MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

RESTAURANT MANAGEMENT SYSTEM

Department of ICT
MIT, Manipal

ICT 2223 Database Management mini project
IVth Sem B.Tech (IT)

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Contents

ABSTRACT

Restaurant Management System is a software platform that enhances and simplifies restaurant operations through order management, inventory management, billing management, reporting and customer service. The software provides the restaurants staff or managers, and customers the tools to provide service to customers more efficiently and effectively, make fewer mistakes and make better decision by using data to support the decision in an easy to use and interactive format.

1. SDG 8 – Decent Work and Economic Growth

Target 8.2: Foster higher levels of economic productivity through technological innovation.

Your system:

- Increases productivity for the restaurant as it completes routine tasks automatically.
- Reduces staff manual workload and enables them to maximize customer satisfaction.
- Improves and increases efficiency and results in higher profitability.

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2. SDG 9 – Industry, Innovation, and Infrastructure

Target 9.5: Enhance scientific research and upgrade technological capabilities.

Your system:

- Implements innovative technologies (C#, SQL Server) to improve dine-in operations.
- Provides a scalable solution that can evolve with machine learning and analytics.
- Modernizes a traditional dine-in restaurant's infrastructure through digital solutions.

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3. SDG 10 – Reduced Inequalities

Target 10.2: Empower and promote the social, economic and political inclusion of all.

Your system:

- Ensures accessible employment tools for staff at any level.
- Fosters multilingual interfaces and inclusive design.
- Enables equitable work behaviour using transparent data on staff performance.

4. SDG 12 – Responsible Consumption and Production

Target 12.3: By 2030, achieve a significant reduction in global food waste, especially at the retail and consumer levels.

Your system:

- Optimize inventory to eliminate food waste.
- Track consumption to ensure waste-free purchasing.
- Promote sustainability with automatic inventory and food waste reports.

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5. SDG 17 – Partnerships for the Goals

Target 17.8: Enhance technology and knowledge sharing.

Your system:

- Can be shared across franchises or implemented by new restaurants.
- Supports data sharing to develop shared supply chain and logistics planning.
- Enables knowledge transfer through reports and other insights derived from the system.

List of Tables

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Abbreviations

- NF- Normalization Form
- BCNF- Boyce Codd Normalization Form
- SQL- Structured Query Language
- ERD- Entity Relationship Diagram
- ACID- Atomicity, Consistency, Isolation, and Durability
- DBMS- Database Management System
- UI- User Interface

CHAPTER - 1

INTRODUCTION

A database is an organized collection of data which can use a database system such as NoSQL to manage and access data. Relational database management systems such as SQL Plus are often used in order to handle complex queries, maintain ACID properties, and support relationships between data through foreign keys. DBMS provide facilities for concurrency control, backup and recovery, and efficient query processing. Nowadays cloud based database systems like MongoDB are popular.

1.1 Architecture:

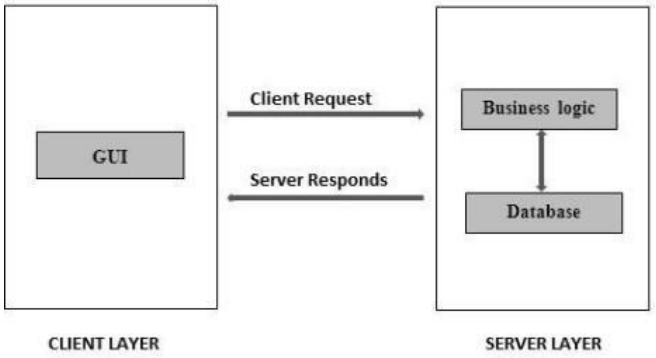


Figure 1.1:Two Tier Architecture

A two-tier architecture for software consists of:

1. Client Tier (Presentation Tier): This tier is the user tier for software. Includes GUI for ease of use. Provides the highest level of abstraction. Helps users access necessary data without knowledge of the actual data constructs or underlying database operations.

2. Server Tier (Data Tier): This tier has the lowest level of data abstraction. This tier is responsible for managing data and logic of application. Performs necessary tasks of data storage, retrieval, and manipulation**.**

At its core the client tier deals with how information is presented to the user while the server tier handles processing and storage of data.

CHAPTER - 2

Literature Survey / Background

2.1 Literature Survey:

- **Evolution of Restaurant Management Systems:** Restaurant operations have shifted from manual, pen-and-paper methods to automated systems. Today, technology offers POS systems, database management in the cloud, and mobile applications to create systems that track inventory in real-time, allow for ordering meals digitally and manage customers better. In general terms, technology allows restaurant operations to be provided more efficiently and in a greater degree of service quality.

- **Database Design in Restaurant Management:** A good database system will manage a variety of working parts including orders, menu items, customers, payments, and staff. Studies show that when using a relational database system such as Oracle or MySQL, the relationship(s) between data and integrity is supported and smoothly handled. Proper normalization and schema design are elements that drive expected scalability and accuracy.

- **Challenges and Solution:** Typical challenges are dealing with volume at peak hours, tracking real-time inventory, managing multiple users, billing accuracy, and data security; with standards such as role-based access, optimized query processing, data backups and integration with other platforms like delivery apps. Combine these with advanced UI/UX design, an optimized backend framework, and mobile interfaces, and your business is ready to go!

2.2 Background:

Restaurant Management Systems are essential today in all areas of the food and hospitality industry for daily process management including menu management, order management, billing, and staff management, improving service quality; lowering errors; and facilitating data-driven decision making to improve efficiency and customer satisfaction.

CHAPTER - 3

Objectives / Problem Statement

3.1 Objectives:

- **Improve User Experience:** Gives staff and customers a clean, user-friendly, and accessible interface to operate a restaurant and receive orders and food.

- **Improve Order Management:** Simplifies placing orders, changing orders, and knowing what customers have ordered in real-time.

- **Reduce errors on Billings:** Automatically generates bills and calculates taxes reducing the potential for manual error.

- **Stock Control/Inventory Management:** Monitors stock items with information on what has been used, appropriately updating stock amounts.

- **Coordination of staff:** Provides people with assigned roles and responsibilities, essentially providing a better workflow.

- **Use data for decision making:** Understand your sales, stock use, and looking back through customer orders you can make more informed decisions about your menu and better service delivery.

3.2 Problem Statement:

- Ordering, billing, and staff coordination are just a few of the restaurant operations that this online restaurant management system was designed to automate and optimise. The system speeds up services, reduces manual errors, and gives management and staff a user-friendly interface.

- Customers can place electronic orders using the system, and the kitchen and billing departments automatically display the order information. This guarantees accurate order execution and quick service.

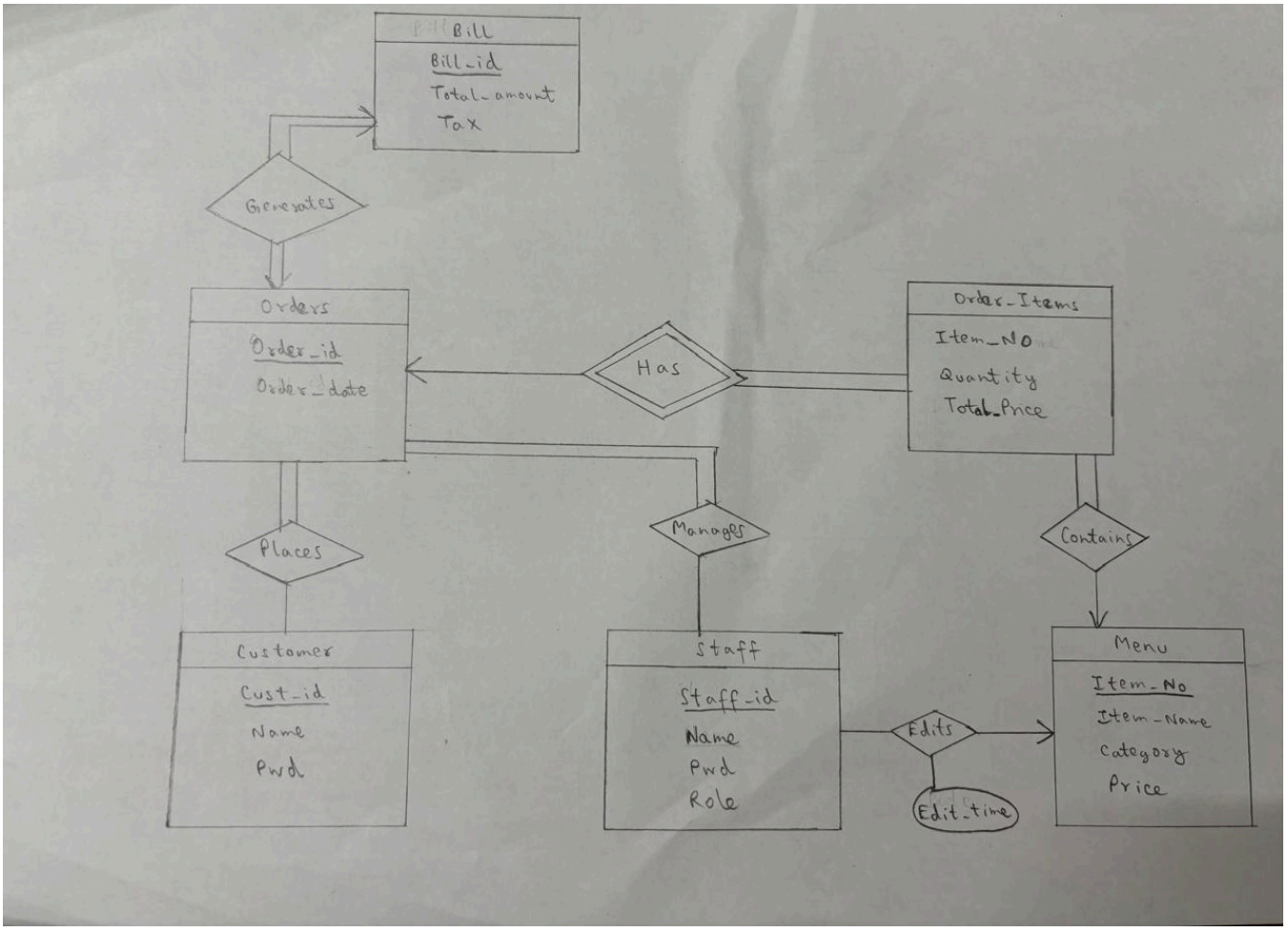
- Workers can log in to carry out their duties, which may include managing inventory, processing payments, changing the menu, or taking orders.
  Because of its centralised database, the system guarantees constant departmental coordination and real-time updates.

