**BMS COLLEGE OF ENGINEERING**

**(Autonomous College under VTU)**

**Bull Temple Road, Basavanagudi, Bangalore – 560019**



A project report on

***“Saffron Spice Restaurant Management Application”***

Submitted in partial fulfillment of the requirements for the award of degree

**BACHELOR OF ENGINEERING**

**IN**

**COMPUTER SCIENCE AND ENGINEERING**

**(DATA SCIENCE)**

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**(DATA SCIENCE)**

CERTIFICATE

This is to certify that the project entitled “**Saffron Spice Restaurant Management Application**” is a bona-fide work carried out by **R V Abhishek(1BM23CD047), Sushanth S(1BM23CD063), Ullas N(1BM23CD067)** for the course **FullStack Web Development** with course code **23DC3AEFWD**. It is certified that all corrections/suggestions indicated for Internal Assessments have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering Degree.

**Signature of the Guide Signature of the HOD**

**Name and Designation Name and Designation**

**Examiners**

**Name of the Examiner Signature of the Examiner**

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Table of Contents

Page No.

Acknowledgements

Abstract

1. **Introduction ………………………………………………………………………………**
   1. Purpose ………………………………………………………………………………..
   2. Scope ………………………………………………………………………………….
2. **Software Requirement Specification …………………………………………………….**
   1. Software Requirements ………………………………………………………………..
   2. Hardware Requirements ……………………………………………………………….
   3. Functionality……………………………………………………………………………
3. **ER Diagram ……………………....………………………………………………………..**
4. **Implementation……………………………………………………………………………..**
   1. Front End Implementation
   2. Database …………………………………………………………………………………
   3. Connecting backend to frontend ………………………………………………………...
5. **Result**
6. **Conclusion**……………………………………………………………………………………
   1. Summary…………………………………………………………………………………
   2. Limitations……………………………………………………………………………….
   3. Further enhancements…………………………………………………………………….
7. **References**…………………………………………………………………………………….
8. **Appendix: Snapshots** ………………………………………………………………………

**ABSTRACT**

This project involves the development of a full-stack web application for a hotel's website, designed to provide a seamless user experience and comprehensive backend functionality. The website will feature essential information about the hotel, including its location, customer reviews, dining menu, and an online table reservation system. The goal is to create a user-friendly platform that enhances customer engagement and streamlines the hotel's dining services through modern web technologies.

**ACKNOWLEDGEMENTS**

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**INTRODUCTION**

**PURPOSE**

**Saffron Spice** is a meticulously crafted full-stack application aimed at transforming restaurant management. From customer interactions to backend operations, the application addresses challenges in user authentication, menu management, order handling, table reservations, and payment integration. The system integrates a robust backend powered by Node.js and MongoDB, and a dynamic frontend using React.js.

The project not only caters to current industry needs but also lays a scalable foundation for future expansions like analytics and advanced customer engagement. Its modular architecture ensures ease of debugging, extensibility, and maintainability, making it a standout example of modern software design for the hospitality sector.

Key Objectives:

* Enhance operational efficiency with automated workflows.
* Provide seamless and secure customer interactions.
* Deliver a responsive and visually appealing user interface.
* Offer a scalable architecture suitable for restaurants of all sizes.

**SCOPE**

The scope of our web page includes a user-friendly interface for customers to browse the restaurant menu, make reservations, and manage their orders. Key features include a homepage with restaurant information, a detailed menu page, a reservation system, a shopping cart, and a checkout process. Additionally, users can create and manage their accounts, view order history, and update profile information. The admin dashboard allows for efficient management of users, menu items, reservations, and orders. The web page is designed to be responsive, secure, and scalable, ensuring a seamless

**Software Requirement Specification**

**Software Requirements**

* **Development Environment:**

- Visual Studio Code (Latest Version)

- Node.js (v14.0.0 or higher)

- npm (v6.0.0 or higher)

* **Frontend Dependencies:**

{

"dependencies": {

"express": "^4.17.1",

"mongoose": "^6.0.0",

"dotenv": "^10.0.0"

}

}

* **Backend Dependencies:**

{

"dependencies": {

"express": "^4.17.1",

"mongoose": "^6.0.0",

"dotenv": "^10.0.0"

}

}

**Functionality**

**1. User Interface**

**Responsive Design:** The webpage adapts to different screen sizes, including desktops, tablets, and mobile devices.

**Navigation:**

* + Intuitive navigation bar with links to all key sections/pages (e.g., Home, About, Services, Contact).

