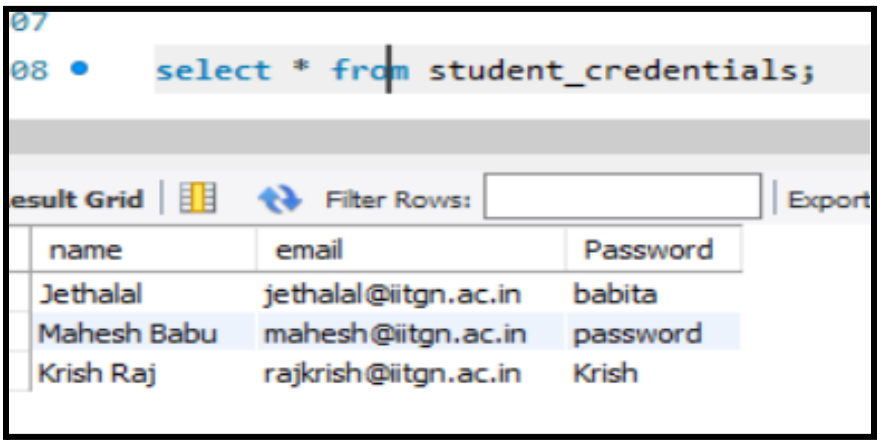
*2. Implement the changes in the database as per the feedback received from stakeholders.*

As we received feedback from the stakeholders we have made the changes accordingly on our website for the feedback of removing the penalty amount for student view we haven't made changes in the database because it has been only removed form the student view but it's there in stakeholder view and the database.




Additionally, we've integrated the 'student_credential' table into our database system. To facilitate easy access, we've provided two samples for viewing the student interface. Initially, any user with stakeholder credentials could access both the stakeholder and student views by confirming their 'user_type' during login.



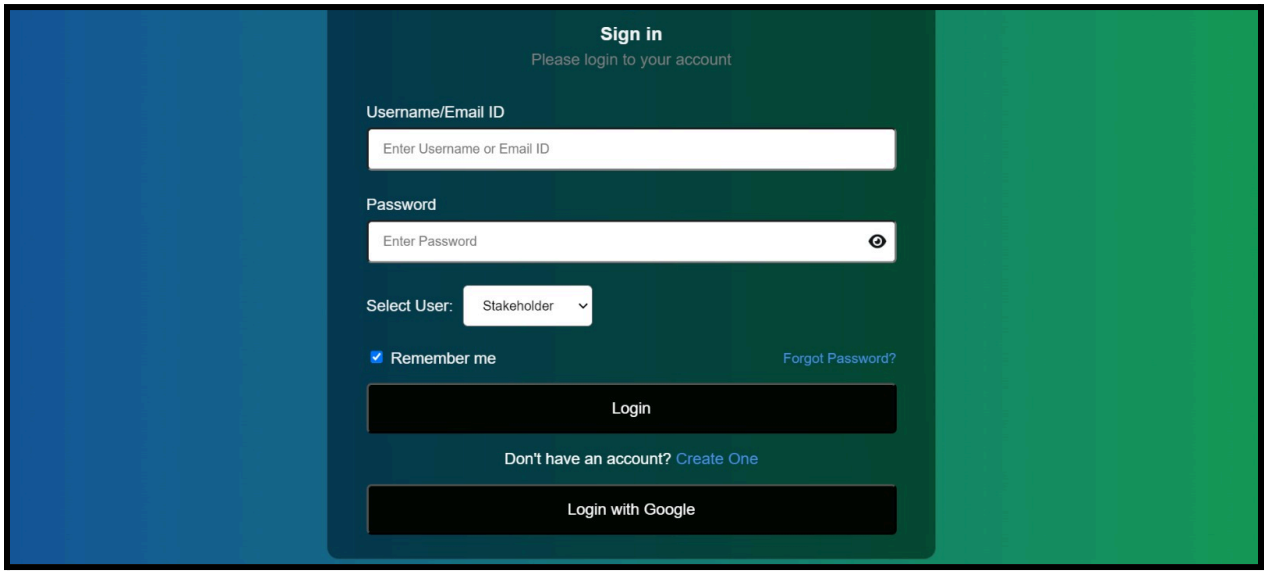




Now, to streamline the process, we've introduced a signup mechanism where student data is stored in the 'student_credential' table upon registration. Once registered, students can seamlessly access the student view of the Outlet Management system using the same credentials for subsequent logins, eliminating the need for repeated signups.

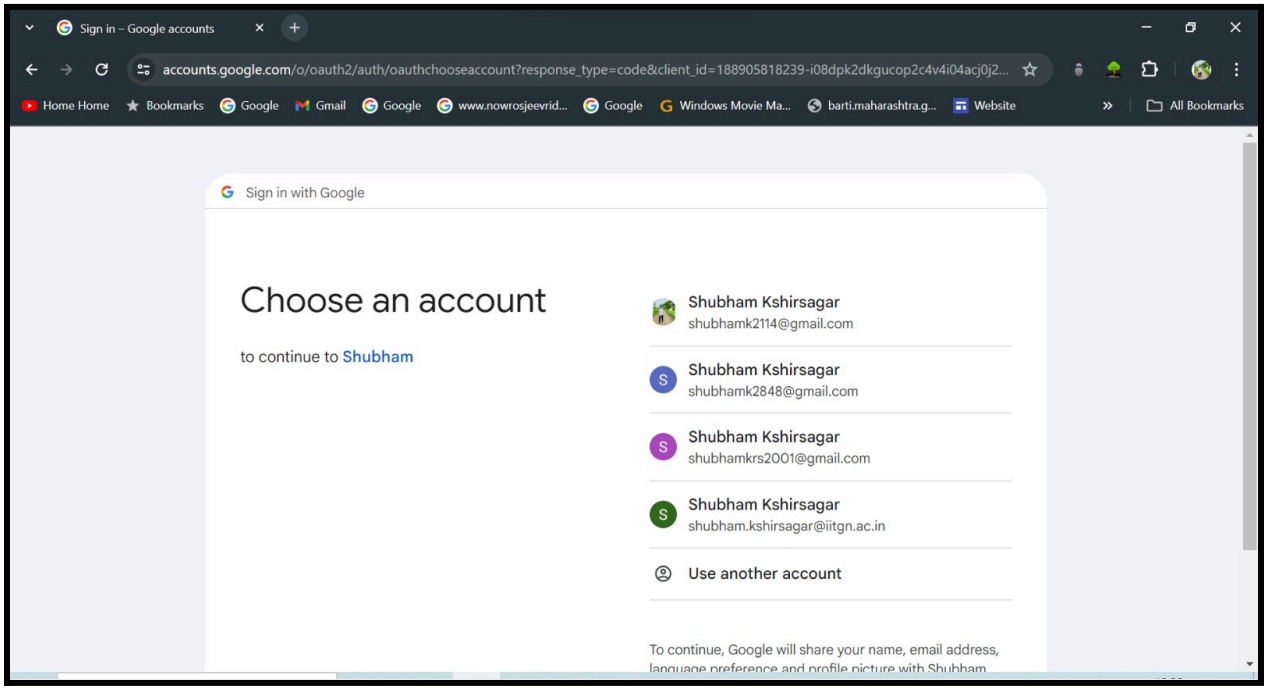
**Note:** We haven't added a register for stakeholders. Adding a registration feature for stakeholders directly into the database by the admin can be beneficial as Security. By minimizing the potential for attackers to exploit vulnerabilities in self-registration processes, the system becomes more resilient against unauthorized intrusion attempts, safeguarding sensitive data and protecting the integrity of the platform.

*3. Add Google authentication for login and registration. (only IITGN users can login and register)*

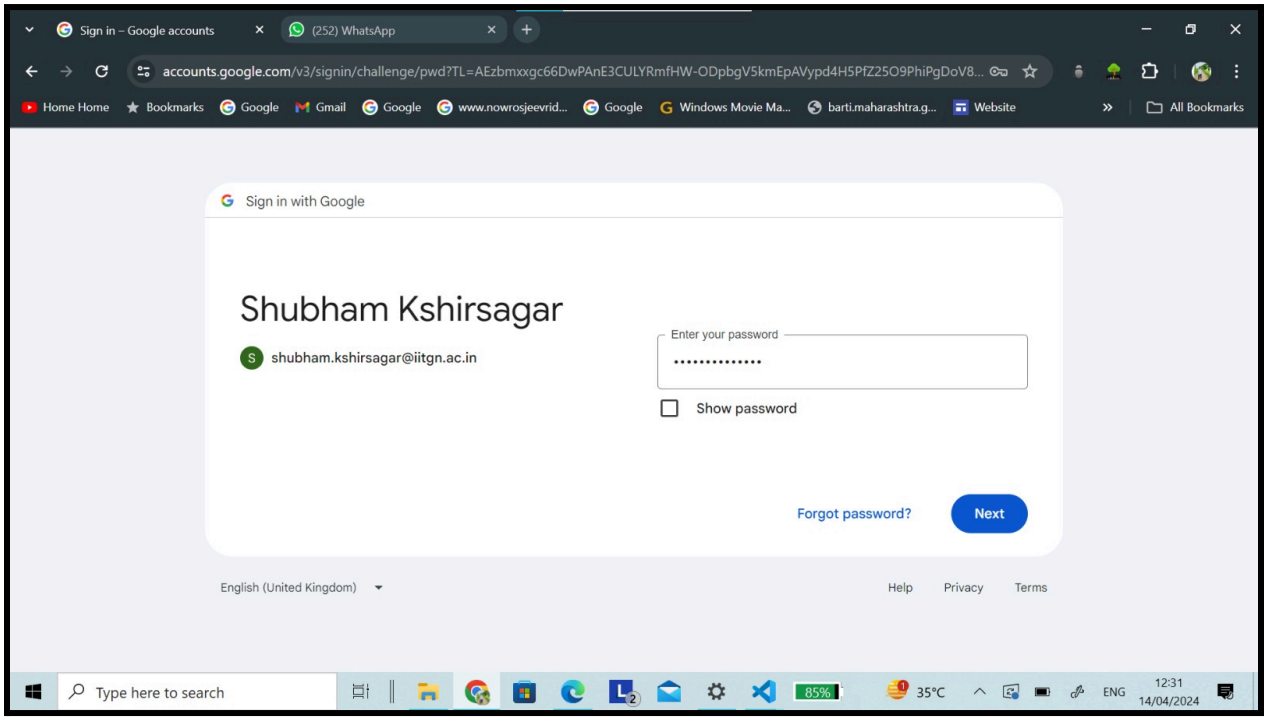
We have added Google authentication on the login page by which the user can login to our website with their Gmail account related to the IIT Gandhinagar.