- By automating routine tasks, this system produces insightful analytics that support restaurant owners in decision-making, service enhancement, and overall customer satisfaction.

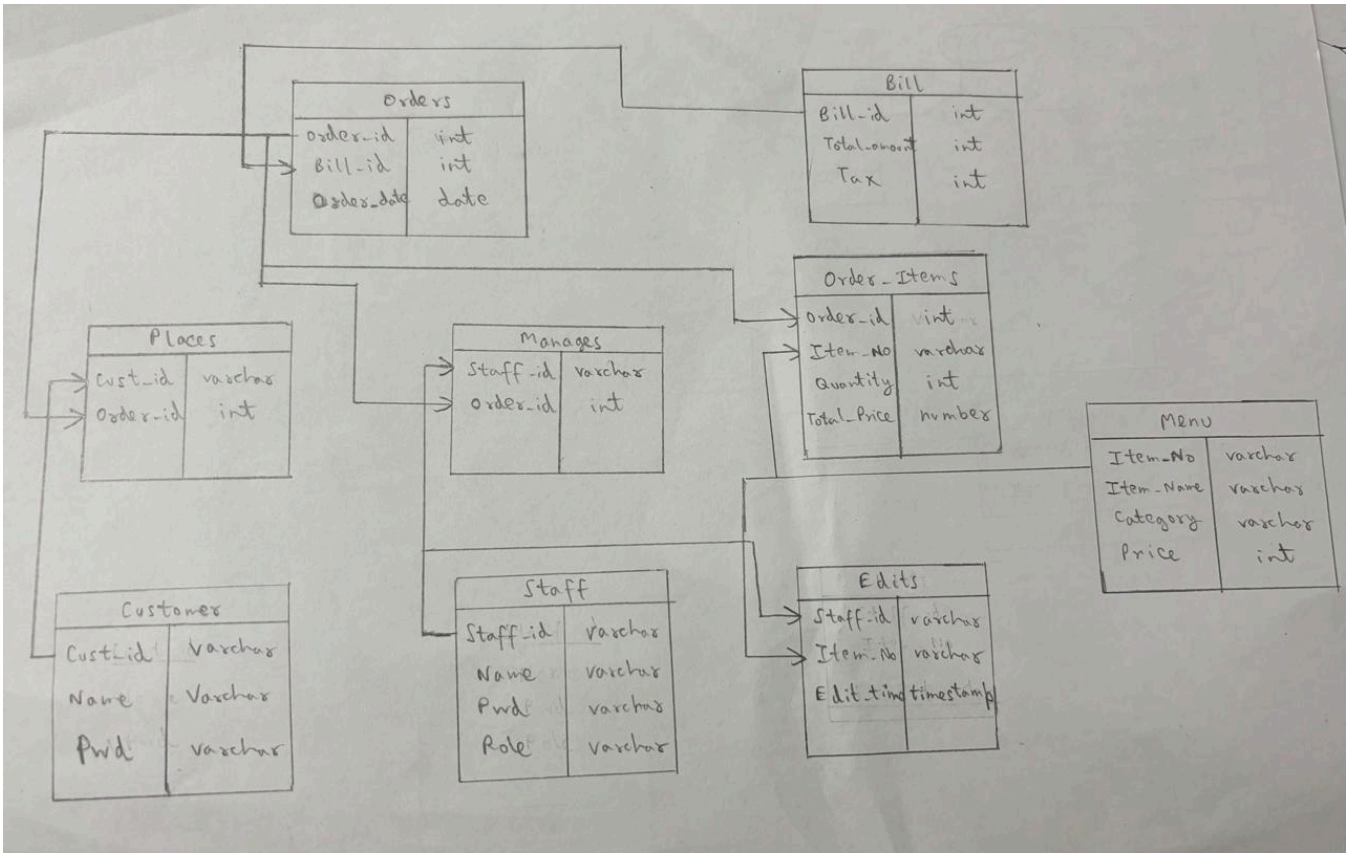
CHAPTER-4

DATA DESIGN

4.1 Entity Relationship Model



4.2 Schema Diagram:



4.3 Normalization:

Decomposition of System Table =
(Cust_ID, Name, Pwd,
Staff_ID, Name, Pwd, Role,
Order_ID, Bill_ID, Order_Date,
Item_No, Item_Name, Category, Price,
Quantity, Total_Price,
Edit_Time)

F1: Cust_ID → Name, Pwd
F2: Staff_ID → Name, Pwd, Role
F3: Order_ID → Cust_ID, Staff_ID, Order_Date, Bill_ID
F4: Bill_ID → Total_Amount, Tax
F5: Item_No → Item_Name, Category, Price
F6: Order_ID, Item_No → Quantity, Total_Price
F7: Staff_ID, Item_No → Edit_Time

STEP 1:
ON DECOMPOSITION

T0 = (Cust_ID, Name, Pwd,
Staff_ID, Name, Pwd, Role,
Order_ID, Customer_ID, Staff_ID, Order_Date, Bill_ID,
Bill_ID, Total_Amount, Tax,
Item_No, Item_Name, Category, Price,
Quantity, Total_Price,
Edit_Time)

T1: Places = (Cust_ID, Order_ID)

T2: Manages = (Staff_ID, Order_ID)

T3: Order_Items = (Order_ID, Item_No, Quantity, Total_Price)

T4: Edits = (Staff_ID, Item_No, Edit_Time)

STEP 2:
ON DECOMPOSITION of T0

T1 = Customer (Cust_ID, Name, Pwd)

T2 = Staff (Staff_ID, Name, Pwd, Role)

T3 = Orders (Order_ID, Cust_ID, Staff_ID, Order_Date, Bill_ID)

T4 = Bill (Bill_ID, Total_Amount, Tax)

T5 = Menu (Item_No, Item_Name, Category, Price)

T6 = Order_Items (Order_ID, Item_No, Quantity, Total_Price)

T7 = Edits (Staff_ID, Item_No, Edit_Time)

FINAL STEP OF DECOMPOSITION:
ALL THE TABLES ARE IN 2NF Form.

T0 : Customer = (Cust_ID, Name, Pwd)

T1 : Staff = (Staff_ID, Name, Pwd, Role)

T2 : Orders = (Order_ID, Cust_ID, Staff_ID, Order_Date, Bill_ID)

T3 : Bill = (Bill_ID, Total_Amount, Tax)

T4 : Menu = (Item_No, Item_Name, Category, Price)

T5 : Order_Items = (Order_ID, Item_No, Quantity, Total_Price)

T6 : Edits = (Staff_ID, Item_No, Edit_Time)

T7 : Places = (Cust_ID, Order_ID)

T8 : Manages = (Staff_ID, Order_ID)

CHAPTER-5

Methodology/Function

5.1 Methodology:

1. Requirement gathering:

- Gather and analyze the requirements of the Restaurant Management System to understand the necessary features and design of the database management system.

2. System Design:

- Design a GUI (graphical user interface) for ease of use ,using VC# for the Restaurant Management System.
- Create an Entity-Relationship Diagram (ERD) to model the database schema, defining entities, attributes, and relationships.

3. Database Implementation:

- Set up SQL Plus Server to store and manage the Restaurant Management System data.
- Define tables, constraints, and relationships based on the ERD.
- Implement stored triggers for data manipulation and business logic.

4. Application Development:

- Develop the application logic in C# to interact with the database.
- Use Visual Studio 2022 framework for database connectivity and operations.

5.2 FUNCTIONS:

- Customer / Staff Login
- New Customers can sign up
- Customer Dashboard
- Create a New Order
- Generate Bill
- View Previous Orders ordered by the customer
- Staff dashboard
- Create a New Order and generate bill
- Staff can view all orders
- Manager can edit the Menu
- Previous edits in menu can be seen by manager
- Manager can edit the staff members

CHAPTER-6

SQL Queries

6.1 Complex Queries:

form2

- SELECT cust_id, pwd, name FROM customer

form3

- SELECT staff_id, pwd, name, role FROM staff

form5

- SELECT INSERT INTO CUSTOMER VALUES('" + textBox2.Text + "','" + textBox1.Text + "','" + textBox3.Text + "')

form7

- SELECT * FROM STAFF ORDER BY staff_id

form8

- SELECT * FROM MENU ORDER BY item_no
- INSERT INTO current_editor (staff_id) VALUES (:id)

form9

- SELECT * FROM MENU ORDER BY item_no
- SELECT * FROM menu WHERE category = :cat order by item_no
- SELECT NVL(MAX(order_id), 0) + 1 FROM order_items
- SELECT NVL(MAX(bill_id), 0) + 1 FROM orders
- INSERT INTO order_items (order_id, item_no, quantity, total_price) VALUES (:order_id, :item_no, :quantity, :total_price)
- INSERT INTO orders (order_id, bill_id, order_date) VALUES (:order_id, :bill_id, :order_date)
- INSERT INTO places VALUES (:cust_id, :order_id)
- INSERT INTO manages VALUES (:staff_id, :order_id)
- SELECT * FROM (SELECT * FROM menu WHERE :cat = 'All' OR category = :cat) WHERE price <= :cap ORDER BY item_no

form10

- SELECT item_name, quantity, price, total_price FROM order_items NATURAL JOIN menu WHERE order_id = :orderID
- INSERT INTO bill (bill_id, total_amount, tax) VALUES (:bill_id, :total_amount, :tax)

form11

- SELECT order_id, order_date FROM ORDERS NATURAL JOIN PLACES WHERE id = :cust_id ORDER BY order_id
- SELECT item_name, quantity, total_price from order_items natural join menu where order_id = :orderID

form12

- (SELECT order_id, order_date, id FROM ORDERS NATURAL JOIN PLACES) UNION (SELECT order_id, order_date, id FROM ORDERS NATURAL JOIN MANAGES) ORDER BY order_id
- SELECT item_name, quantity, total_price from order_items natural join menu where order_id = :orderID

form13

- SELECT * FROM EDITS ORDER BY EDIT_TIME DESC

6.2 Procedures/Functions:

FORM9- TOTAL ORDER AMOUNT

```
CREATE OR REPLACE FUNCTION get_order_total(p_order_id IN NUMBER)
RETURN NUMBER
IS
  v_total NUMBER := 0;
BEGIN
  SELECT SUM(total_price)
  INTO v_total
  FROM order_items
  WHERE order_id = p_order_id;

  RETURN NVL(v_total, 0);
END;
/
```