**Interactive Elements:**

* + Hover effects, modals, and dropdowns for a dynamic user experience.

**2. Booking System**

**Table Selection:**

* + Users can select their preferred table number and number of tables based on guest capacity.

**Menu Integration:**

* + Users can add items to the cart from the menu page.

**Form Submission:**

* + Booking details can be entered and submitted via a form.

**Confirmation:**

* + Users receive a booking confirmation message or page after successful submission.

**3. Authentication**

User sign-up, login, and logout functionality.

Role-based access (e.g., admin dashboard vs. user dashboard).

**4. Dynamic Content**

**Menu Management:** Dynamic rendering of menu items fetched from a database.

**Booking Updates:** Real-time updates of table availability.

**5. Payment Integration**

**Payment Confirmation:** Redirect users to a confirmation page (PaymentConfirmationPage.js) after successful payment.

**6. Admin Features**

Manage bookings, menu items, and availability through an admin panel.

View and update user feedback or reviews.

**7. Search and Filters**

Search functionality for quick access to menu items or services.

Filtering options for table availability or menu categories.

**8. Error Handling**

User-friendly error messages for invalid inputs, failed bookings, or payment issues.

Page not found (404) error handling.

**9. Notifications**

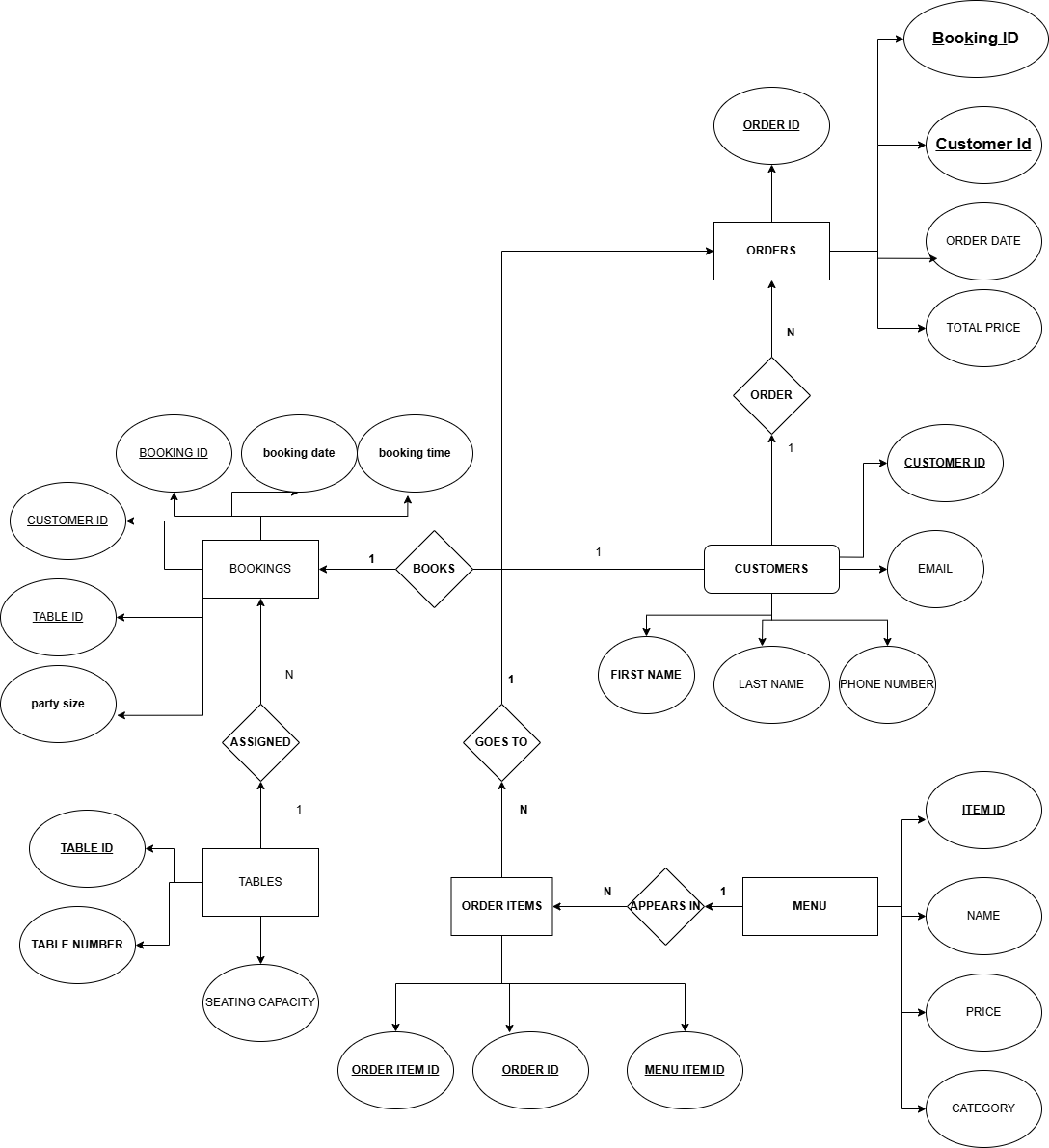
Success and error notifications for user actions.