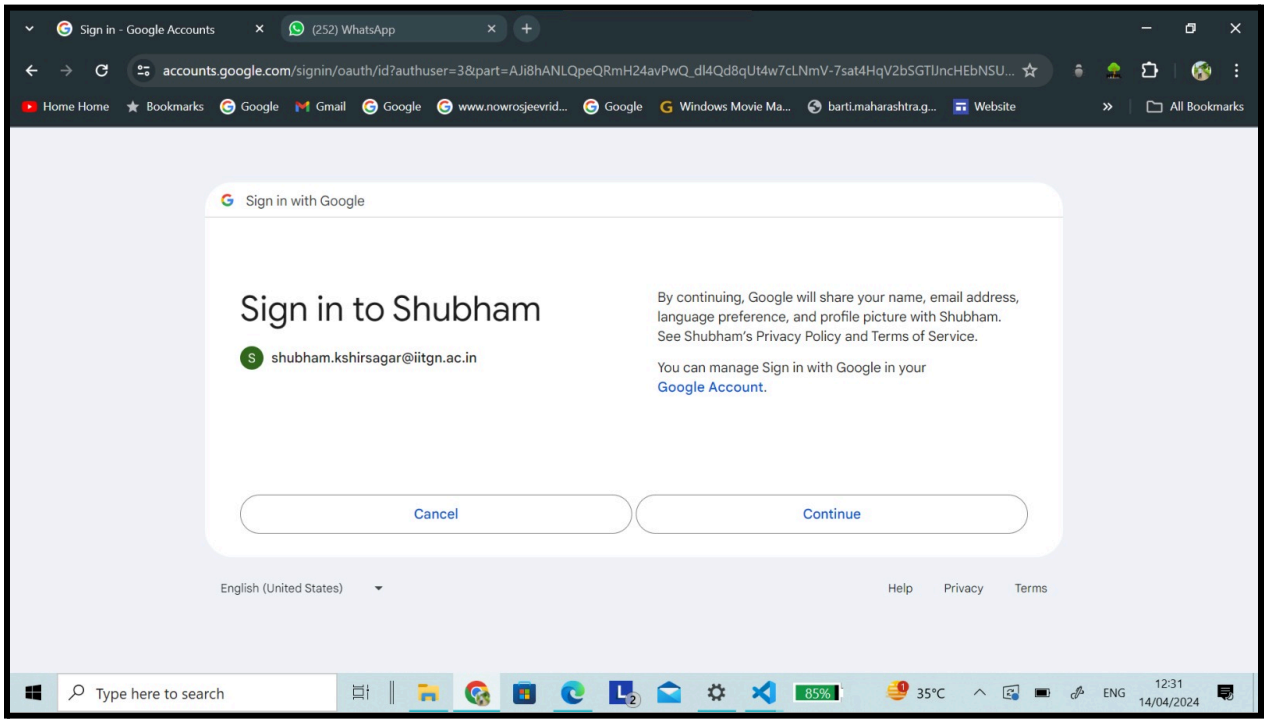

By choosing the option for login with Google at the bottom we get another page asking to choose an account.

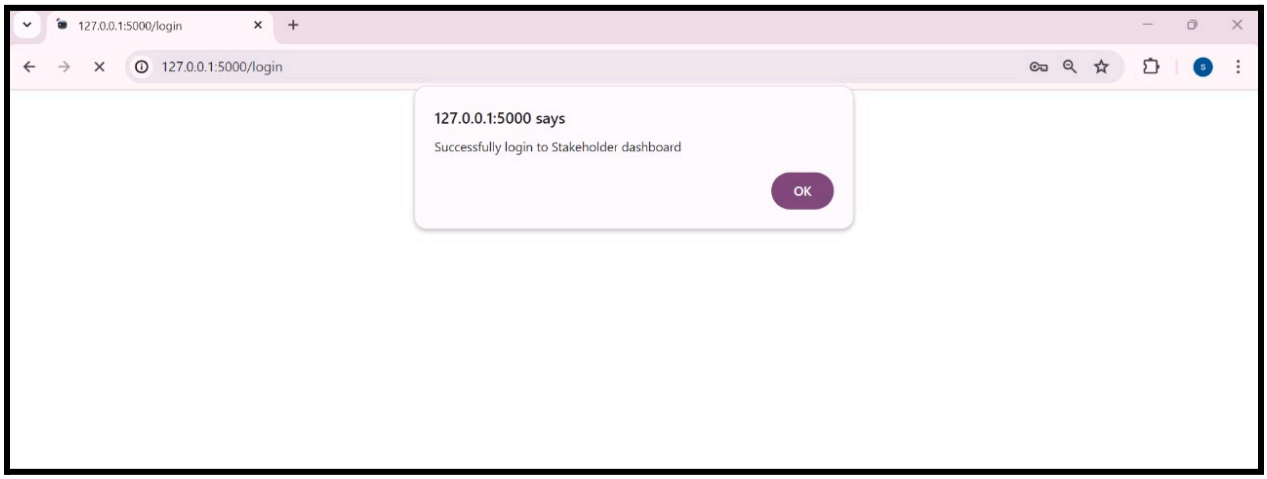


Further selecting an account will open a page asking for your Gmail password.




And in the end, we get a confirmation page.




127.0.0.1:5000/login
127.0.0.1:5000/login
127.0.0.1:5000 says
Successfully login to Stakeholder dashboard
OK

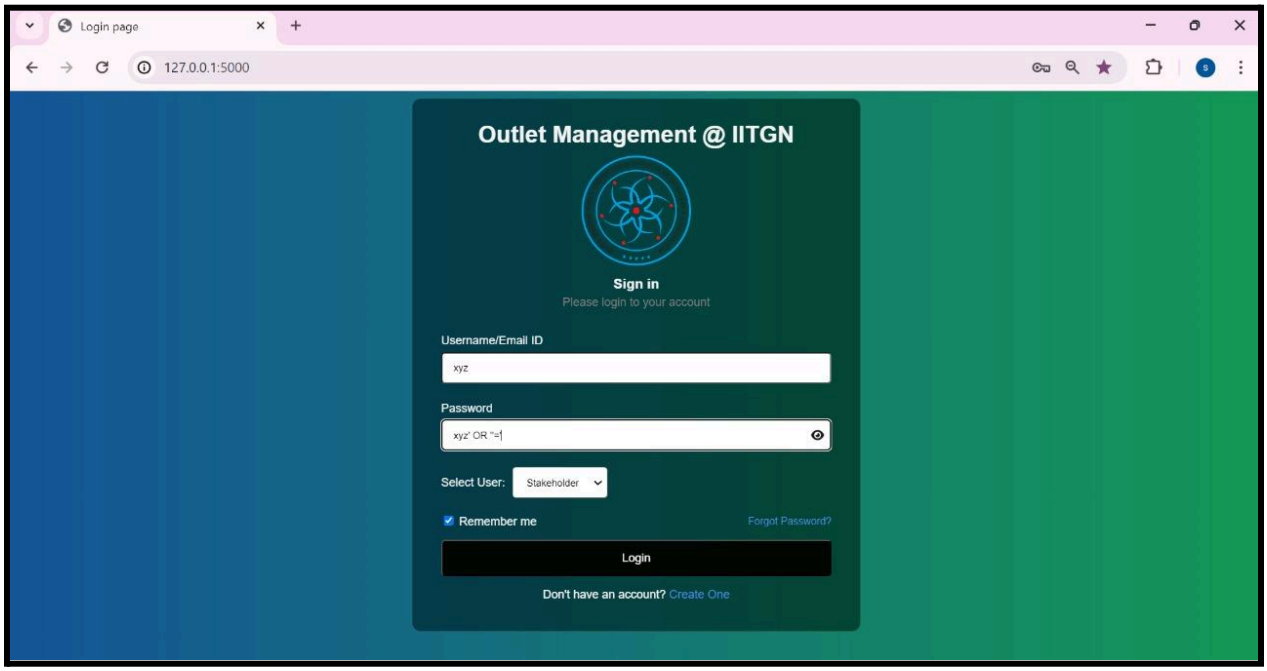
# Responsibility of G1 and G2

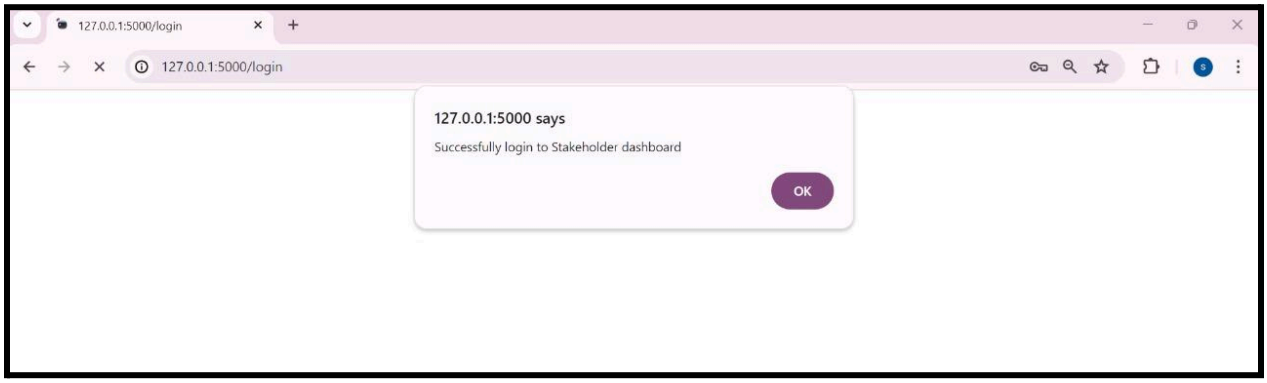
*1. Documentation and screenshots of a total of 2 attacks [SQL Injection and XSS] performed and the defenses against those attacks.*

## SQL Injection attack

## Method 1

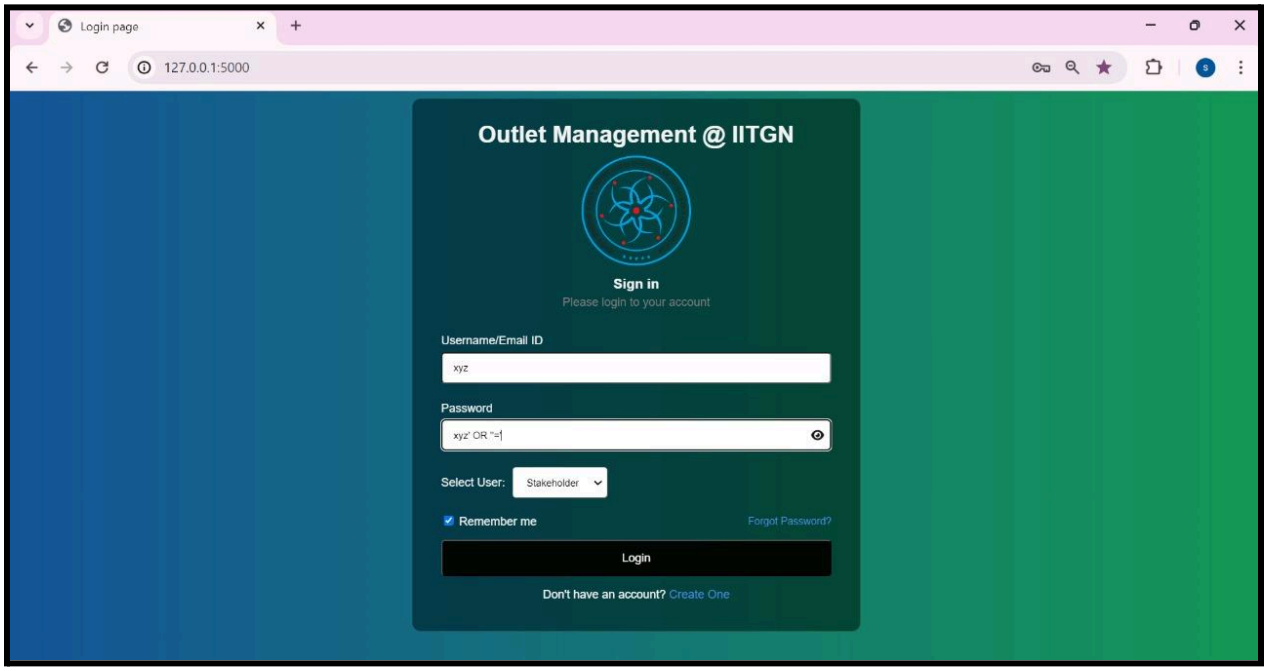
Here the user entered any keyword as username instead of email, and the password was given randomly and by using OR given true value(1). Then it was implemented and logged in successfully.