6.3 Triggers:

```
CREATE OR REPLACE TRIGGER log_menu_edit
BEFORE UPDATE ON menu
FOR EACH ROW
DECLARE
   v_staff_id VARCHAR2(20);
BEGIN
   BEGIN
      SELECT staff_id INTO v_staff_id FROM current_editor WHERE ROWNUM = 1;

      INSERT INTO edits (staff_id, item_no, edit_time)
      VALUES (v_staff_id, :OLD.item_no, CURRENT_TIMESTAMP);
   EXCEPTION
      WHEN NO_DATA_FOUND THEN
         NULL;
   END;
END;
/
```

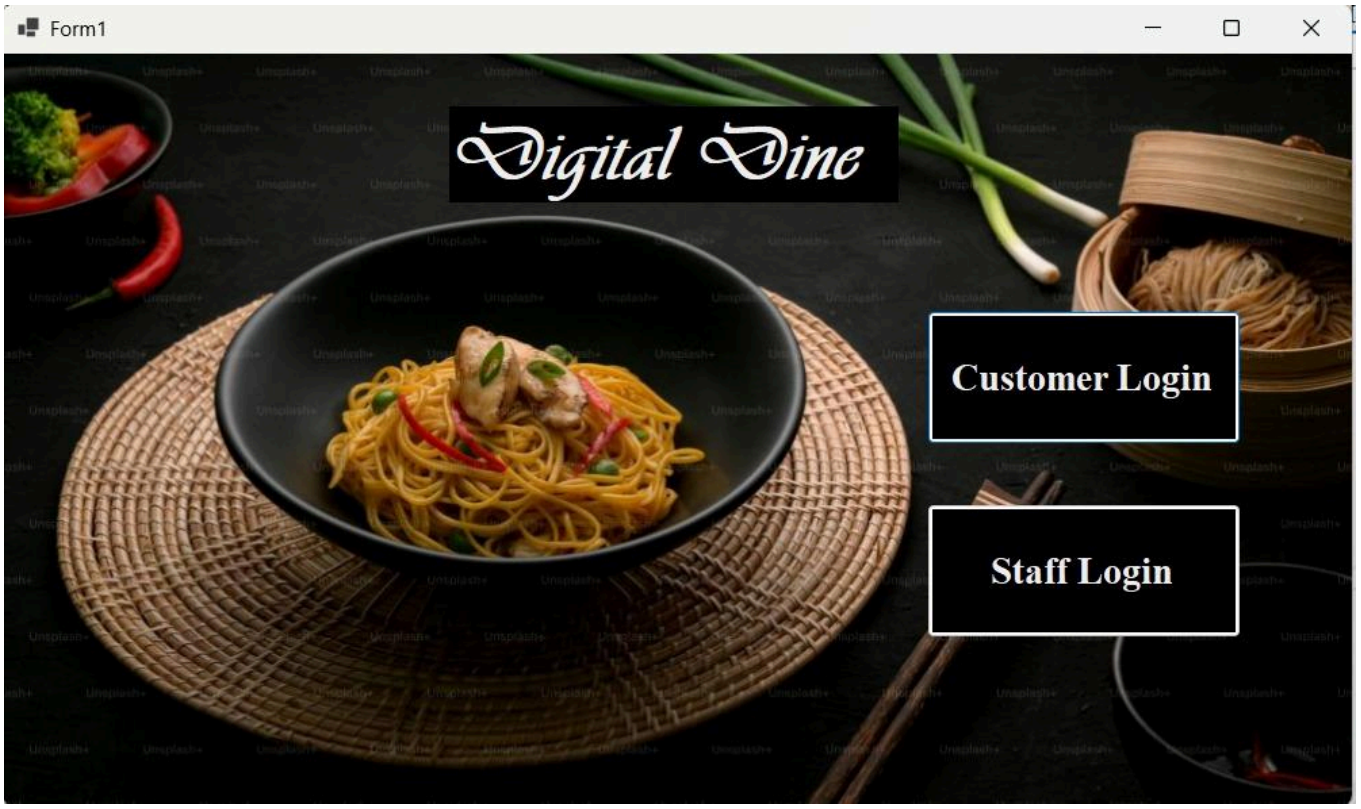
CHAPTER-7

RESULT:

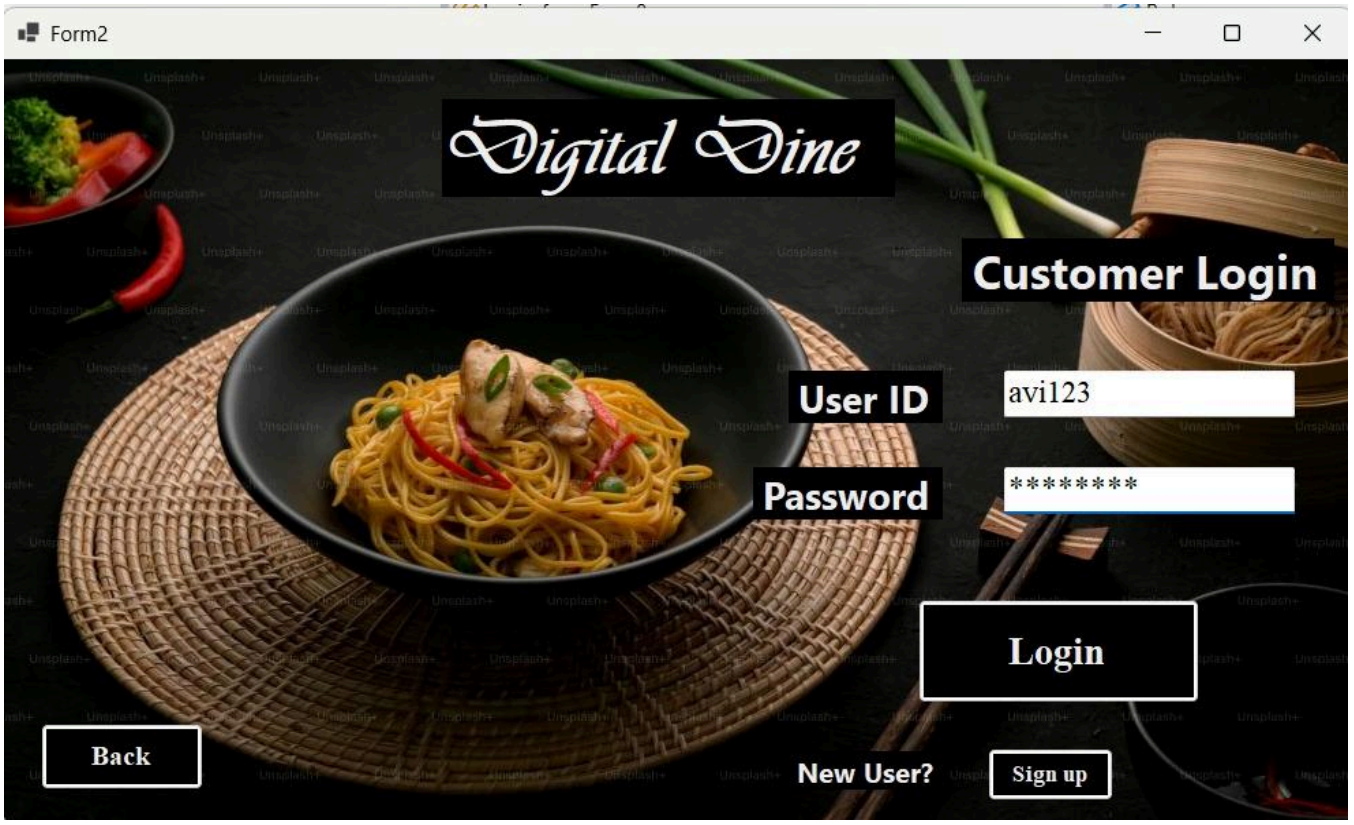
The successful implementation of the Restaurant Management System has significantly improved the efficiency and oversight of restaurant operations. The framework of this system facilitates the streamlined management of various core aspects such as menu creation, order processing, billing etc.. With the integration of SQL Plus for backend database operations and C# for the frontend interface, the system ensures smooth data handling and an interactive user experience.

Key features include real-time order updates, categorization of menu items, staff and customer management modules etc.. The system automates routine tasks, reduces human error, and enhances service speed, ultimately leading to better customer satisfaction. The user-friendly interface promotes ease of use for both staff and administrators, contributing to high adoption and usability. Overall, the system represents a significant step towards the digital transformation of restaurant management, optimizing day-to-day operations and decision-making.

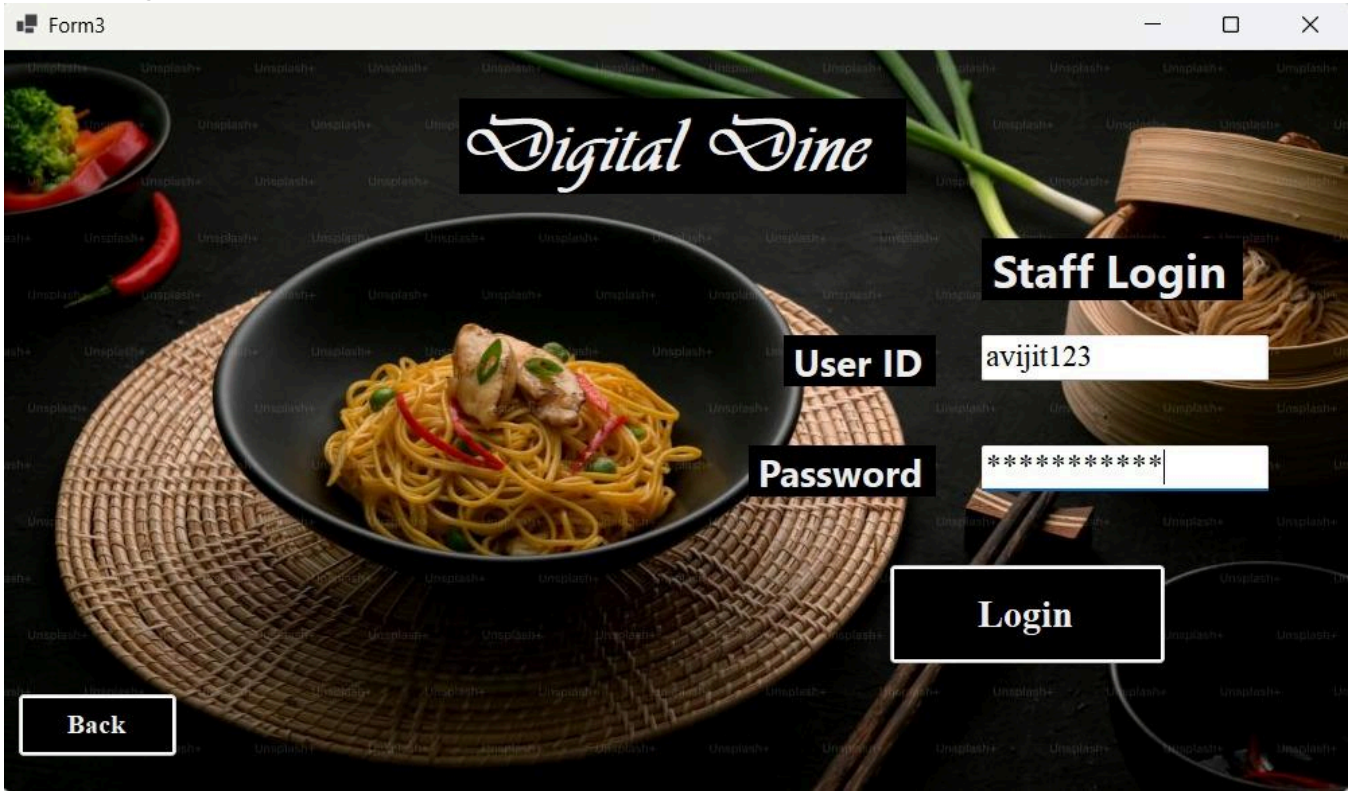
LOGIN PAGE (FORM-1)- this is the initial login page where the user can proceed to login depending if the user is a customer or a staff of the restaurant.