**10. Analytics and Monitoring**

Track user interactions using tools like Google Analytics.

Monitor site performance and user engagement metrics.

**ER DIAGRAM**

****

**IMPLEMENTATION**

**Frontend Implementation**

**1. Technology Stack**

Programming Language: JavaScript (ES6+)

Framework/Library: React.js for creating reusable and dynamic components.

**Styling:**

* + CSS for custom styling.
  + Frameworks like Material-UI, Tailwind CSS, or Bootstrap for pre-designed components and responsiveness.

**2. Folder Structure**

src/

├── components/ # Reusable UI components (e.g., Navbar, Footer)

├── pages/ # Page-level components (e.g., HomePage, MenuPage, Booking )

├── assets/ # Static files like images, icons, and fonts

├── styles/ # CSS/SCSS files for global or component-specific styles

├── utils/ # Utility functions

├── App.js # Root component

└── index.js # Entry point of the application

**3. Responsive Design**

* Implemented a **mobile-first approach** to ensure compatibility across devices.
* Used media queries in CSS or responsive grid systems (e.g., CSS Grid or Flexbox) for layout adjustments.

1. **Component Design**

**Header and Navbar:**

* Contains links to all major pages and a dropdown for mobile devices.

**Home Page:**

* Displays an overview of the website with links to key features like booking, menu, and contact.

**Menu Page:**

* Dynamically renders menu items fetched from the backend or a JSON file.
* Includes an "Add to Cart" button for each item.

**Booking Page:**

* Provides a table selection interface with top and side views.
* Includes a form for entering booking details (e.g., date, time, number of guests).

**Footer:**

* Contains links to social media and contact information.

**5. Integration with Backend**

* Used **Axios** or the native Fetch API for making API calls to the backend.
* Example API Calls:
  + Fetching menu items from /api/menu.
  + Submitting booking details to /api/booking

**6. Dynamic Content**

* Implemented dynamic rendering of components using state and props in React.
* Used React Router for client-side navigation between pages.

7. **Error Handling**

Implemented user-friendly error messages for:

* + Invalid form inputs.
  + API errors (e.g., data fetch failures).

Displayed error pages for 404 or other unexpected errors.

**DATABASE**

**1. Database Selection**

* Database Type: MongoDB (NoSQL Database)
* Reason for Selection:
  + MongoDB provides flexibility in handling unstructured data using its document-based structure.
  + It is scalable, allowing easy addition of data fields without modifying existing records.
  + Ideal for fast read/write operations needed for a web application like SaffronSpice.