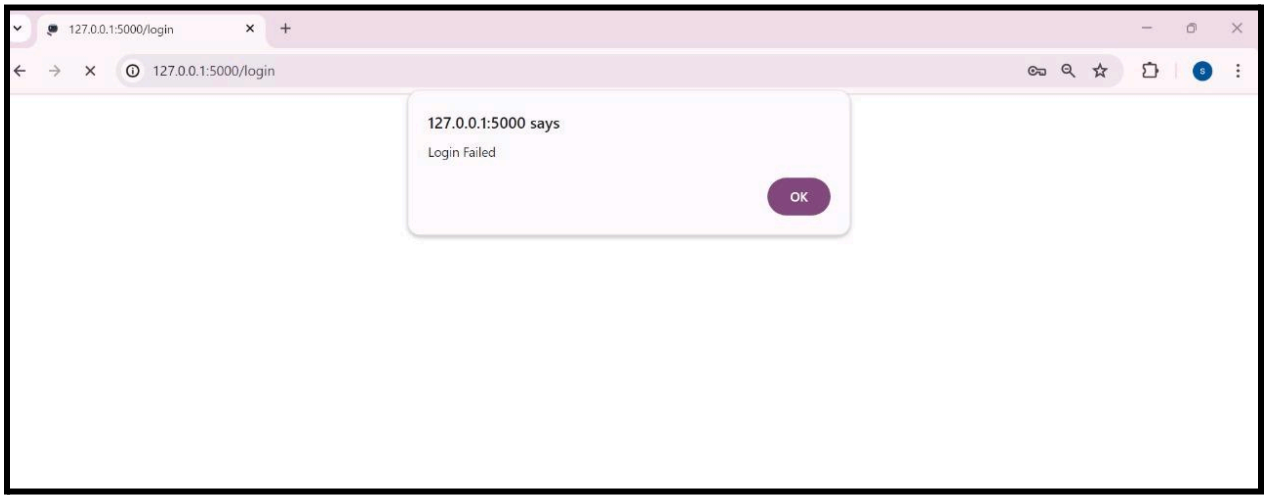


## Defense for SQL injection

Initially, anyone can enter our website by filling in any of the keywords in the email and password therefore, we have provided some parameters to prevent this attack to protect our website.



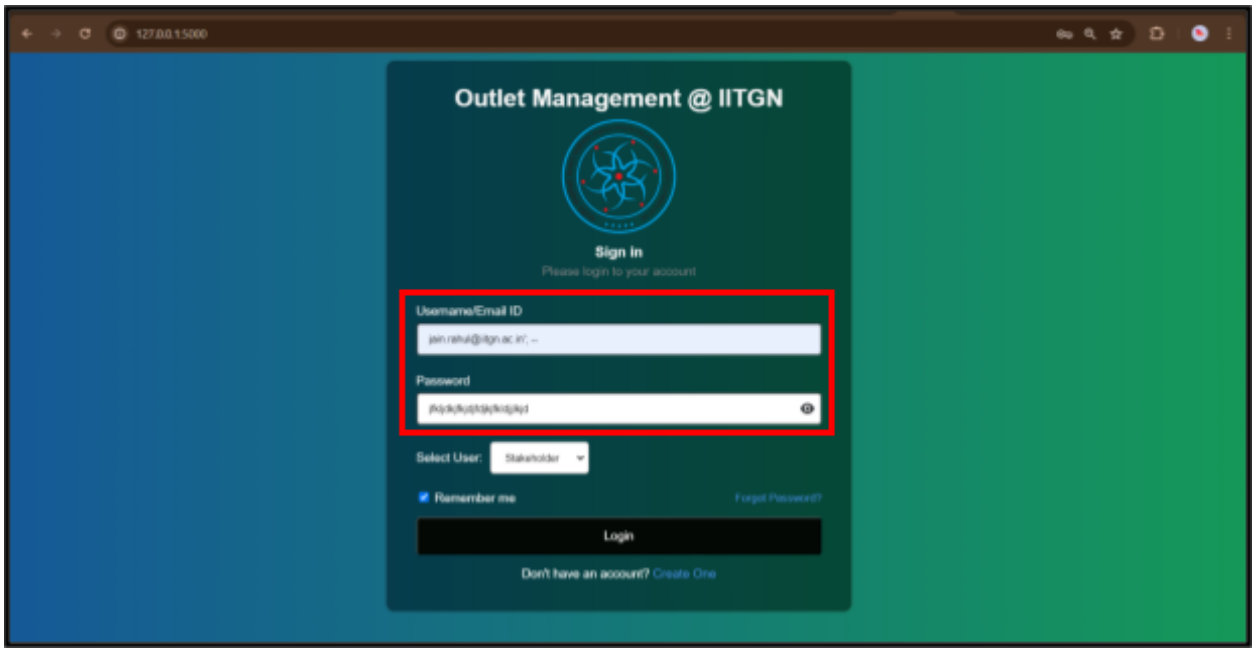
```python
@app.route("/login", methods=["POST"])
def login_user():
    email = request.form.get("username")
    password = request.form.get("password")
    user_type = request.form.get("userType")
    cur = mysql.connection.cursor()


    if user_type == "stakeholder":

        # cur.execute("SELECT * FROM stakeholder WHERE email = %s AND password = %s", (email, password))
        query = f"SELECT * FROM stakeholder WHERE email = %s and password = %s"
        print(query)
        cur.execute(query,(email, password))
        stakeholder = cur.fetchone()
```

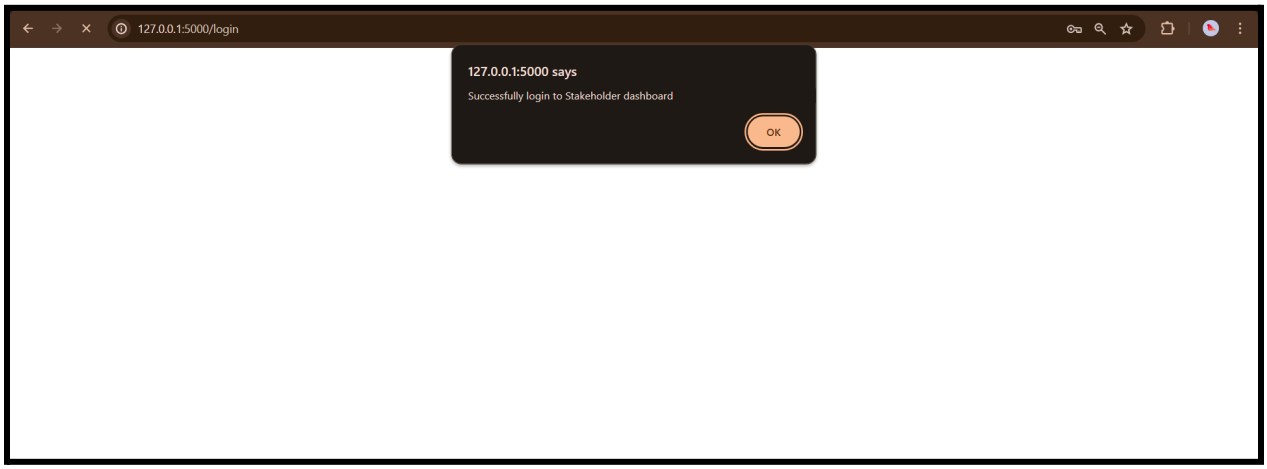
This code defines a route /login in a Flask application, which accepts POST requests. When a request is received, it retrieves the username, password, and user type from the form data.

If the user type is "stakeholder", it prepares an SQL query to select data from a table named stakeholder based on the provided email and password. The query is parameterized to prevent SQL injection attacks.

The execute function executes the query with the provided parameters and the fetched data is stored in the stakeholder variable.

## Method 2


127.0.0.1:5000
Outlet Management @ IITGN
Sign in
Please login to your account
Username/Email ID
Password
Select User:
Stakeholder
Remember me
Forgot Password?
Login
Don't have an account? Create One


127.0.0.1:5000/login
127.0.0.1:5000 says
Successfully login to Stakeholder dashboard
OK

```python
@app.route("/login", methods=["POST"])
def login_user():
    email = request.form.get("username")
    password = request.form.get("password")
    user_type = request.form.get("userType")
    cur = mysql.connection.cursor()

    if user_type == "stakeholder":
        query = f"SELECT * FROM stakeholder WHERE email = '{email}' and password = '{password}'"
        # print(query)
        cur.execute(query)
        stakeholder = cur.fetchone()
        cur.close()
```

The code fetches user inputs from the submitted form data, including email, password, and user type. It constructs an SQL query dynamically using formatted strings, directly appending the user-provided email and password into the query.