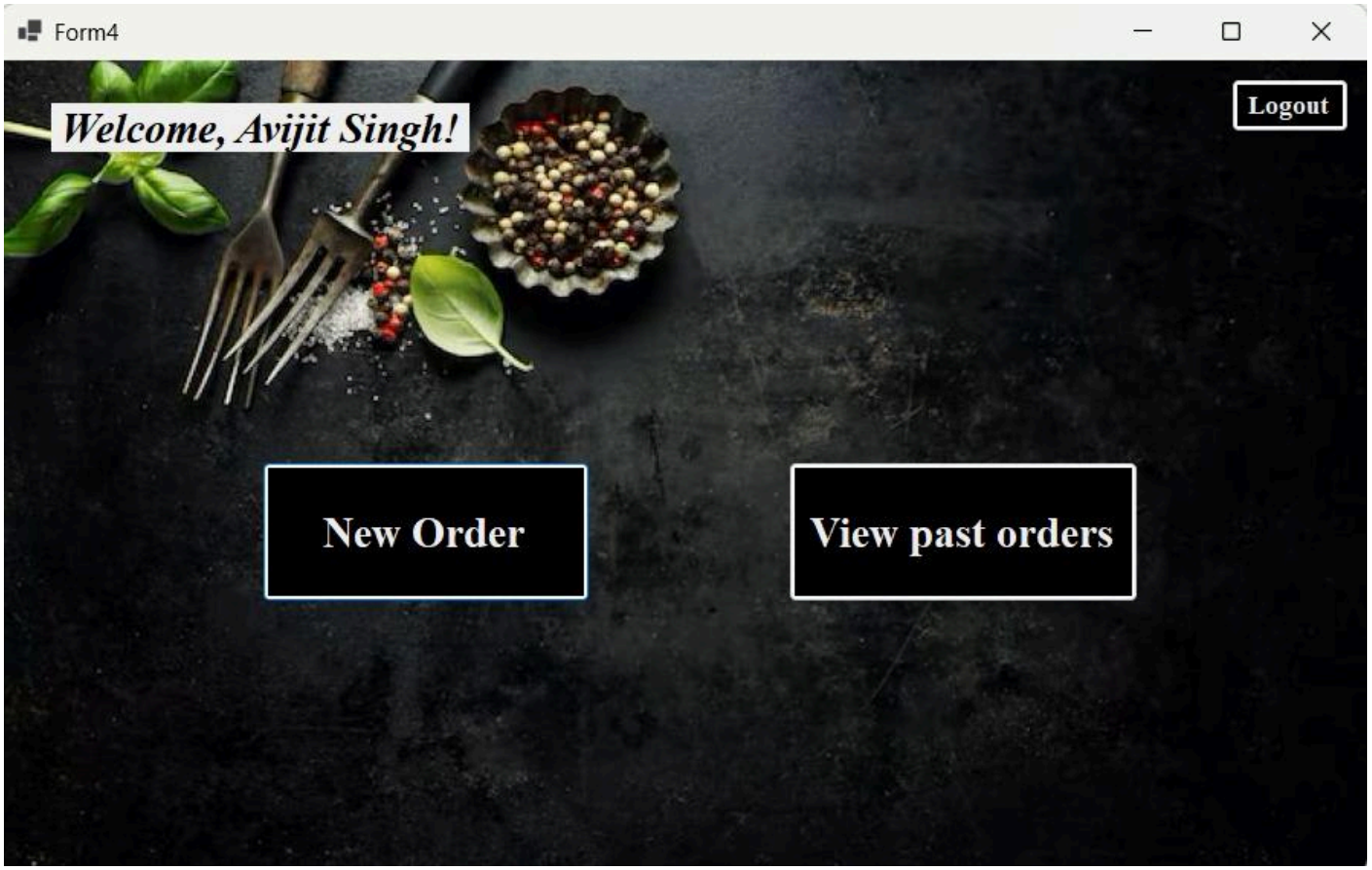
CUSTOMER LOGIN PAGE (FORM-2)- customer should enter user id and password. After pressing **'LOGIN' form-4** opens. If **'Sign up'** is clicked **form-5** opens.



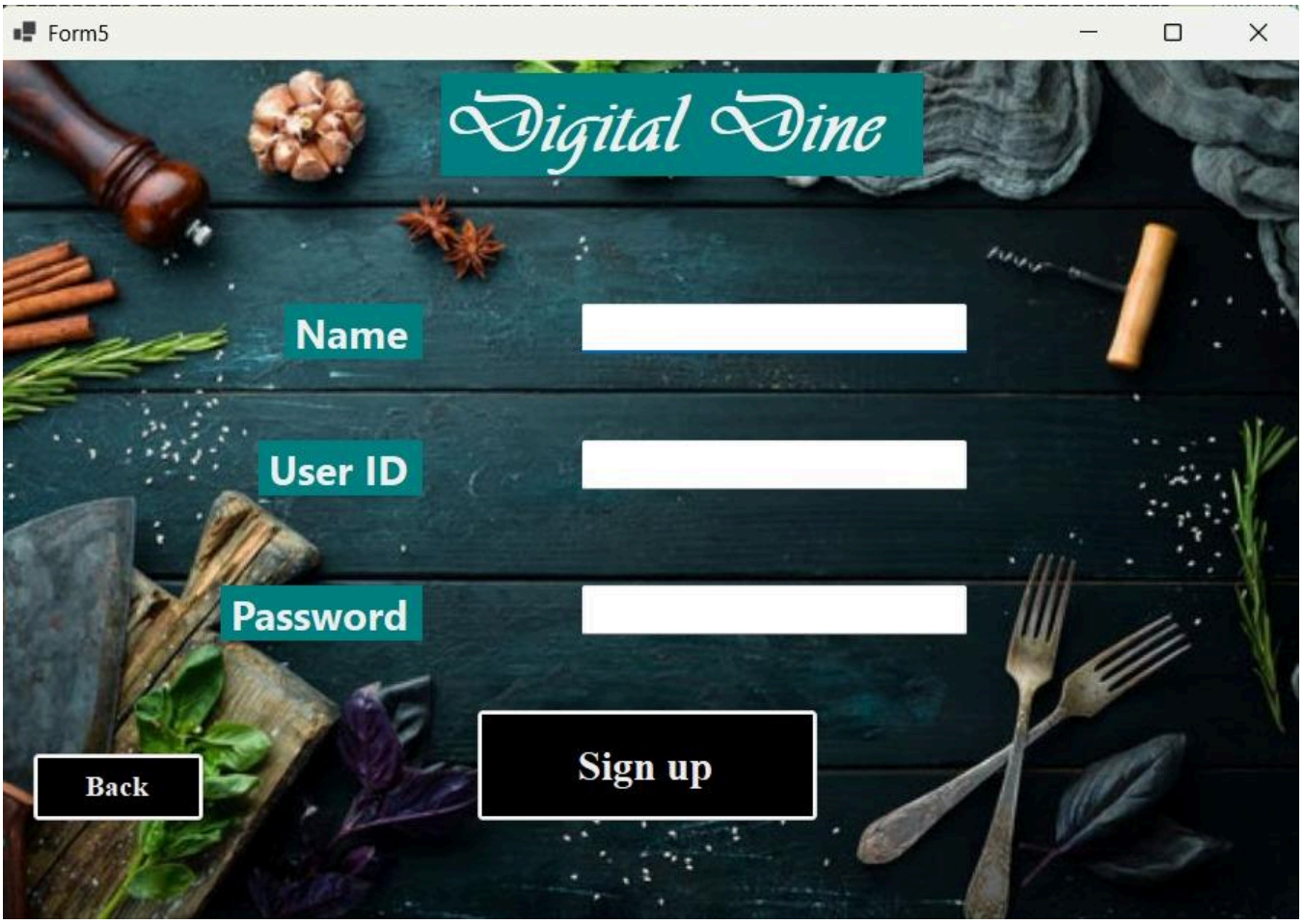
STAFF LOGIN PAGE(FORM-3)- once login is clicked go to **form-6.** If back is clicked user goes to form-1.