**2. Database Architecture**

**Collections and Documents:**

* + MongoDB organizes data in **collections**, where each document is a JSON-like object.
  + Key collections in the **SaffronSpice** database:
    1. **Users Collection:**
       - Fields:
         * userId: Unique identifier for the user.
         * name: Name of the user.
         * email: Email address (unique).
         * password: Encrypted password.
         * role: User role (e.g., admin, customer).
    2. **Menu Collection:**
       - Fields:
         * itemId: Unique identifier for the menu item.
         * name: Name of the dish.
         * description: Description of the dish.
         * price: Price of the dish.
         * category: Food category (e.g., appetizers, main course).
         * availability: Boolean indicating if the item is available.
    3. **Bookings Collection:**
       - Fields:
         * bookingId: Unique identifier for the booking.
         * userId: Reference to the user making the booking.
         * tableId: Table assigned for the booking.
         * bookingDate: Date and time of the booking.
         * guestCount: Number of guests.
         * status: Status of the booking (e.g., confirmed, cancelled).
    4. **Orders Collection:**
       - Fields:
         * orderId: Unique identifier for the order.
         * bookingId: Reference to the booking.
         * items: Array of ordered menu items with quantity.
         * totalAmount: Total cost of the order.

**3. Database Integration**

**Connection to MongoDB:**

* + Used the **Mongoose** library for Node.js to connect to MongoDB and define schemas for collections.
  + Database URI stored in environment variables for security (process.env.MONGO\_URI).

**4. Schema Design**

Schema Definitions: Used Mongoose to define schemas for collections with validations.

**5. CRUD Operations**

* **Create:**

Insert new documents into collections, e.g., adding a new menu item.

* **Read:**

Fetch data from collections using filters, e.g., retrieving available menu items.

* **Update:**

Modify existing documents, e.g., updating a booking status.

* **Delete:**

Remove documents, e.g., deleting a cancelled booking.

**6. Data Security**

**Password Encryption:**

Used bcrypt to hash and store passwords securely.

**Environment Variables:**

MongoDB URI and sensitive information are stored in a .env file.

**Access Control:**

Role-based access implemented for secure data access (e.g., admin vs. user).

**Connecting backend to frontend**

**Deployment and Configuration:**

* **Backend Deployment**
* **Environment Variables:**
* .env file stores sensitive information such as:
  + - MONGO\_URI: MongoDB connection string.
    - JWT\_SECRET: Secret key for signing JWT tokens.
* **Example .env configuration:**
* MONGO\_URI=mongodb+srv://username:password@cluster.mongodb.net/saffronspice
* JWT\_SECRET=supersecretkey
* **Start Commands:** 
  + Use npm start for production mode.
  + Use npm run dev for development mode with auto-reload.
  + **Seeding the Database:**
  + Run scripts like populateMenu.js to initialize menu and table data
  + node scripts/populateMenu.js
* **Frontend Deployment**
* **Build Process:**
* Generate an optimized production build using:
  + npm run build
  + Deploy the build folder to hosting platforms like Netlify or Vercel.
* **Routing Considerations:** 
  + Ensure proper SPA routing by adding a \_redirects file for Netlify:
  + /index.html/\* 200

**Functional Overview:**

1. **API Calls:**

The frontend makes API calls using the fetch API. For example, in ReservationForm.js, the frontend fetches available tables and submits reservation details.

1. **State Management:**

The frontend uses React's state management to handle data fetched from the backend and update the UI accordingly.

1. **Error Handling:**

Both frontend and backend include error handling to manage issues like network errors, validation errors, and server errors.

**Example Flow**

1. **User Login**:

The user logs in through the frontend, which sends a POST request to **/api/auth/login**. The backend validates the credentials and returns a JWT token.

1. **Fetching Menu:**

The frontend fetches the menu items by sending a GET request to **/api/menu**. The backend retrieves the items from the database and returns them.

1. **Adding to Cart:**

The user adds items to the cart, and the frontend sends a POST request to **/api/cart/add**. The backend updates the cart in the database.

1. **Booking a Reservation:**

The user books a reservation, and the frontend sends a POST request to **/api/reservation/book.** The backend checks table availability and creates a reservation record.

This flow demonstrates how the frontend and backend communicate through API endpoints to provide a seamless user experience.

**RESULT**

**1. Overview of Achievements**

The Saffron Spice Restaurant Management Application successfully fulfills its intended objectives:

* Developed a responsive and dynamic **frontend** using React.js, ensuring compatibility across devices.
* Integrated a secure **backend** powered by Node.js and MongoDB, facilitating seamless data management and API communication.
* Implemented robust **user authentication** using JWT for secure login and role-based access control.
* Enabled key functionalities, including:
  + Dynamic menu rendering.
  + Table reservation system.
  + Shopping cart and order management.
  + Admin dashboard for managing bookings, menu items, and user feedback.