The vulnerability lies in directly concatenating user inputs into the SQL query string. If an attacker provides a specially crafted email input like "jain.rahul@iitgn.ac.in'; -- ", the resulting SQL query becomes:

```sql
SELECT * FROM stakeholder WHERE email = 'jain.rahul@iitgn.ac.in'; -- and password
```

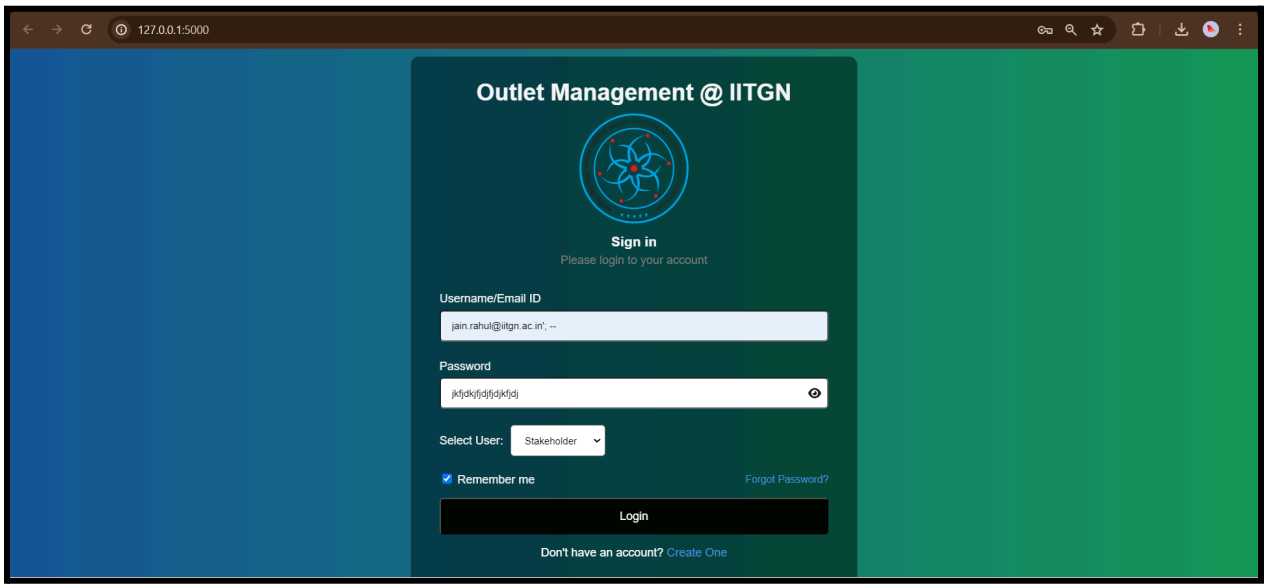
In this scenario, if the attacker gains access to a stakeholder's email address, they can leverage SQL injection techniques to bypass the password authentication mechanism and gain unauthorized access to the system. By carefully crafting the email input, such as appending a malicious SQL command like "**'; –** " the attacker effectively terminates the original SQL query and introduces their own arbitrary SQL code, effectively bypassing the password check. This manipulation allows the attacker to log in without providing a valid password, compromising the application's security and putting sensitive data at risk.

## Defense for SQL injection 2

We used parameterized queries or prepared statements to address this vulnerability and prevent SQL injection attacks. These techniques separate SQL code from user input, preventing the input from being interpreted as part of the SQL command. Here's how we can modify the code to use parameterized queries:

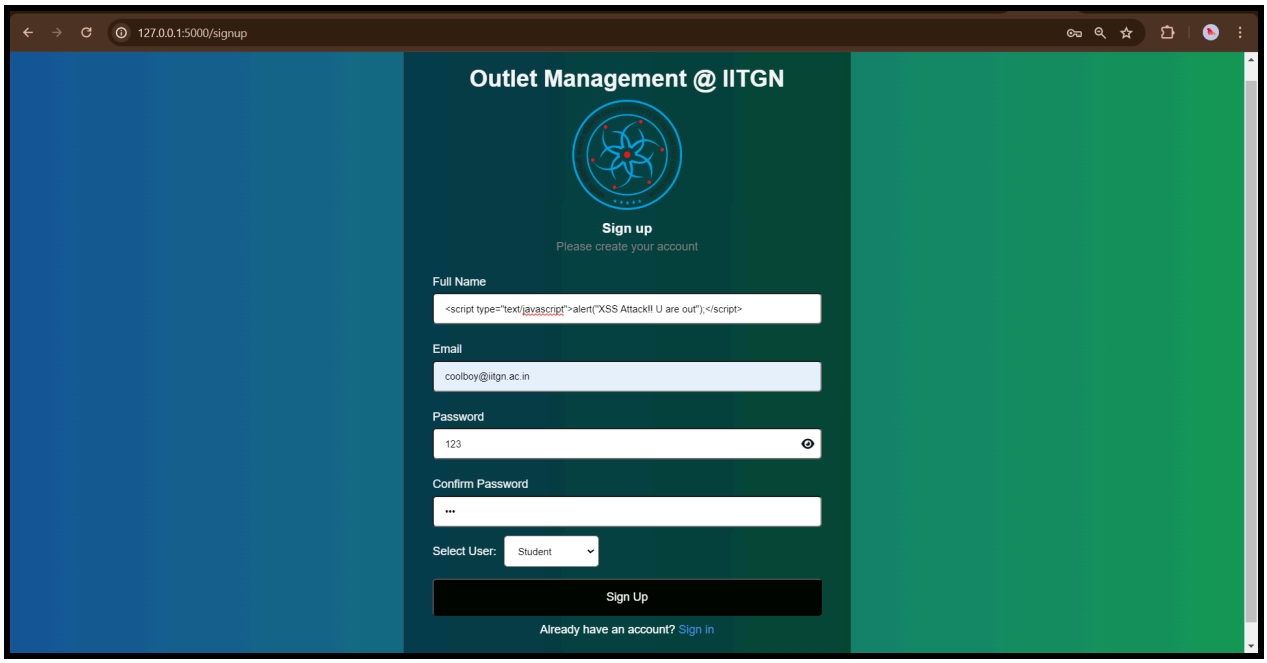
```python
@app.route("/login", methods=["POST"])
def login_user():
    email = request.form.get("username")
    password = request.form.get("password")
    user_type = request.form.get("userType")
    cur = mysql.connection.cursor()

    if user_type == "stakeholder":
        cur.execute("SELECT * FROM stakeholder WHERE email = %s AND password = %s", (email, password))
        # query = f"SELECT * FROM stakeholder WHERE email = '{email}' and password = '{password}'"
        # print(query)
        # cur.execute(query)
        stakeholder = cur.fetchone()
        cur.close()
```

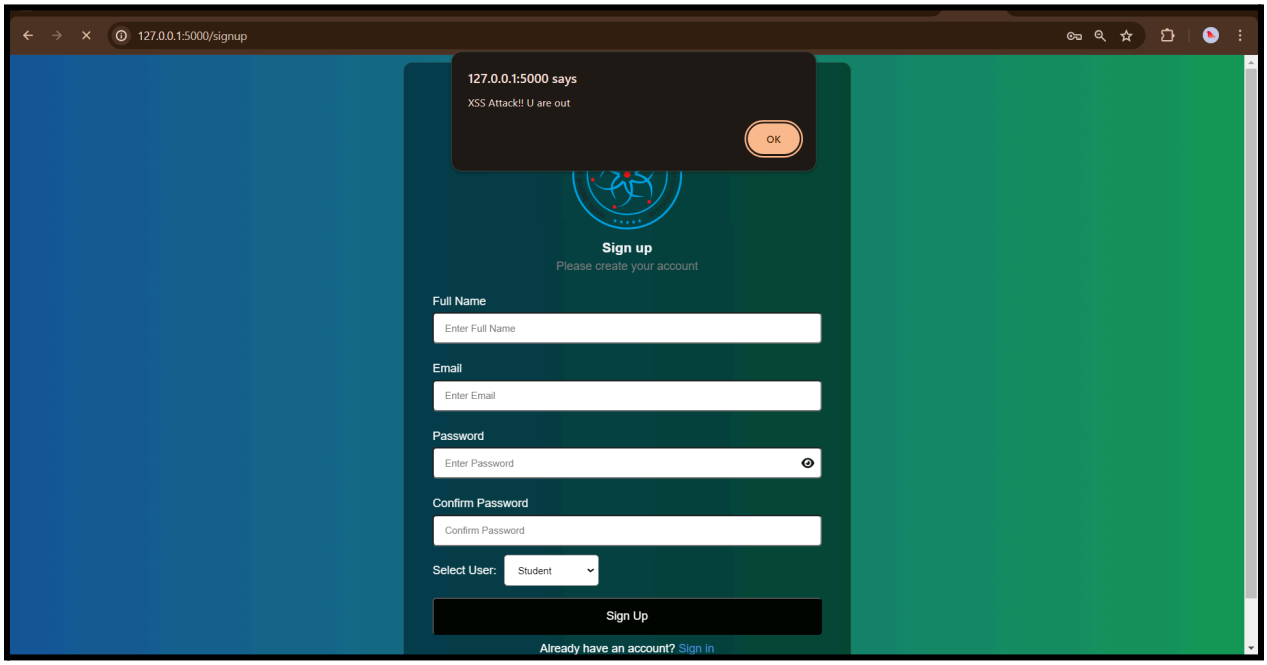
With parameterized queries, the database driver handles escaping and quoting of the user input, effectively preventing SQL injection attacks.




## XSS Attack

Cross-site scripting (XSS) is a type of web security vulnerability that attackers exploit to inject malicious scripts into websites. These scripts run within the victim's web browser, allowing attackers to potentially steal data, redirect users to malicious sites, or disrupt the website's functionality.



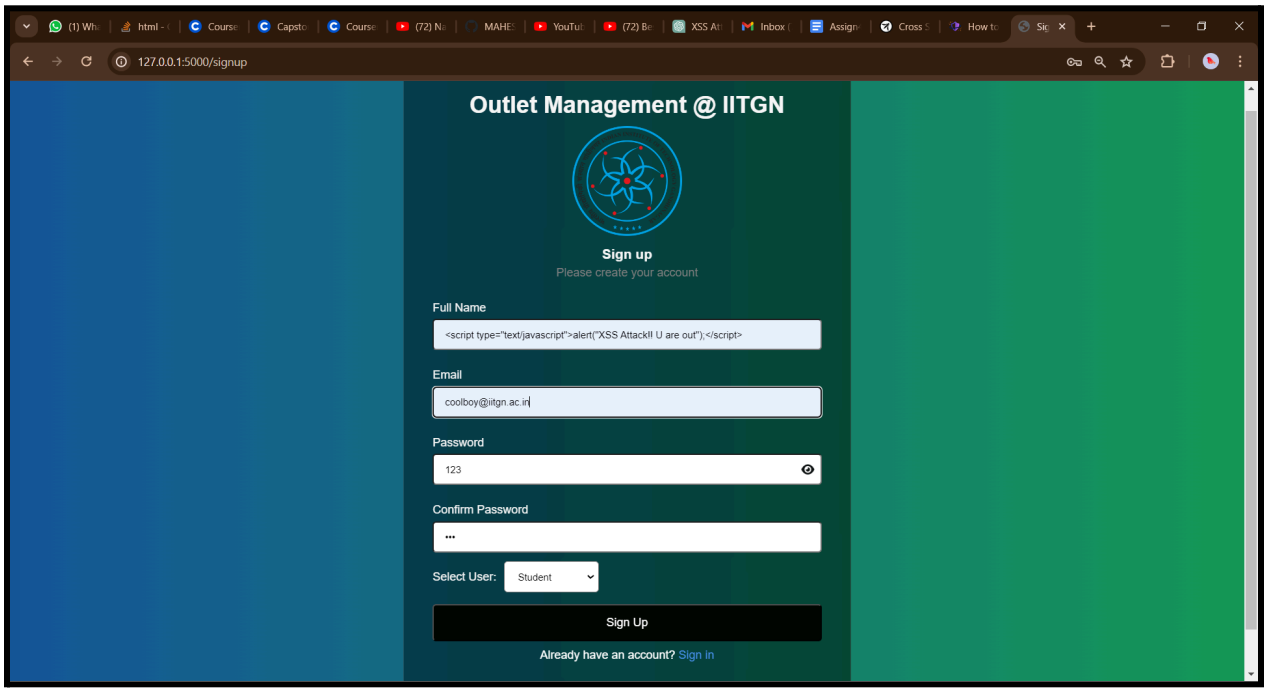
Here, I injected this script into the fullname input field on the signup form. When the form is submitted and the fullname field is processed on the server side, the script "**<script type="text/javascript">alert("XSS Attack!! U are out");</script>**" will be executed, causing a pop-up alert with the message "**XSS Attack!! U are out**" to appear. This is achieved by setting the value attribute of the input field to a JavaScript script tag that contains the malicious code. This is hapening because the form is submitted without proper input sanitization or escaping on the server side. This lack of sanitization creates a Cross-Site Scripting (XSS) vulnerability.