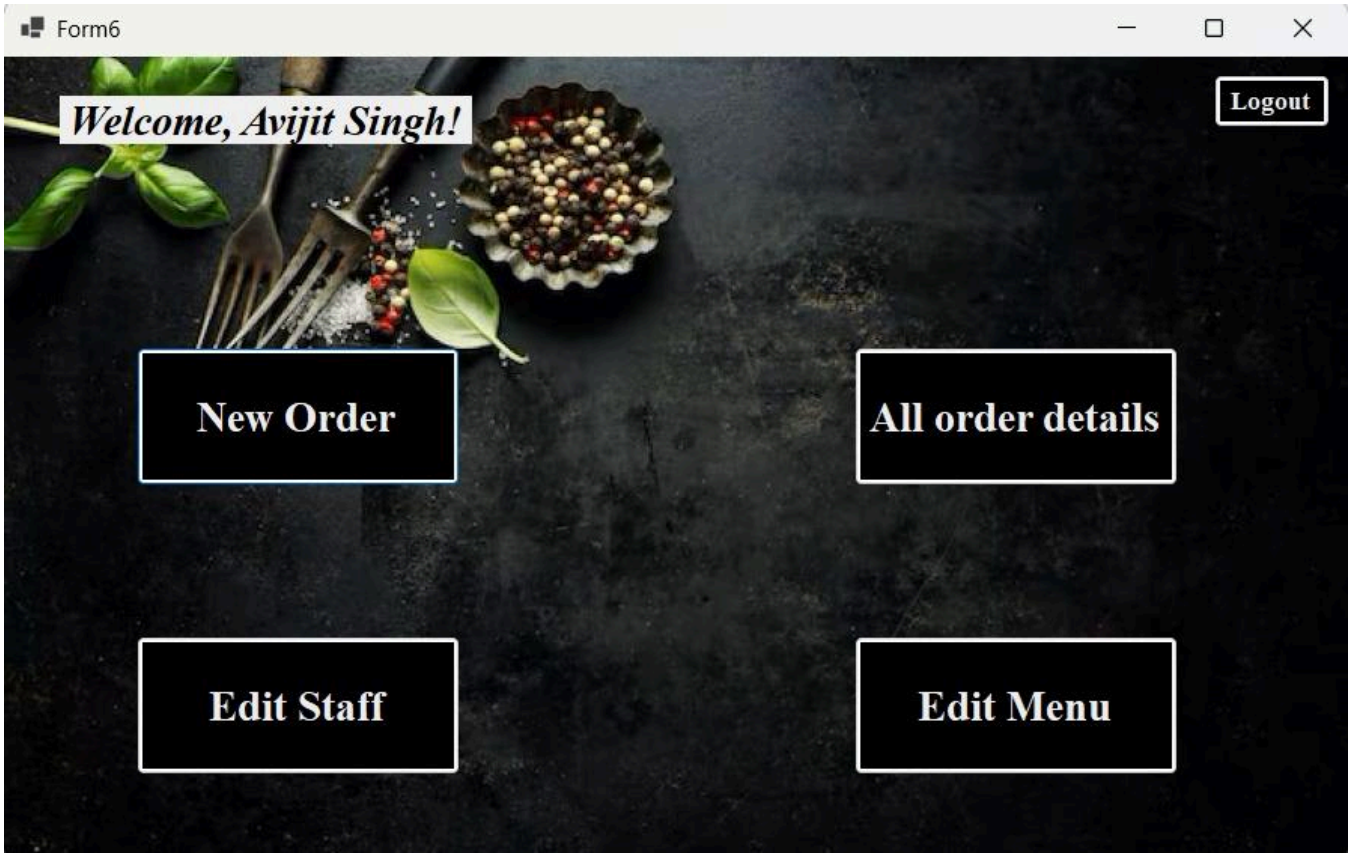
CUSTOMER LOGGED IN (FORM-4)- customer can place new order, view his/her past orders or logout.



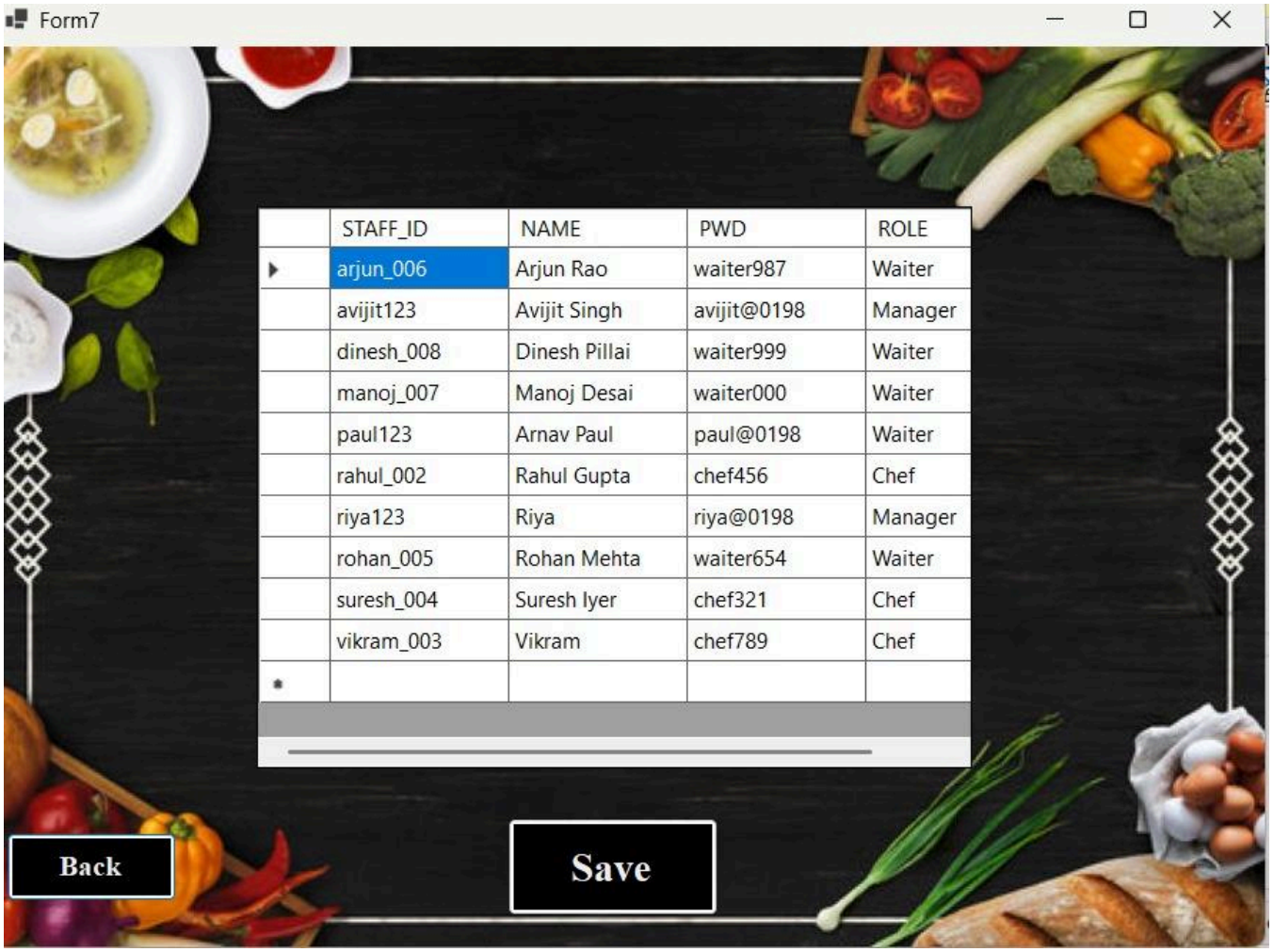
NEW CUSTOMER SIGNUP PAGE (FORM-5)**-** if a customer clicks sign up on form-2 this page appears (form-5).



***STAFF LOGGED IN (FORM-6)*-** this page opens when staff logs in i.e. **after form-3**.



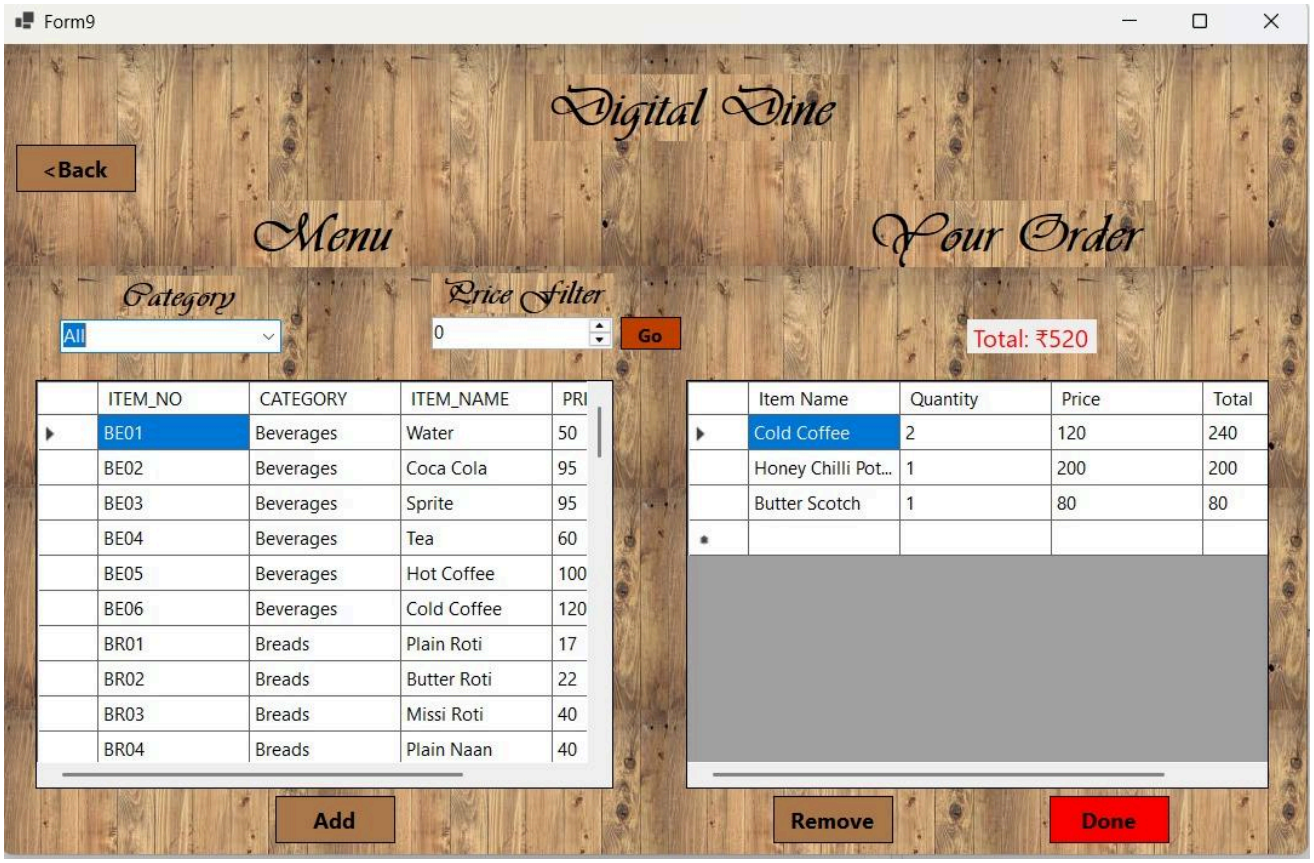
STAFF EDIT PAGE (FORM-7)- this page opens when the **'Edit Staff' button** is clicked on **form-6.**