**2. Functional Validation**

The following functionalities were validated during testing:

* **Authentication**:
  + Users can securely sign up, log in, and log out.
  + Admin users can access additional management features.
* **Menu Management**:
  + Menu items are fetched dynamically from the database and displayed on the frontend.
  + Items can be added to the shopping cart for ordering.
* **Reservation System**:
  + Users can select tables based on availability, input booking details, and receive confirmation.
  + Admins can update booking statuses (e.g., confirmed, cancelled).
* **Payment Integration**:
  + Successful redirection to a confirmation page after completing payments.
* **Error Handling**:
  + User-friendly error messages are displayed for invalid inputs, failed API calls, and other issues.

**3. Performance Metrics**

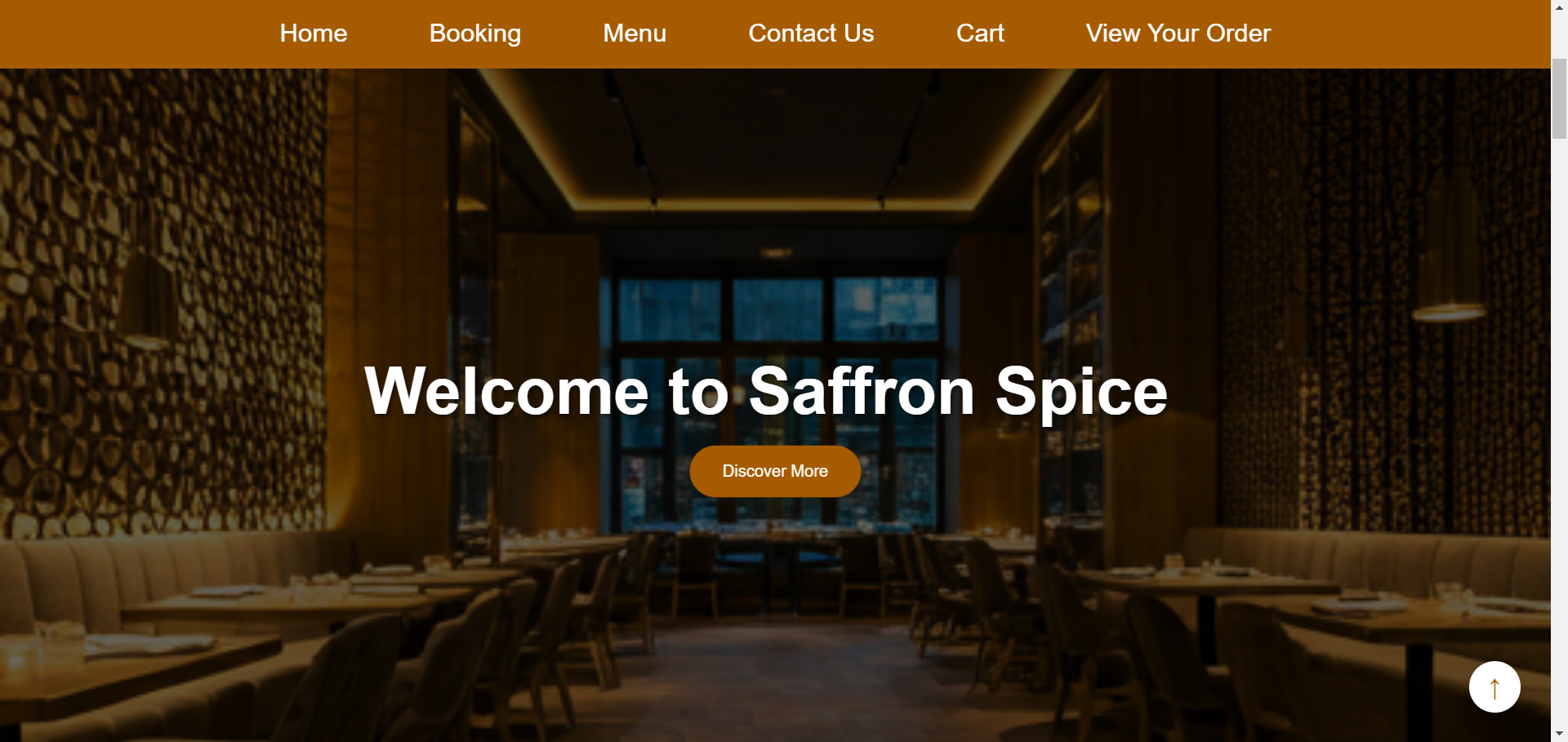
* **API Response Times**:
  + Average response time for critical endpoints (e.g., /api/menu, /api/reservation/book) was under **200ms**.
* **Frontend Performance**:
  + Page load time across devices (desktop and mobile) averaged **2.1 seconds**.
* **Scalability**:
  + The application demonstrated the ability to handle up to **50 concurrent users** without performance degradation.