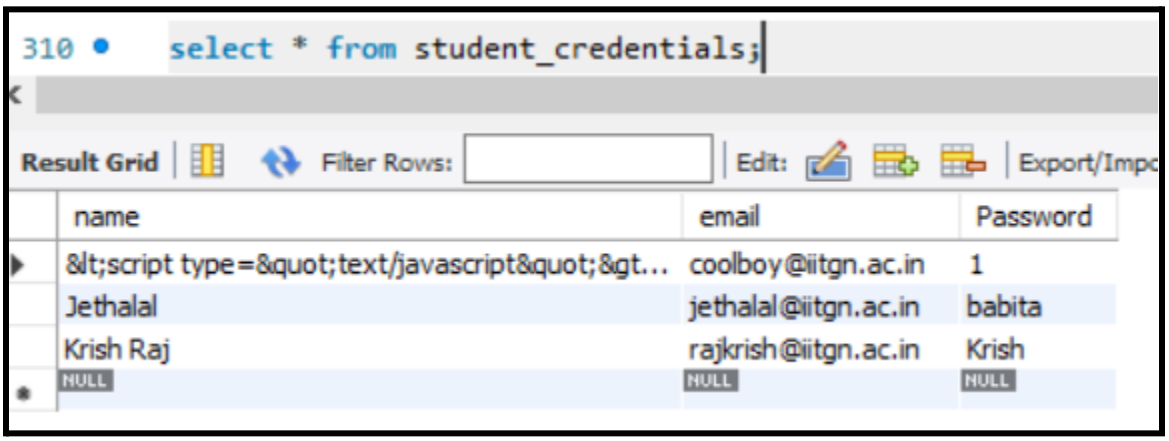
## Defense for XSS Attack

### Approach 1

```python
@app.route("/signup", methods=["GET", "POST"])
def signup():
    msg = ""

    if request.method == "POST":
        name = html.escape(request.form['fullname'])
        email = html.escape(request.form['email'])
        password = html.escape(request.form['password'])
        confirm_password = html.escape(request.form['confirmPassword'])
        user_type = request.form['userType']
```

To defend against the Cross-Site Scripting (XSS) attack in our web application, I implemented input sanitization on the server side using the html.escape() function provided by the Python html module. This function escapes special characters in the user input, converting them into their HTML entity equivalents. By escaping user input before processing it, we prevent malicious scripts from being executed when the data is rendered in the browser.





```
310 •   select * from student_credentials;
```

Result Grid | Filter Rows: | Edit: | Export/Impo

| name | email | Password |
|---|---|---|
| <script type="text/javascript"&gt... | coolboy@iitgn.ac.in | 1 |
| Jethalal | jethalal@iitgn.ac.in | babita |
| Krish Raj | rajkrish@iitgn.ac.in | Krish |
| NULL | NULL | NULL |

In our Flask route for handling user sign-up (/signup), we sanitize the input fields (fullname, email, password, confirmPassword) using the **html.escape()** function. This function converts characters like <, >, ", and & into their respective HTML entities (<, >, ", &). This ensures that any potentially malicious JavaScript code entered by the user is treated as plain text and not executed by the browser.

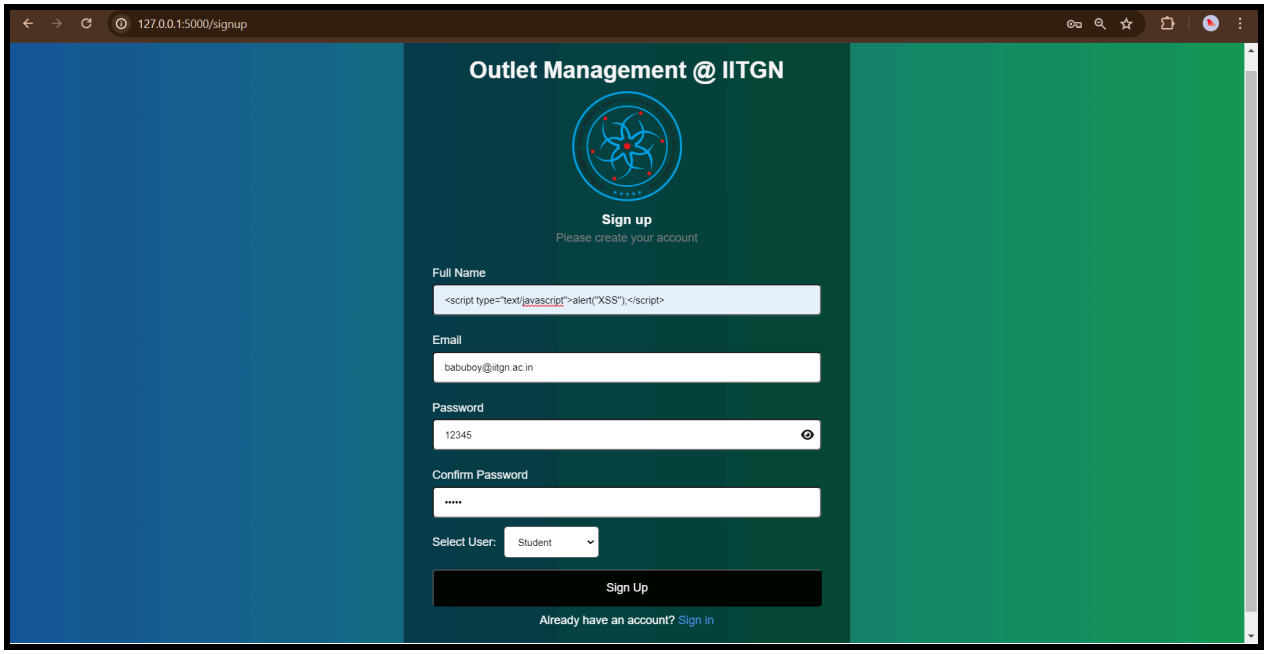
When the sanitized input is stored in the database, it is stored as-is, with the special characters replaced by their HTML entity equivalents. For example, if the user enters <script>alert("XSS");</script> in the fullname field, it will be stored in the database as <script>alert("XSS");</script>. This ensures that even if the data is retrieved from the database and rendered in the browser, it will be displayed as plain text and not executed as JavaScript.

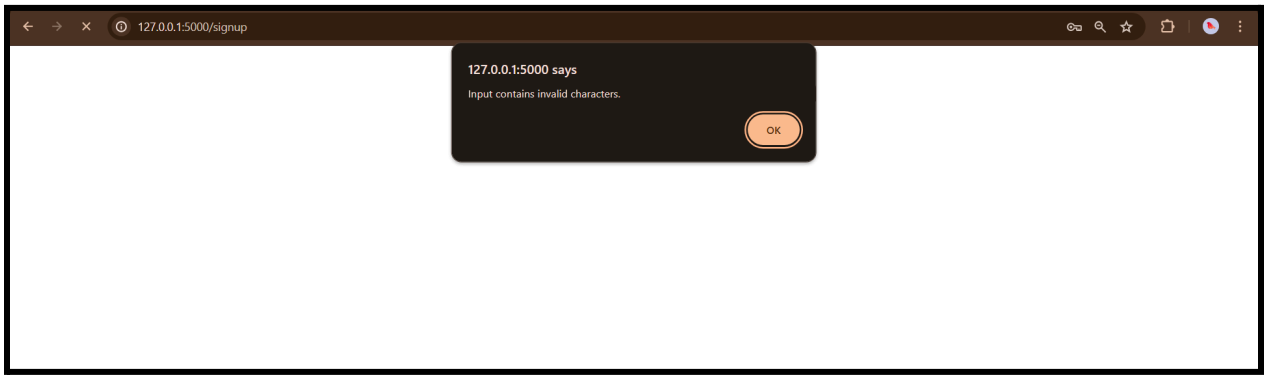
## Approach 2

```
# Regular expression pattern to match HTML or JavaScript tags
HTML_JS_REGEX = re.compile(r'<.*?>|<script.*?>.*?</script>', re.IGNORECASE)
```

I have implemented input validation to ensure that the user-provided input does not contain any HTML or JavaScript tags. I've defined a regular expression pattern (HTML_JS_REGEX) to match HTML or JavaScript tags. Inside the signup route, I use this pattern to search for any HTML or JavaScript tags in the user-provided input (name, email, password, confirm_password).

```
@app.route("/signup", methods=["GET", "POST"])
def signup():
    msg = ""

    if request.method == "POST":
        name = request.form['fullname']
        email = request.form['email']
        password = request.form['password']
        confirm_password = request.form['confirmPassword']
        user_type = request.form['userType']

        # Input validation
        if HTML_JS_REGEX.search(name) or HTML_JS_REGEX.search(email) or HTML_JS_REGEX.search(password) or HTML_JS_REGEX.search(confirm_password):
            return """
            <script>
            alert("Input contains invalid characters.");
            window.location.href = "{}";
            </script>
            """.format(url_for("signup"))
```




If the expression pattern finds any HTML or JavaScript tags in the user input, it indicates the presence of potentially harmful content. In such cases, the user is redirected back to the signup page with an error message. This prevents the submission of malicious script tags and mitigates the risk of XSS attacks.

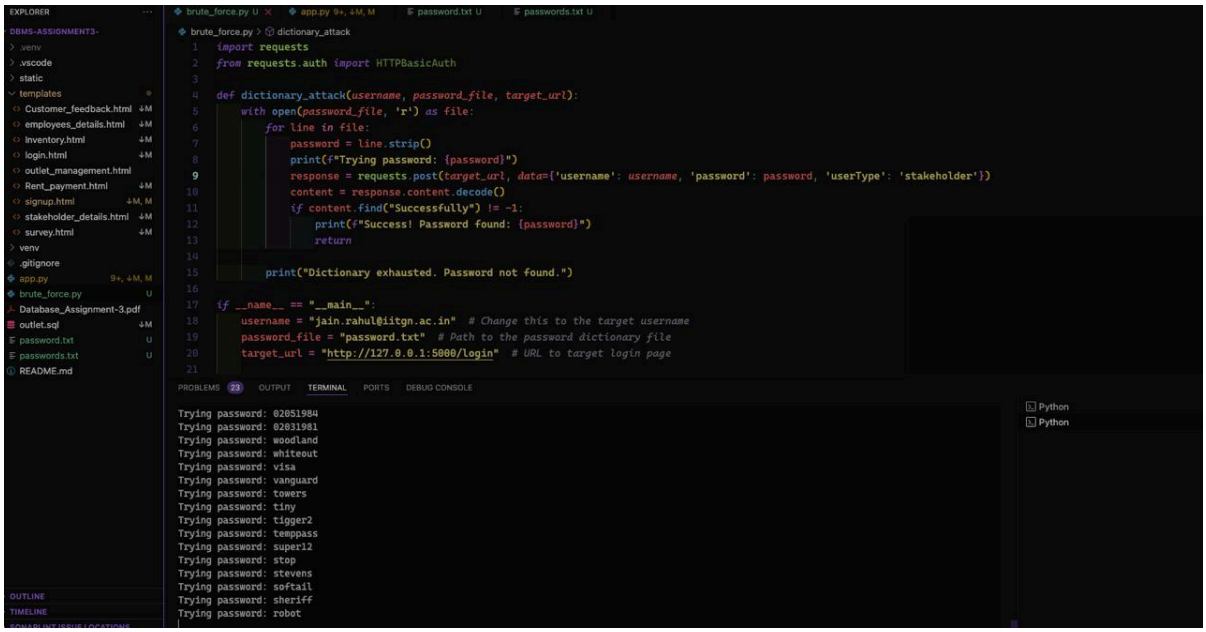
After input validation, if the input passes all checks, the registration process proceeds as usual. This includes storing the user's information in the database, displaying a success message, and rendering the signup page with the success message.