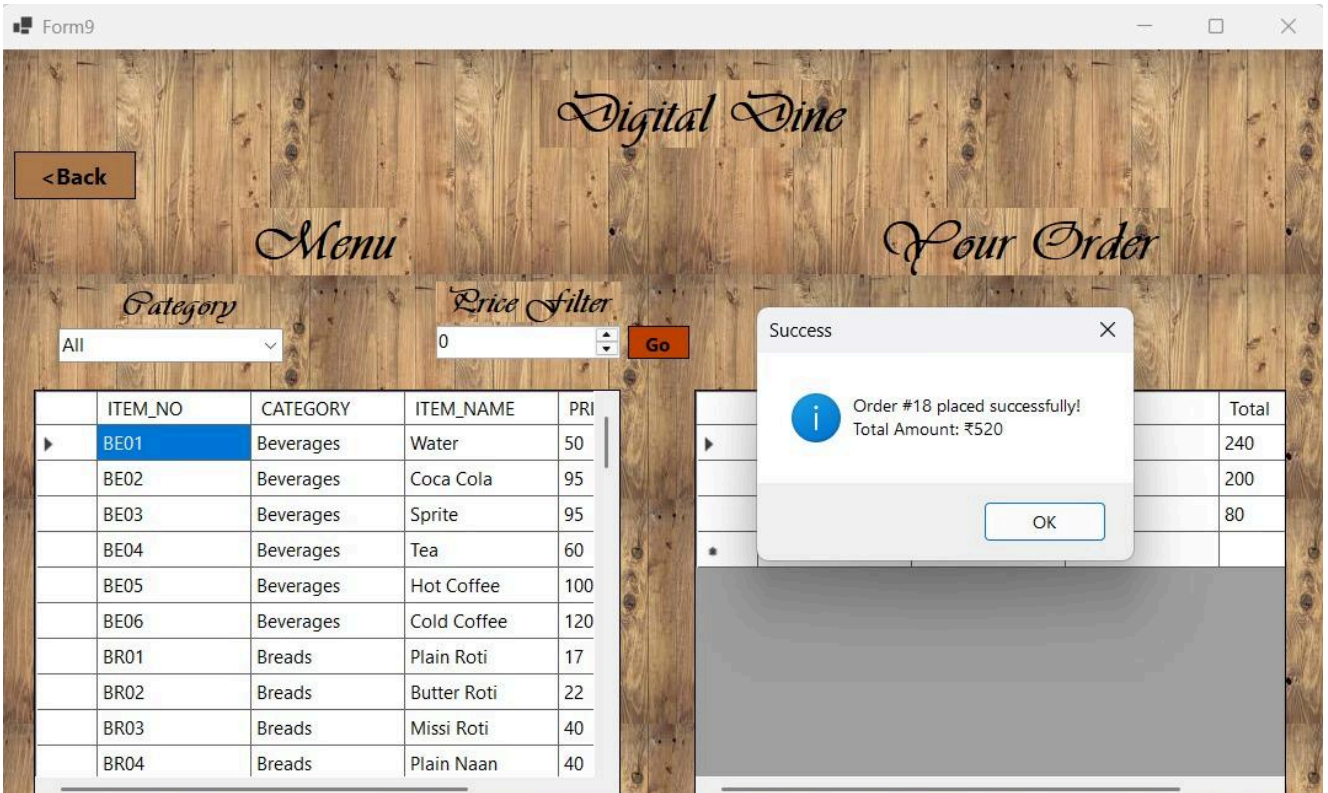


***EDIT MENU PAGE (FORM-8)*-** this opens the **'Edit Menu'** when clicked **on form-6.**

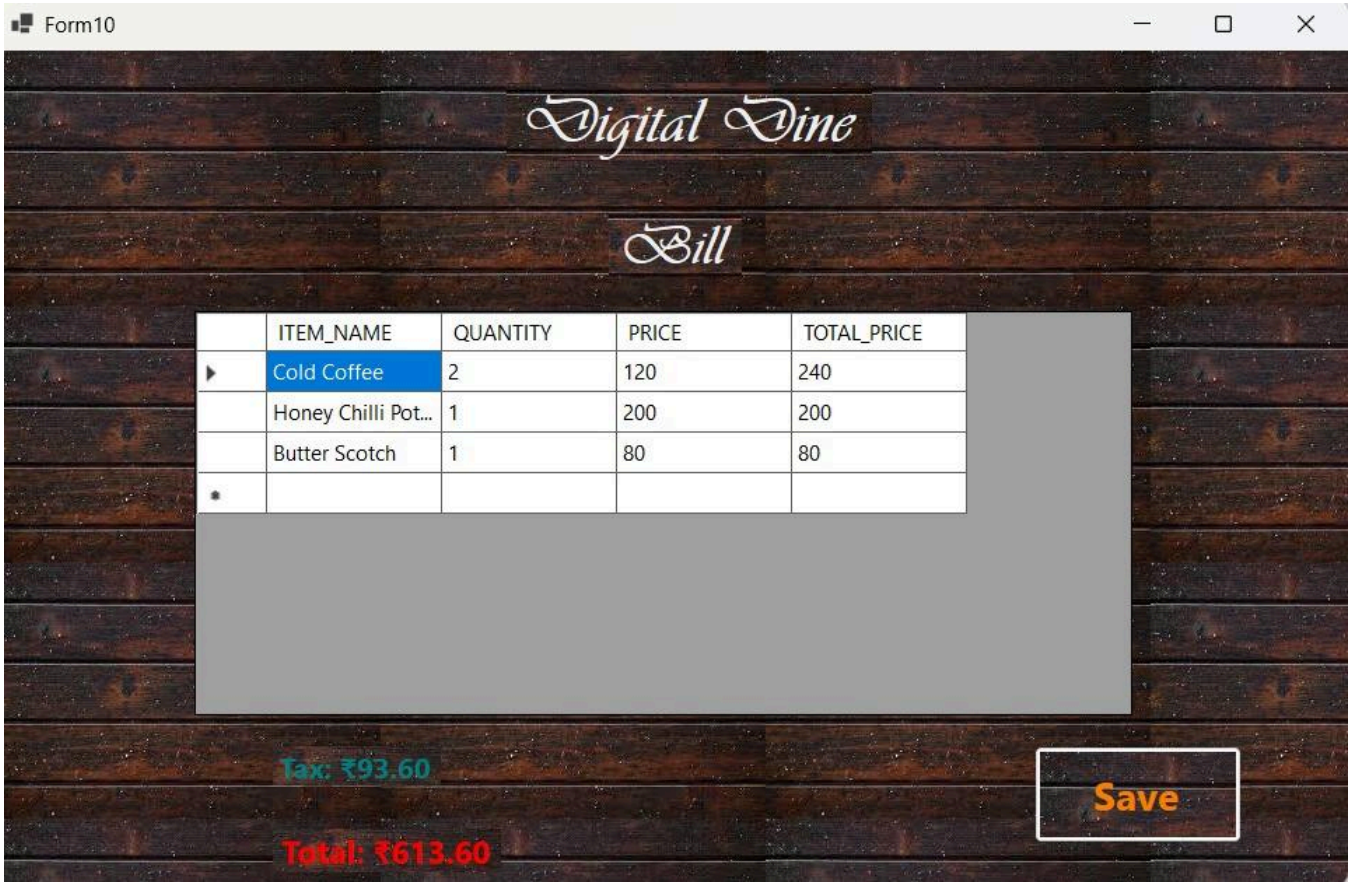
	ITEM_NO	CATEGORY	ITEM_NAME	PRICE
▸	BE01	Beverages	Water	50
	BE02	Beverages	Coca Cola	95
	BE03	Beverages	Sprite	95
	BE04	Beverages	Tea	60
	BE05	Beverages	Hot Coffee	100
	BE06	Beverages	Cold Coffee	120
	BR01	Breads	Plain Roti	17
	BR02	Breads	Butter Roti	22
	BR03	Breads	Missi Roti	40
	BR04	Breads	Plain Naan	40
	BR05	Breads	Butter Naan	65
	BR06	Breads	Lachha Paratha	45
	IC01	Ice Cream	Vanilla	60
	IC02	Ice Cream	Chocolate	70
	IC03	Ice Cream	Butter Scotch	80
	IC04	Ice Cream	Black Currant	80
	IC05	Ice Cream	Strawberry	70
	NI01	North Ind	Dal Makhani	190
	NI02	North Ind	Dal Tadka	170