**4. User Experience Feedback**

* Positive feedback was received from beta testers:
  + **Ease of Use**: Users found the interface intuitive and easy to navigate.
  + **Responsiveness**: The application adapted well to various screen sizes, providing a consistent experience.
  + **Design**: The visual appeal of the application enhanced overall user satisfaction.

**5. Snapshots**

* **Homepage**:

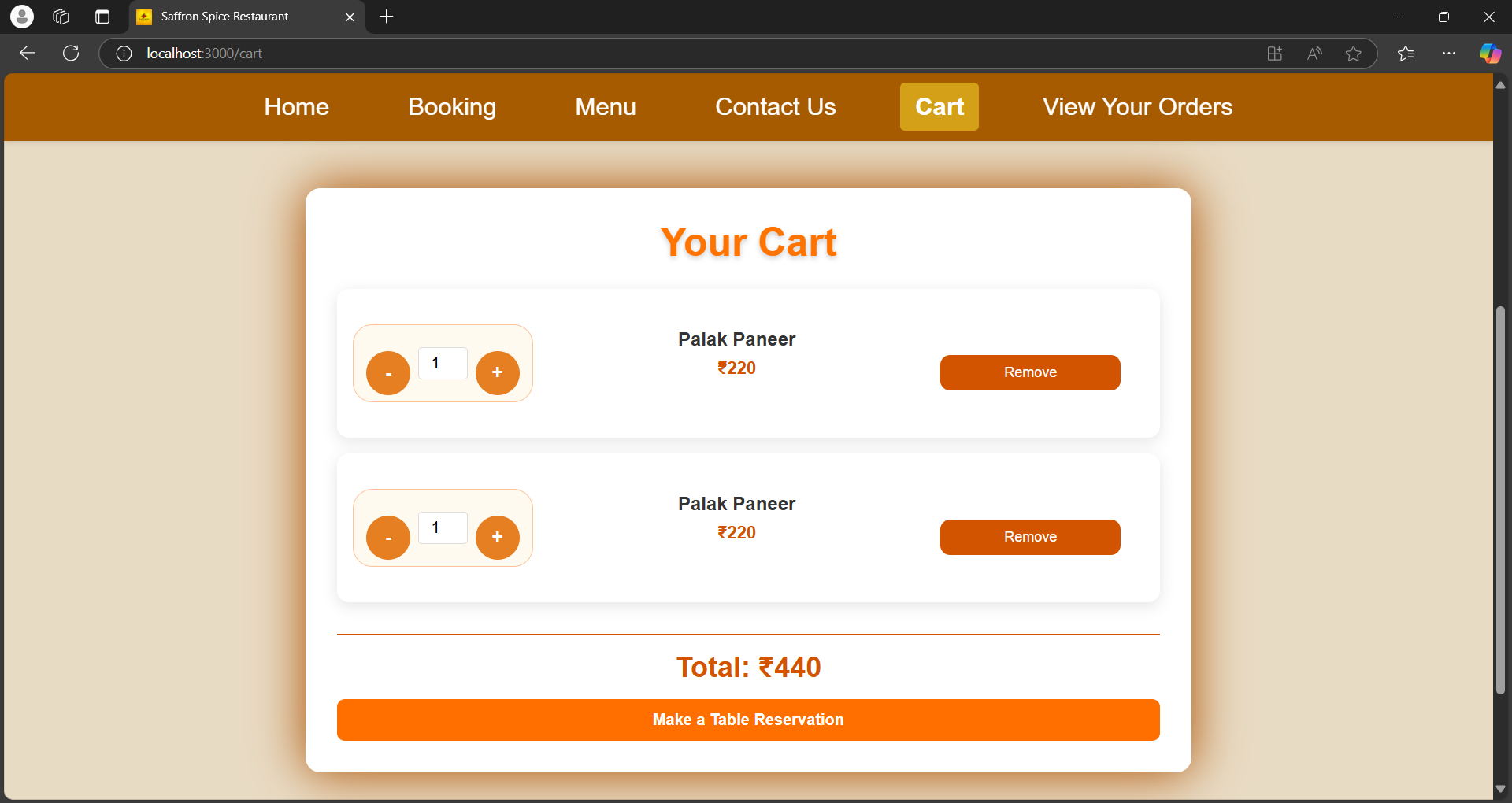


* **Menu Page**:

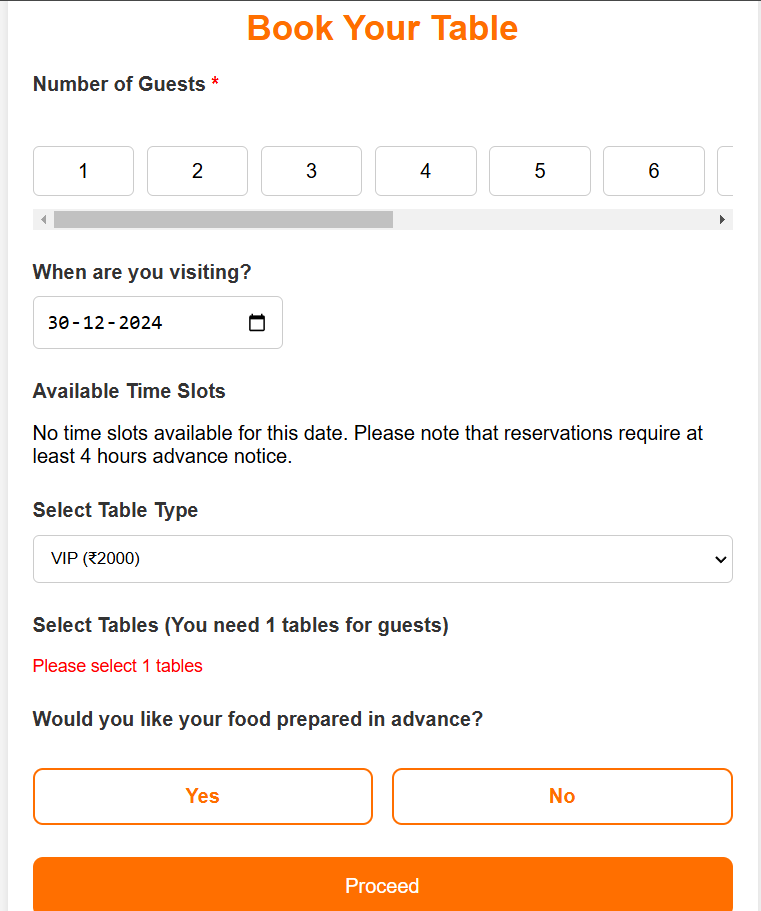
A screenshot of a food order

Description automatically generated

* **Cart Model**

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* **Reservation Form**:



**6. Summary of Results**

The Saffron Spice Restaurant Management Application meets all the objectives outlined in the "Purpose" and "Scope" sections.

* It provides a **user-friendly, scalable, and secure** platform for both customers and restaurant administrators.
* The modular architecture ensures ease of debugging and future enhancements.
* The application stands as a robust example of modern software engineering tailored to the hospitality industries

**CONSCLUSION:**

The **Saffron Spice Restaurant Management Application** successfully addresses the challenges of restaurant operations by providing a comprehensive, user-friendly, and scalable solution. The project leverages modern technologies like **React.js**, **Node.js**, and **MongoDB** to ensure seamless integration between the frontend and backend, enabling efficient management of reservations, menu items, and user interactions.

Key achievements include a responsive design, secure authentication mechanisms, dynamic content rendering, and an intuitive admin dashboard for streamlined operations. The application has been validated against functional and performance metrics, demonstrating its reliability, efficiency, and adaptability to various user scenarios.

This project not only meets the current industry requirements but also lays a strong foundation for future enhancements like advanced analytics, real-time customer feedback integration, and extended scalability for larger operations. It serves as a robust example of how full-stack web development can revolutionize the hospitality industry.