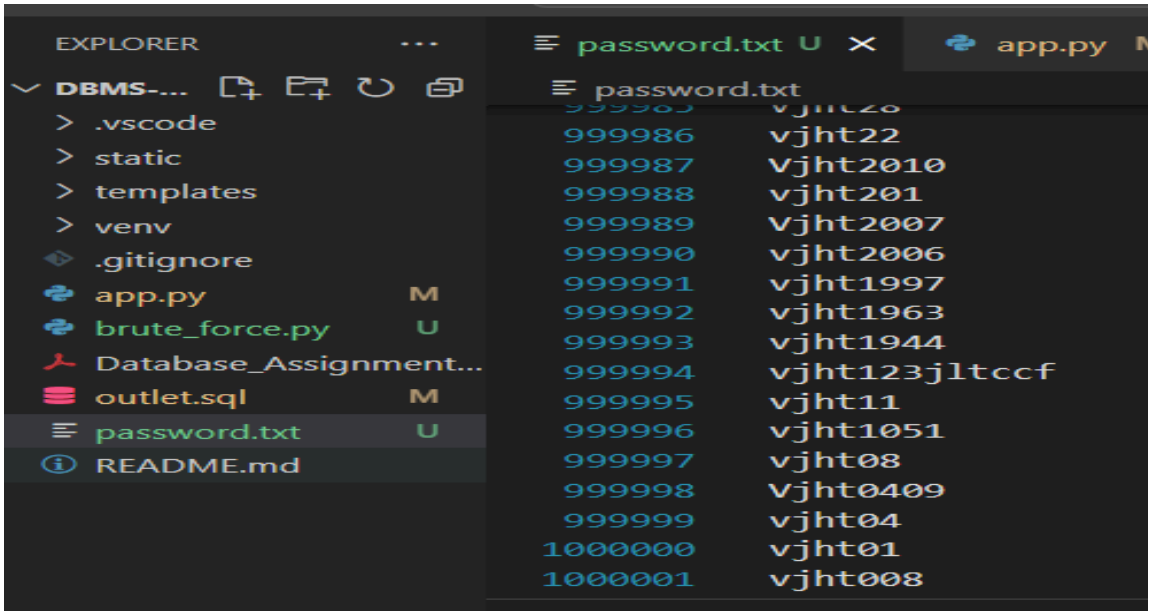
.

*a. Additional attack and defense will lead to 10 bonus points for the team.*

## Brute-Force Attack

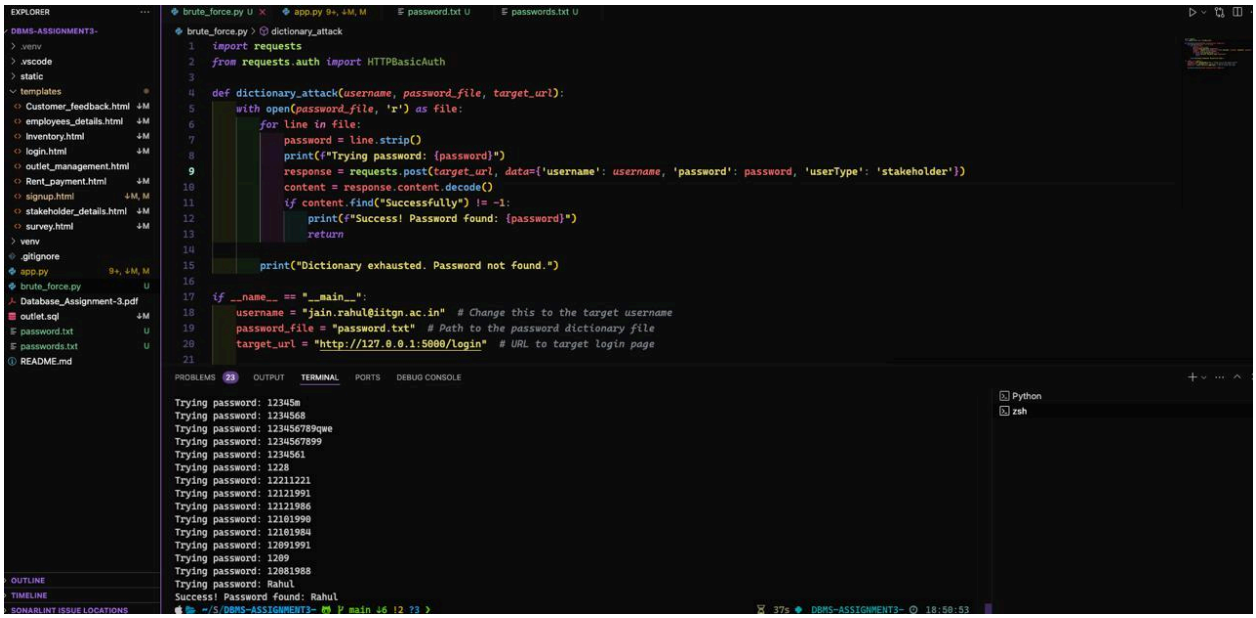
In a brute force attack, the attacker systematically and exhaustively tries all possible combinations of passwords until the correct one is found, thereby gaining unauthorized access to the targeted system. In the context of the provided website, the brute force attack is likely targeting the login functionality, where the attacker repeatedly attempts to log in using various username and password combinations.



The script is designed to perform a dictionary attack on a login page. It iterates through a list of passwords, with one password per line stored in a text file (password.txt) and sends HTTP POST requests to the target login URL, attempting to log in with a specified username and each password from the dictionary file.

The script uses the requests library to send POST requests to the target URL, providing the username (jain.rahul@iitgn.ac.in), a password from the dictionary file, and the user type (stakeholder) as form data.