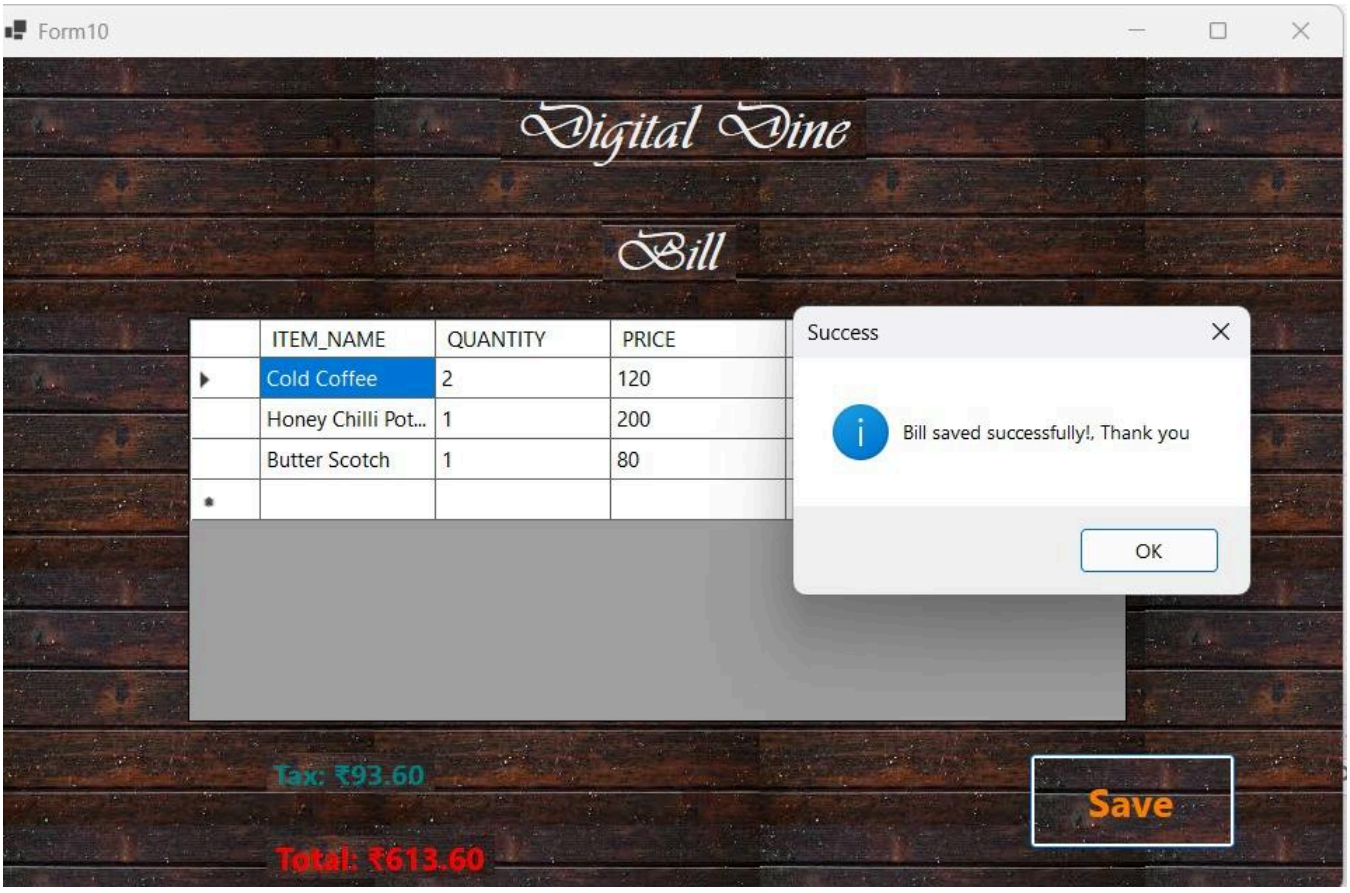
CUSTOMER PLACES ORDER PAGE (FORM-9)**-** this page opens when a customer clicks **'New Order'** on **'Form-4'.** Customers can place an order from this page. An item can be added as well as removed. Customers can select a category of food items and apply price filters for food items. Total price of all the items added by the customer is simultaneously shown. Once done is clicked, 'Success' dialog box appears with order number and total price of all items.



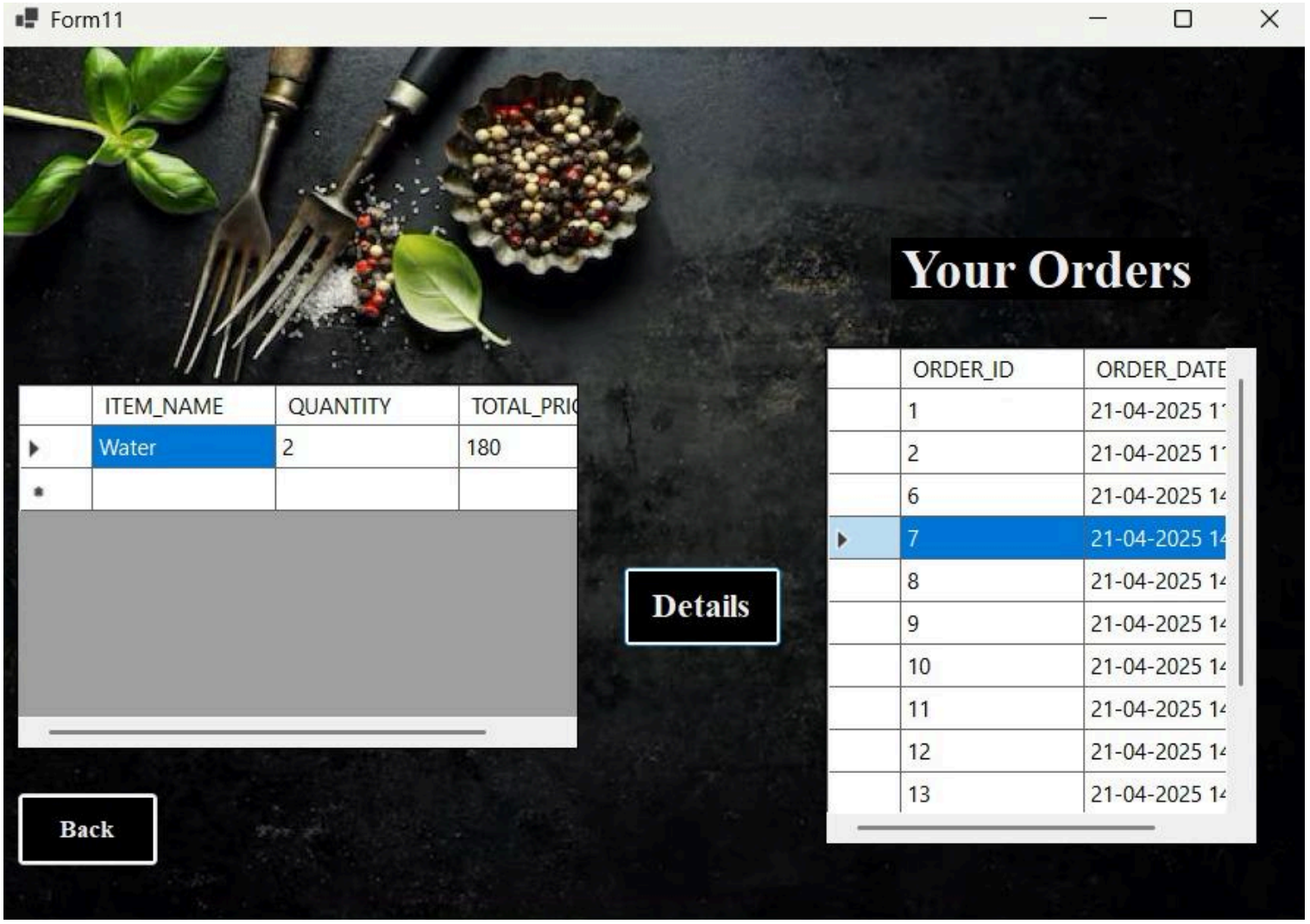


BILL PAGE(FORM-10)- appears after form-9 when 'Done' is clicked. This page has all the order details and also shows the tax amount on that particular order and then the total amount (inclusive of all taxes). Once 'Save' is clicked, 'Success' dialog box appears with a thank you message.