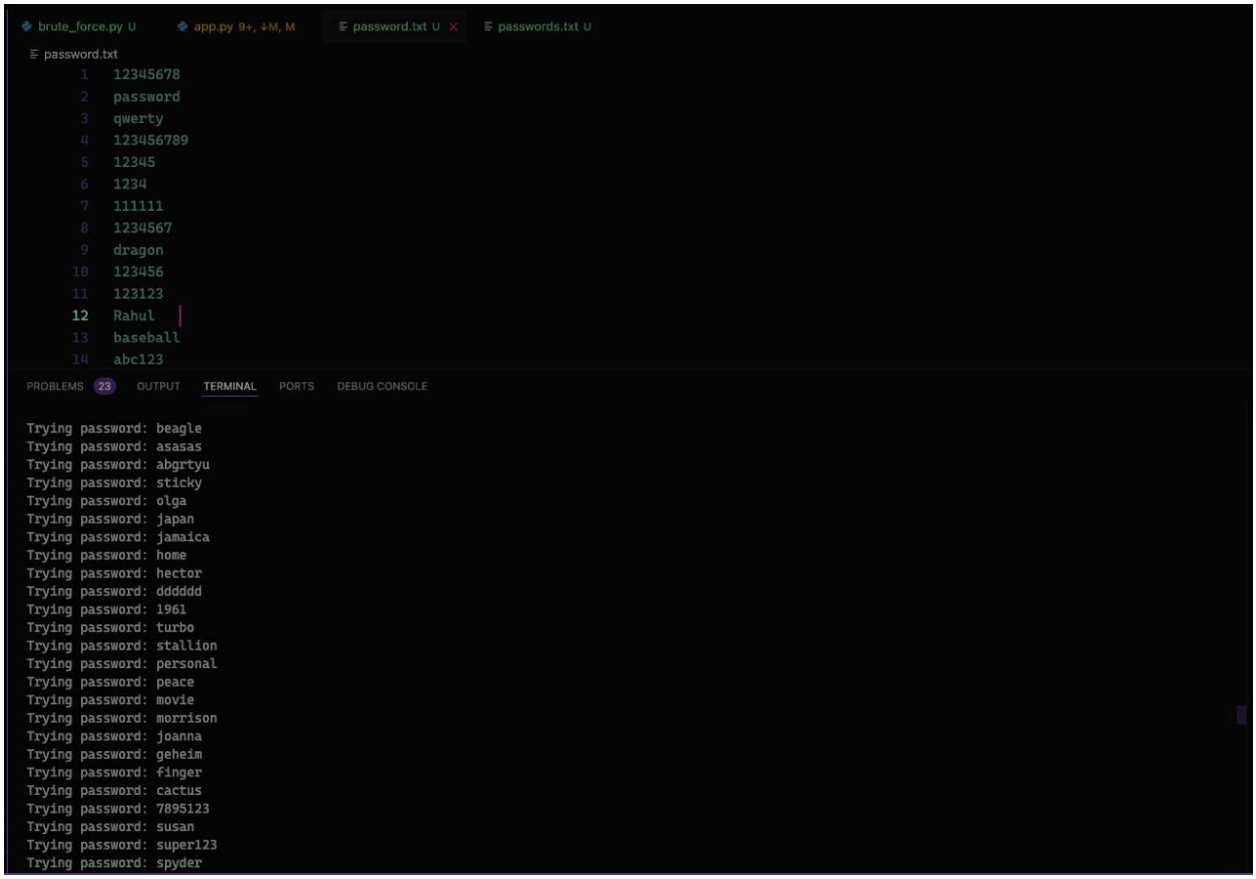


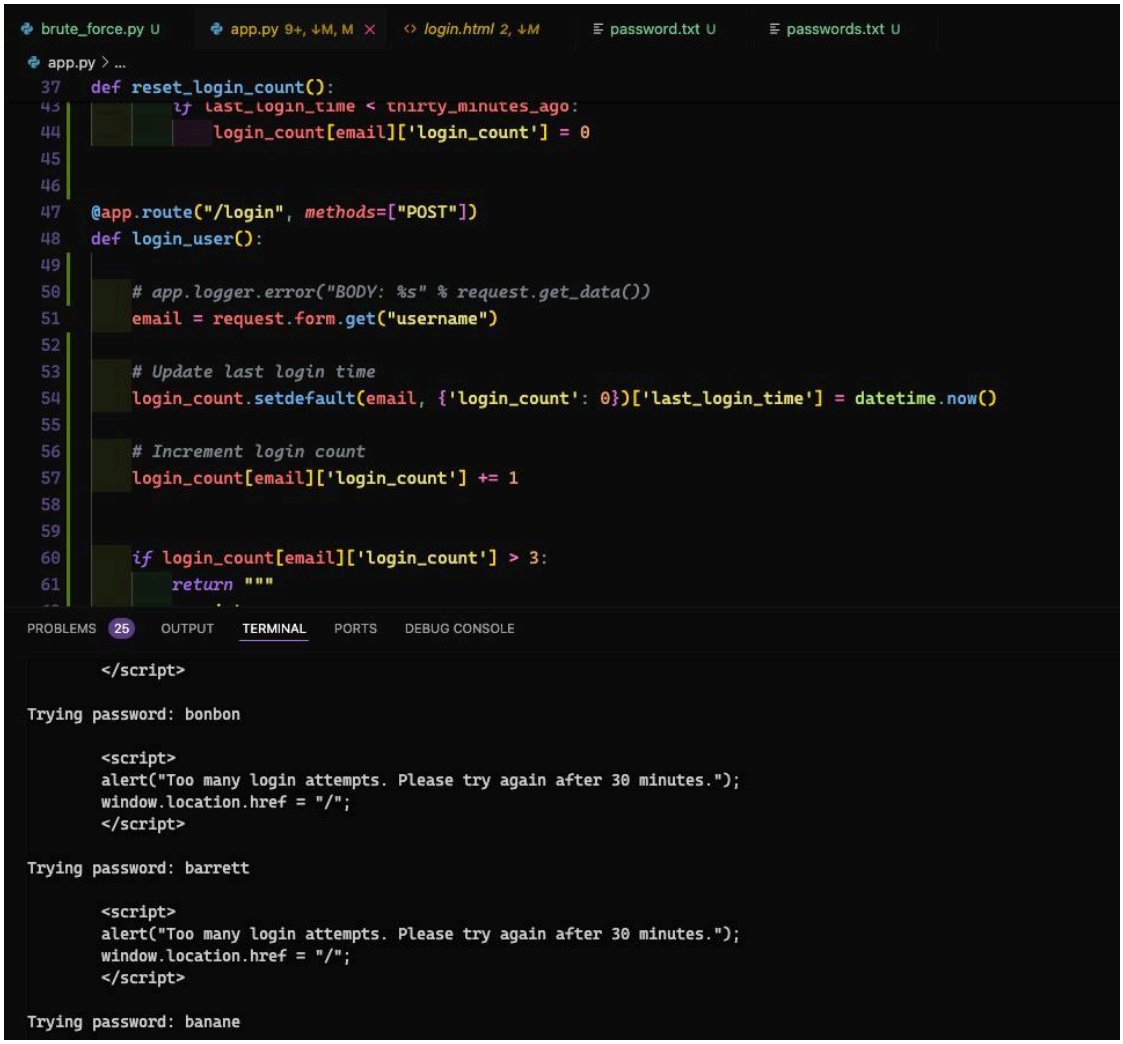

After each request, the script checks the response content to determine if the login attempt was successful. If the response contains the string "Successfully", it indicates that the login was successful, and the correct password has been found. The script then prints the successful password and stops further iterations.

## Defense For Brute-Force Attack

```
login_count = {}

@app.route("/")
def login():
    return render_template("login.html")

@app.before_request
def reset_login_count():
    current_time = datetime.now()
    thirty_minutes_ago = current_time - timedelta(minutes=30)

    for email, info in list(login_count.items()):
        last_login_time = info['last_login_time']
        if last_login_time < thirty_minutes_ago:
            login_count[email]['login_count'] = 0


@app.route("/login", methods=["POST"])
def login_user():

    # app.logger.error("BODY: %s" % request.get_data())
    email = request.form.get("username")

    # Update last login time
    login_count.setdefault(email, {'login_count': 0})['last_login_time'] = datetime.now()

    # Increment login count
    login_count[email]['login_count'] += 1


    if login_count[email]['login_count'] > 3:
        return """
        <script>
        alert("Too many login attempts. Please try again after 30 minutes.");
        window.location.href = "/";
        </script>
        """

    password = request.form.get("password")
    user_type = request.form.get("userType")
    cur = mysql.connection.cursor()
```

In the implemented a dictionary named “login_count” to keep track of login attempts for each email address. This dictionary stores the login count and the timestamp of the last login attempt for each email. Before processing each login request, the reset_login_count function is triggered. This function iterates through the “login_count” dictionary and resets the login count for email addresses whose last login attempt was more than 30 minutes ago. By doing so, it ensures that the login count remains accurate and does not accumulate indefinitely over time.






During the login request handling in the login_user function, the login count for the provided email address is incremented by one. If the login count exceeds three (indicating more than three failed login attempts within the last 30 minutes), the user is blocked from further login attempts for the next 30 minutes. This preventive measure is implemented to thwart brute force attacks, where attackers try to gain unauthorized access by systematically guessing passwords.

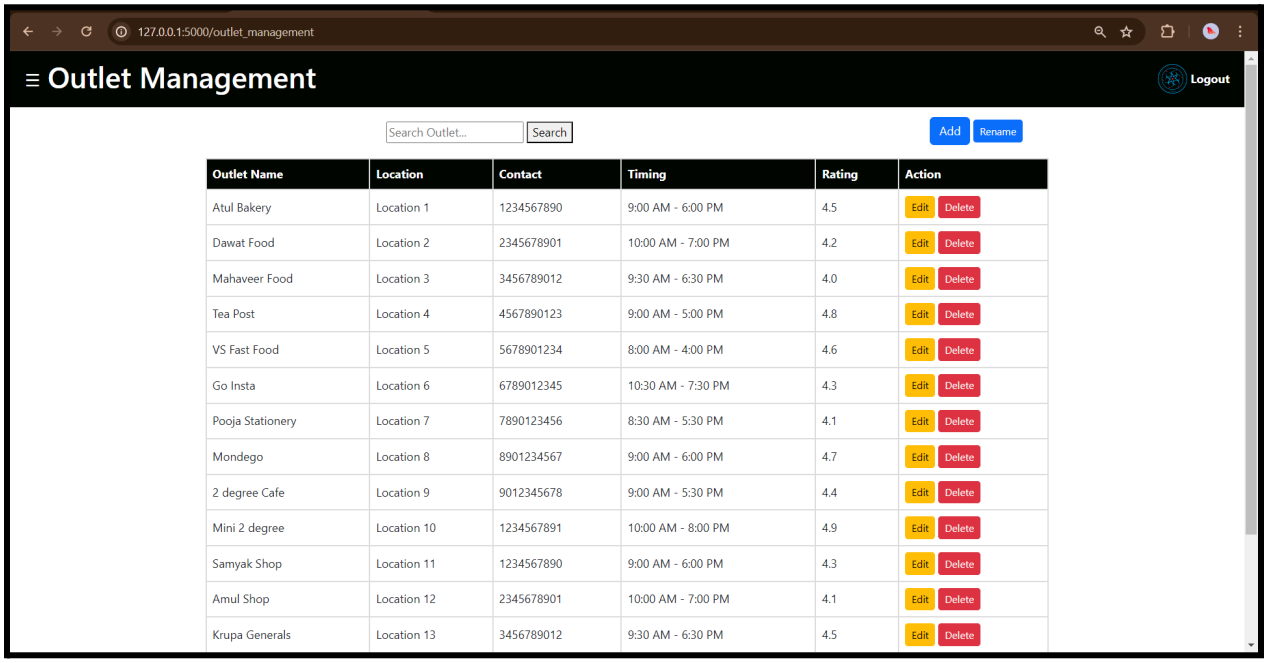
In response to a successful login attempt, the user is redirected to the corresponding dashboard with a success message. Conversely, if the login attempt fails, an error message is flashed, informing the user of the unsuccessful login and prompting them to retry. This feedback mechanism ensures transparent communication with the user regarding the outcome of their login attempt.

Another approach could be to implementing CAPTCHA challenges for login attempts can differentiate between human users and automated scripts, making it more difficult for attackers to automate the login process.

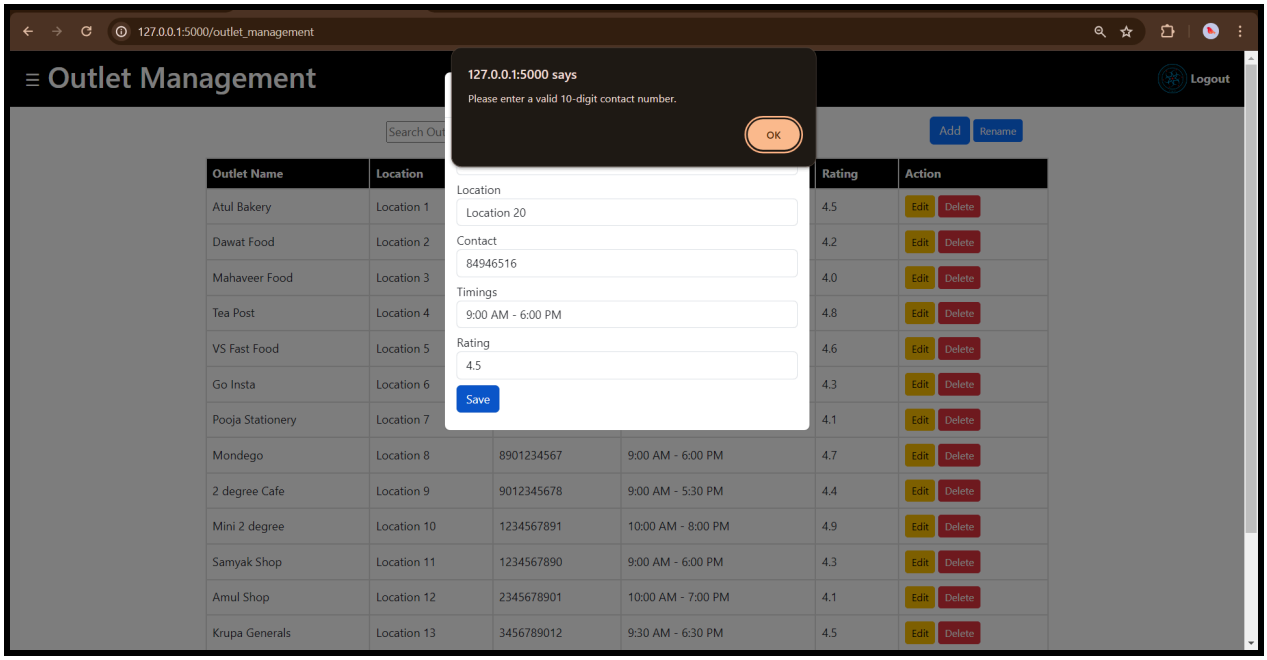
*2. Show that all the relations and their constraints, finalized after the second feedback, are present and valid as per the ER diagram constructed in Assignment 1*

Constraints :

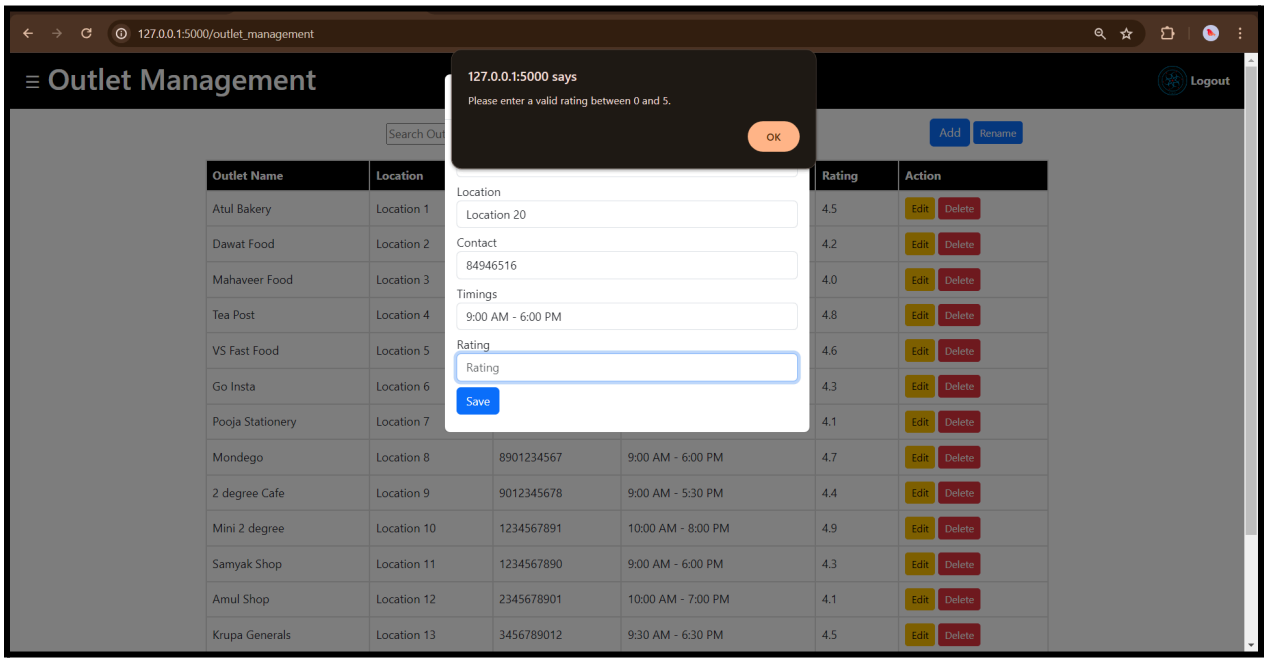
```
42      -- Create the Outlet table
43  •   CREATE TABLE Outlet (
44          Outlet_ID INT AUTO_INCREMENT PRIMARY KEY,
45          Stakeholder_ID  INT,
46          Outlet_name VARCHAR(50) NOT NULL,
47          Location_name VARCHAR(50) NOT NULL,
48          Contact_No BIGINT CHECK (Contact_No >= 1000000000 AND Contact_No < 10000000000),
49          timings VARCHAR(50),
```



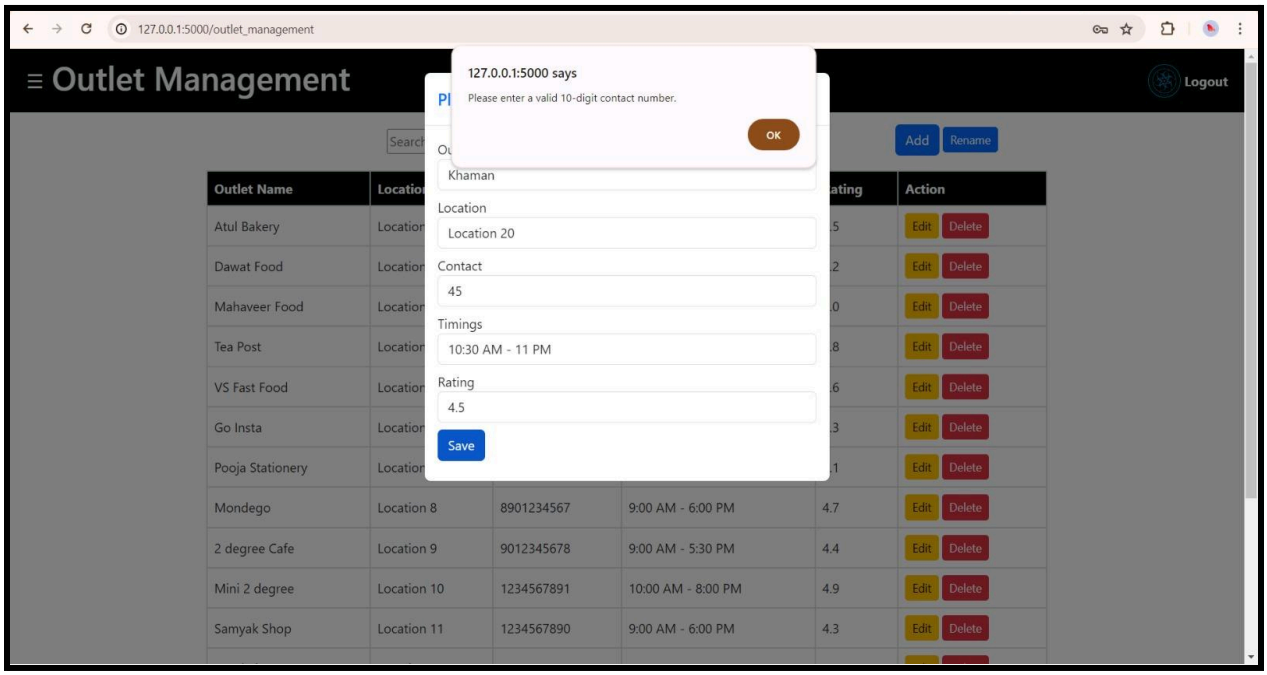

Similarly, in the SQL bench, we assigned the datatype set of Contact details as int, which signifies that only integers can be entered. This can also be seen in the webpage where in the Contact input, only integers are written.




Similarly in the rating input, only float values are allowed. But when a char alphabets) is written, there will be a message popping up saying to enter a valid input which can be on the web page below.

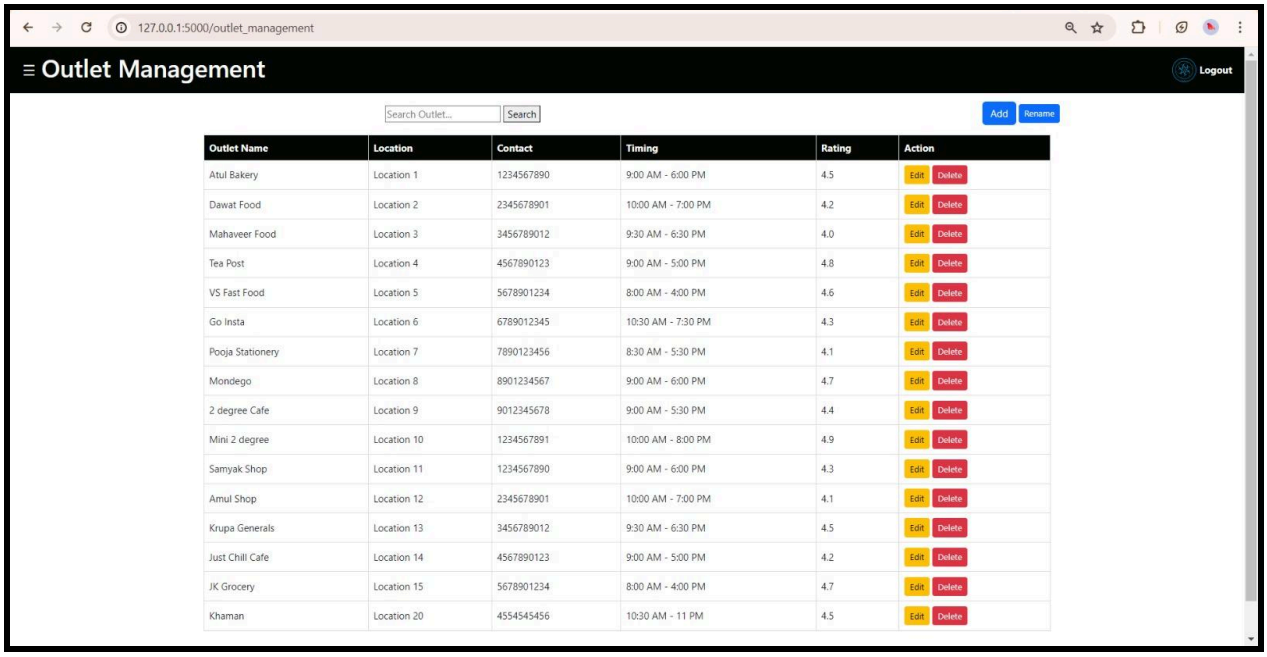


Similarly, in the contact input, 10 digits should be entered, which is one of the constraints. So, a message will pop up when the condition is not satisfied. Note that all the conditions are given in the SQL code.




We also added one more table student_credentials, with the below conditions for the student login page.

```
INSERT INTO student_credentials (name, email, Password) VALUES
('Krish Raj', 'rajkrish@iitgn.ac.in', 'Krish'),
('Jethalal', 'jethalal@iitgn.ac.in', 'babita');

select * from student_credentials;
```




Throughout the making of the database, we made sure that all the relations and constraints in the relational schema were maintained in the database. Almost all the attributes and entities were maintained in the database, with minor changes to a few attributes. For example, the prescription table was modified after the first feedback, to include additional attributes.

***No additional changes to the relations were made in the database***

# Contribution details by each group member:

**DHARAVATH MAHESH(22110073):** Group(G2)

- Contributions in the documentation
- Implemented the necessary changes given by the stakeholders.

**SHUBHAM KSHIRSAGAR :** Group(G2)

- Implemented the necessary changes given from the stakeholders on Rent and Stakeholder, i.e Multiple where clause.
- Implemented Google Authentication.

**MALLEPOGULA CHARAN TEJA(22110136):** Group(G2)

- Report documentation
- Helped in necessary changes in the webpage

**SHIPRA KETHWALIA(23210091):** Group(G2)

- Implementation of SQL Injection Attack.
- Implementation of LOCK Tables within SQL queries for Concurrent multi-user access.
- Brainstorming in google authentication for login and registration.
- Helped in report documentation.

**Harsh Kumar Keshri (22110094)**: Group(G1)

- Crafted the final documentation report
- Created the project on the Google Cloud to get a client ID and client secret for google authentication.

**Krish Raj (20110160)**: Group(G1)

- Executed SQL Injection and XSS attacks, fortifying defenses against unauthorized data access and script injection.
- Enhanced security measures with stringent input validation and parameterized queries
- Also, implemented the Brute-force attack and defense.
- Gathered and integrated feedback from stakeholders and students to enhance webpage
- Helped in report documentation.

**SUSMITA R** (22110265) : Group (G1)

- Relations and constraints part of the webpages
- Report documentation

**Yajurvedh Bodala (19110077)** : Group(G1)

## Reference:

1 *MySQL forums :: General* (no date a) *MySQL*. Available at: https://forums.mysql.com/read.php?20%2C17671%2C27914