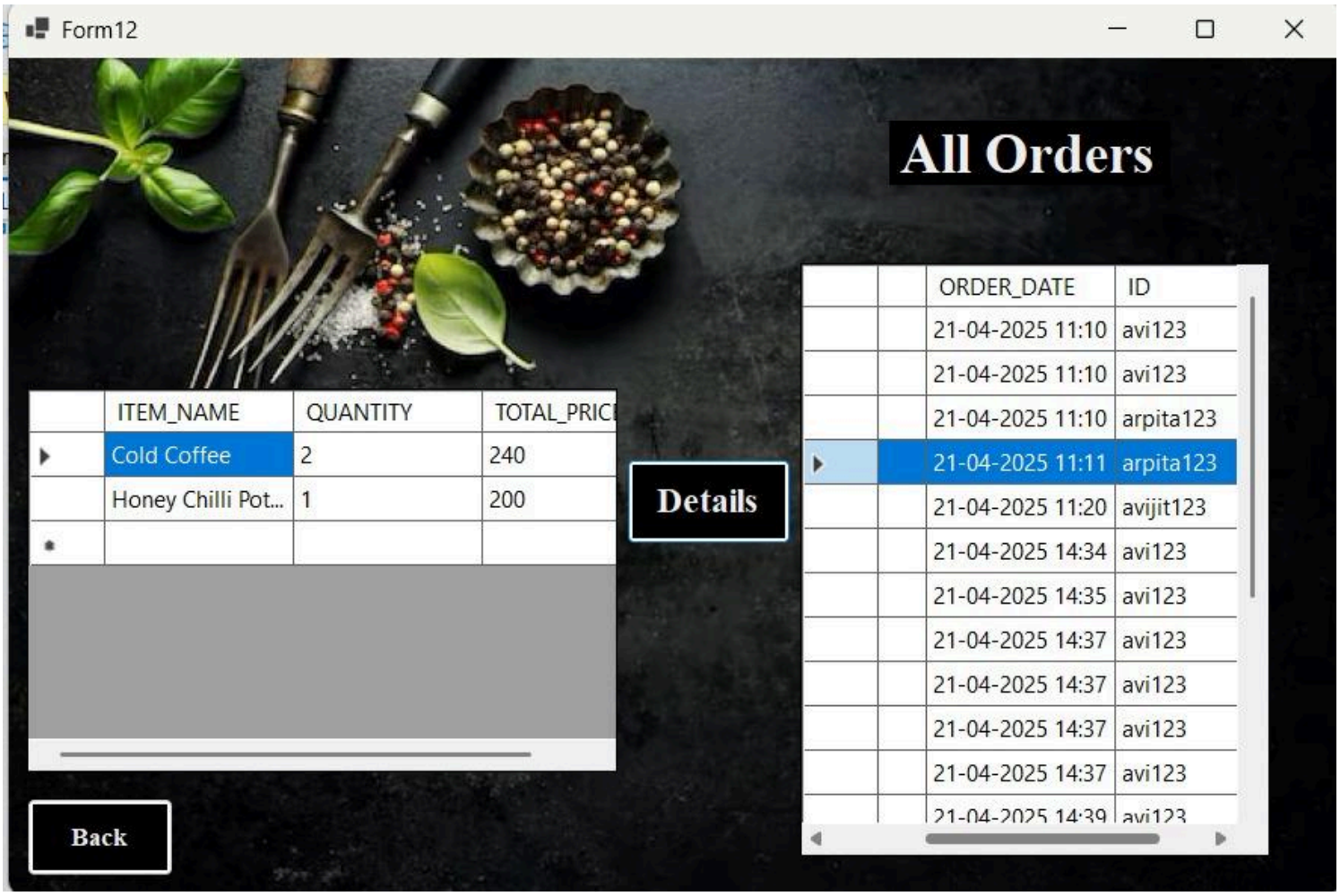




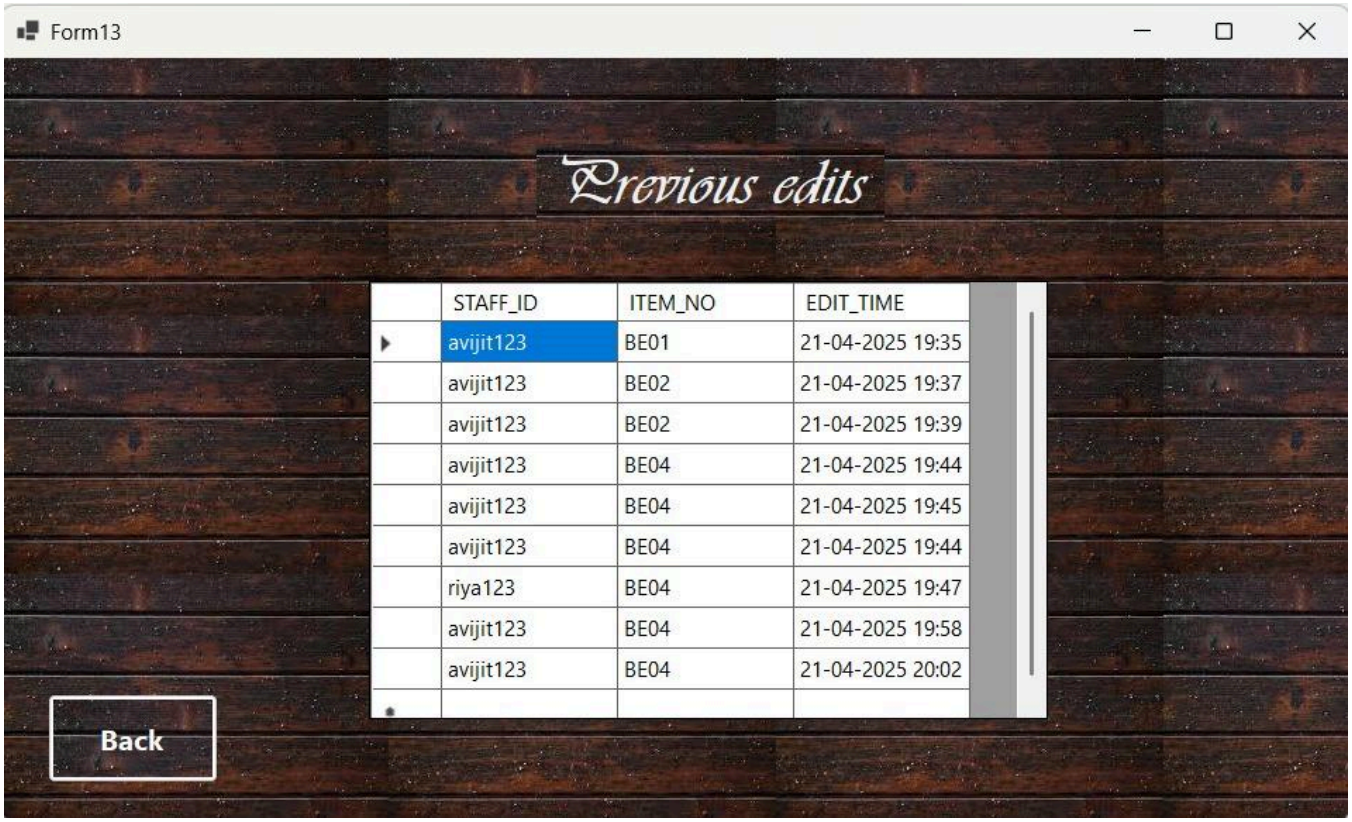
VIEW PAST ORDERS PAGE (FORM-11)**-** this page opens when a customer clicks 'View Past Orders' on **form-4.** If 'back' is clicked on this page then customer goes back to form-4.



ALL ORDER DETAILS PAGE (FORM-12)- this page opens when 'All order details' is clicked by staff (already logged in) on form-6. This page gives all information about all the orders placed by all staffs on a given date.



VIEW PREVIOUS EDITS PAGE (FORM-13)**-** this page opens when '**View previous edits**' is clicked on **form-4**. This page shows all the previous edits made in the menu by a particular staff.



CHAPTER-8

8.1 Conclusion:

The Restaurant Management System signifies a major advancement in the digital transformation of hospitality operations, streamlining processes such as menu management, order processing, billing, and performance tracking. By enhancing operational efficiency and user experience, the system empowers restaurant staff and management to make data-driven decisions while delivering a seamless experience to customers.

Its intuitive interface ensures ease of use, enabling even users with minimal technical knowledge to navigate and operate the system effectively. With accurate and timely access to key information, the system improves day-to-day operations, reduces manual workload, and enhances customer satisfaction through faster service and error-free transactions.

In conclusion, the Restaurant Management System is more than just a tool for managing daily restaurant activities; it is a dynamic, scalable platform that promotes smarter and more efficient hospitality service through technology-driven innovation

8.2 Future Opportunities:

The future of the Restaurant Management System is bright, with numerous opportunities for expansion and added functionality:

- **Integration of Machine Learning:** Incorporating machine learning algorithms to analyze customer behavior, predict popular dishes, optimize inventory, and provide personalized menu recommendations.

- **Gamification for Staff Motivation:** Adding gamification elements like achievement badges, performance leaderboards, or reward systems to increase staff engagement and productivity.

- **Real-time Analytics and Reporting:** Enhancing reporting capabilities to offer deeper insights into sales trends, peak hours, customer preferences, and employee performance for more informed decision-making.

- **Anti-fraud and Error Detection Tools:** Implementing checks to prevent billing errors or detect suspicious transactions, ensuring the system maintains integrity and accuracy.

- **Collaboration & Communication Tools:** Integrating platforms like Slack, Microsoft Teams, or internal messaging features to streamline communication between kitchen, service, and management staff.

- **Multilingual Support:** Enabling the system to support multiple languages, making it accessible to a broader user base and applicable in diverse, multilingual environment.

Software Requirements

Specification

for

Restaurant Management System

Version 1.0

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Manipal Institute of Technology

20/04/25

Table of Contents

Revision History

Name	Date	Reason For Changes	Version

1. Introduction

1.1 Purpose

This document summarizes the functional and non-functional requirements for the Restaurant Management System, which allows customers to place orders, staff to manage orders and items, and ensures efficient restaurant operation and billing..

1.2 Document Conventions

This document follows standard IEEE SRS formatting and numbering conventions. Requirements are listed with unique identifiers.

1.3 Intended Audience and Reading Suggestions

This document is intended for developers, project managers, database administrators, testers, and end users interested in the system's functionality.

1.4 Product Scope

The system simplifies restaurant operations through order management, billing automation, role-based access, inventory tracking, and digital interfaces for customers and staff. It ensures efficient handling of orders and edits, with secure login for all roles.

1.5 References

-IEEE Software Requirements Specification Template
- DBS Project Synopsis Document
*- SQL Plus Database Documentation*Overall Description

2.Overall Description

2.1Product Perspective

The Restaurant Management System is a standalone application integrated with a SQL Plus backend and a VC# frontend using Visual Studio. It enables seamless coordination between customers, staff, and kitchen workflows.

2.2 Product Functions

- *Customer/Staff Login*
- *Customer Dashboard*
- *Menu display and item selection*
- *Place new orders*
- *View bill details post order*
- *Staff Dashboard*
- *Add/edit menu items*
- *View order history*
- *Generate bills automatically*
- *Timestamp-based staff edits*

2.3 User Classes and Characteristics

- ***Customers****: View menu, place orders*
- ***Staff****: Manage menu, handle orders, generate/edit bills*

2.4 Operating Environment

- ***Frontend-****VC# using Visual studio*
- ***Backend-*** *Visual Studio Framework*
- ***Database-*** *SQL Plus*

Design and Implementation Constraints

- *Must use VC# and SQL Plus*
- *Only authorized users can access*
- *Two-tier architecture*

1.1 User Documentation

- *Users require internet connection to access the website.*
- *The Staff and menu data preloaded in the database*

1.2 Assumptions and Dependencies

- *Users require internet connection to access the website.*
- *The Staff and menu data exist prior in the database*
- *Staff can update menu and order-related data.*

3. External Interface Requirements

3.1 User Interfaces

- Login page
- Customer dashboard
- Menu display
- Bill screen
- Responsive UI with category-wise display and timestamps

3.2Hardware Interfaces

*Standard computer or mobile device with internet access***.**

3.3 Software Interfaces

- *Database : SQL Plus*
- *Frontend : VC#*

3.4 Communications Interfaces

- HTTPS for secure communication

4 System Features

4.1 Authentication

- Validate login for customers and staff
- Redirect to role-based dashboards

4.2 Order Management

- Select menu items
- Staff can view and manage placed orders
- Real-time billing and update on order status

4.3 Billing Module

- Auto-generate bills with tax and total
- View detailed bill with item-wise breakdown

4.4 Staff Controls

- Add/edit/delete menu items
- View/edit placed orders
- Timestamp record for each menu update

5 Other Nonfunctional Requirements

5.1 Performance

- Response time < 2 seconds for placing or editing orders
- System supports 100+ simultaneous users

5.2 Safety

- Prevent loss of orders via autosave mechanism

5.3 Security

- Role-based access control
- Password encryption

5.4 Quality Attributes

- High usability and reliability
- Scalable database schema
- Modular code for maintainability

5.5 Business Rules

- Only registered customers/staff can use the system
- Staff can only edit menu or orders under their role

6 Other Requirements

- Triggers and procedures must auto-update result/attempt tables
- Normalized tables (2NF or higher)
- Data integrity enforced with foreign keys

Appendix A: Glossary

- **ERD**: Entity Relationship Diagram
- **ACID**: Atomicity, Consistency, Isolation, Durability
- **UI**: User Interface
- **SQL**: Structured Query Language

Appendix B: Analysis Models

- *Entity-Relationship (ER) Diagram*
- *System Architecture Diagram*

Appendix C: To Be Determined List

- *Loyalty point system for customers.*
- *Support for online payments and e-receipts*

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