HOSPITAL MANAGEMENT SYSTEM

COMPREHENSIVE PROJECT REPORT

SUBMITTED BY:

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SUBMITTED TO:

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COURSE: BS-AI Database & Management System

SEMESTER: Fall 2025 - 4th Semester BSAI

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Chapter 1: Introduction

1.1 Overview of the Project

The Hospital Management System (HMS) is a comprehensive database-driven software solution designed to automate and streamline healthcare facility operations. This system manages patient records, appointments, medical history, billing, staff information, and room allocations in a centralized database. The HMS eliminates manual paperwork, reduces errors, and enhances the efficiency of hospital operations while maintaining data security and integrity.

1.2 Problem Statement

Traditional hospital management faces numerous challenges:

- Manual patient record keeping leading to data inconsistency
- Difficulty in tracking appointment schedules and doctor availability
- Errors in billing and payment processing
- Inefficient room and bed management
- Lack of real-time medical history access
- Poor coordination between departments
- Security concerns with sensitive patient data

1.3 Objectives of the Project

- To computerize all hospital operations including patient registration and appointment scheduling
- To maintain accurate and secure electronic medical records
- To automate billing and payment processes
- To provide real-time room availability and staff scheduling
- To generate comprehensive reports for management decisions
- To ensure data security through role-based access control
- To improve patient care through efficient service delivery

1.4 Scope of the Project

The system covers:

- Patient management (registration, medical history, appointments)
- Staff management (doctors, nurses, administrative staff)
- Appointment scheduling and tracking
- Medical records management
- Billing and payment processing
- Room and bed management
- Laboratory test management
- Medicine inventory management
- Report generation and analytics

1.5 Project Category

- Category: Database Management System and Web Application

- Type: Enterprise Healthcare Management Solution

- Technology Stack: PHP, MySQL, HTML5, CSS3, JavaScript

- Deployment: Web-based application using XAMPP stack

Chapter 2: System Analysis

2.1 Existing System

Most healthcare facilities currently use:

- Paper-based patient records and manual filing systems
- Spreadsheet applications for limited data management
- Disconnected departmental systems without integration
- Manual appointment booking through phone calls or direct visits
- Physical ledger-based billing and payment tracking

2.2 Limitations of Existing System

- Time-consuming manual data entry processes
- High probability of human errors in records and billing
- Difficulty in retrieving historical patient data
- Lack of real-time information sharing between departments
- Security vulnerabilities with physical records
- Inefficient resource utilization
- Poor patient experience due to delays

2.3 Proposed System

The Hospital Management System proposes:

- Centralized database for all hospital operations
- Automated patient registration and appointment scheduling
- Digital medical records with complete history
- Integrated billing and payment system
- Real-time room and staff availability
- Secure role-based access control

2.4 Advantages of Proposed System

- Efficiency: Automated processes reduce manual work

- Accuracy: Minimized human errors in data handling

- **Accessibility:** Quick access to patient information

- Security: Encrypted data storage and access controls

- Cost-effective: Reduces paperwork and storage costs

- Scalable: Can be expanded for multiple hospital branches

- User-friendly: Intuitive interface for all user types

2.5 Feasibility Study

Technical Feasibility:

- Uses established technologies (PHP, MySQL)

- Compatible with standard hardware configurations

- No specialized hardware requirements

- Existing technical expertise available

Operational Feasibility:

- User-friendly interface requires minimal training

- Gradual implementation possible

- Supports existing hospital workflows

- Reduces staff workload significantly

Economic Feasibility:

- Low development and maintenance costs

- Quick return on investment through efficiency gains

- Reduces operational costs (paper, storage, manpower)

- Affordable for small to medium hospitals

Chapter 3: System Design

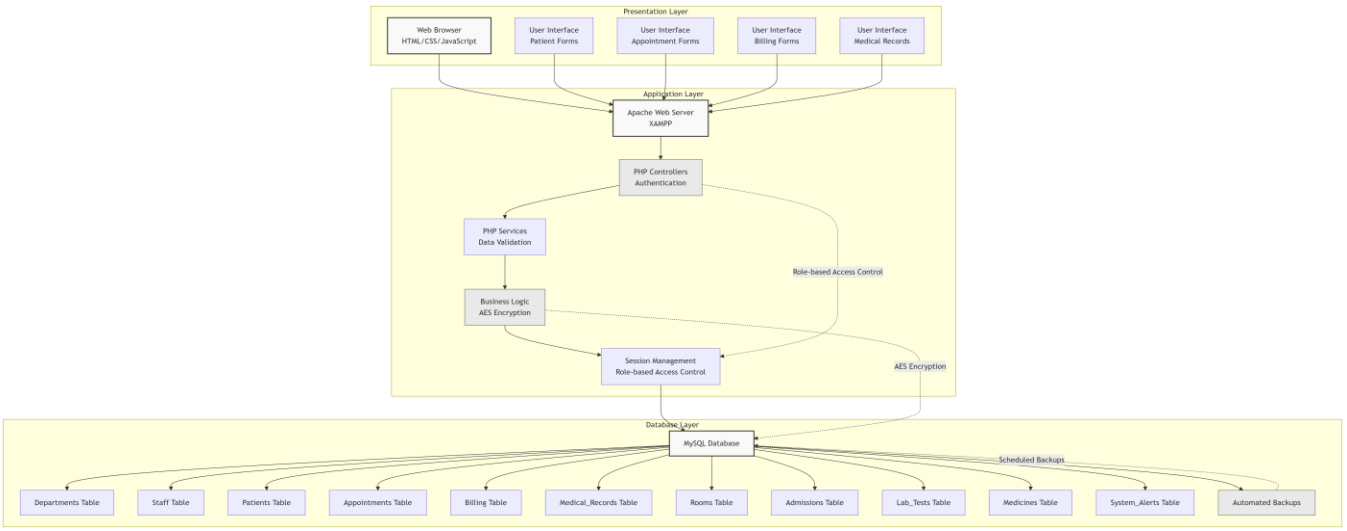
3.1 System Architecture

Three-Tier Architecture:

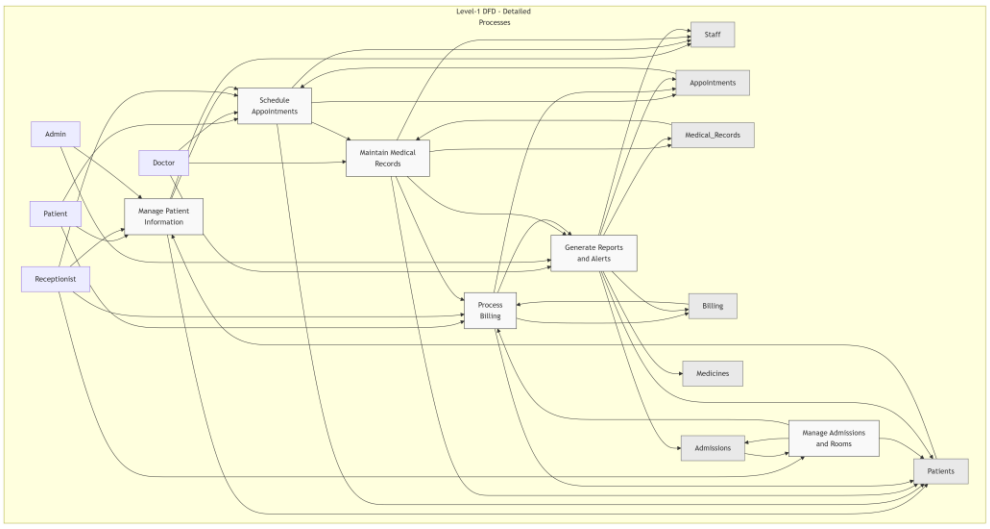
1. Presentation Layer: Web interface (HTML, CSS, JavaScript)

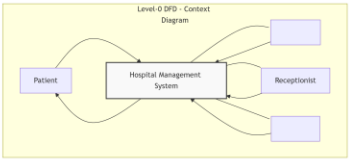
2. Application Layer: PHP business logic and controllers

3. Database Layer: MySQL database with stored procedures

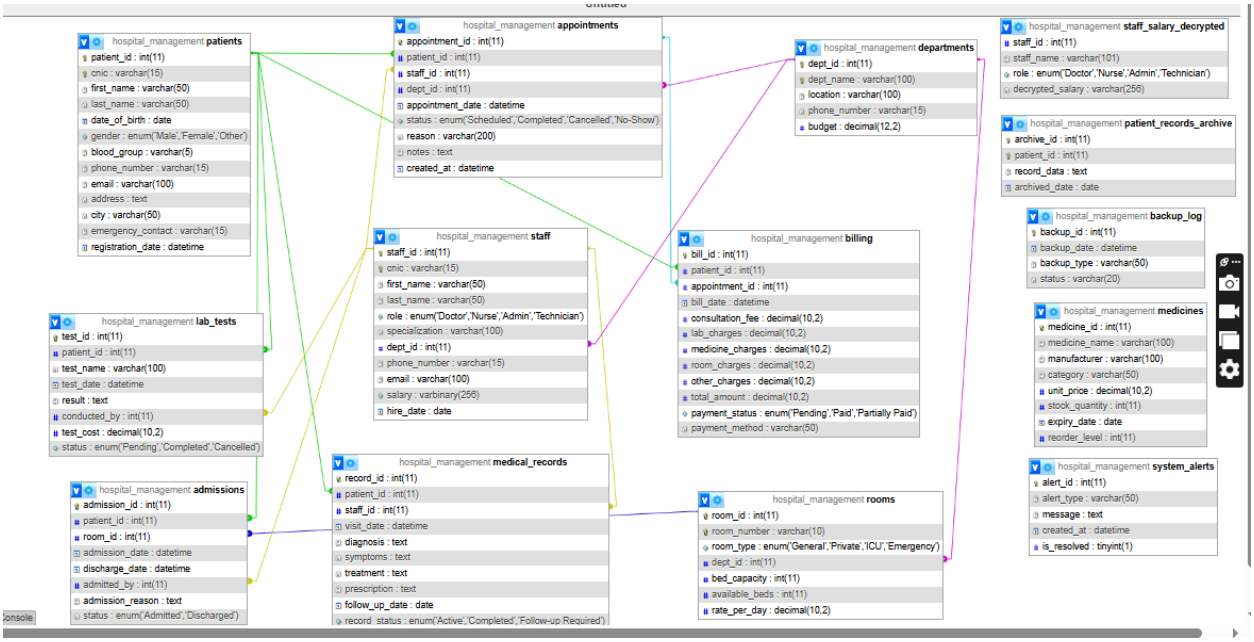


3.2 Data Flow Diagrams

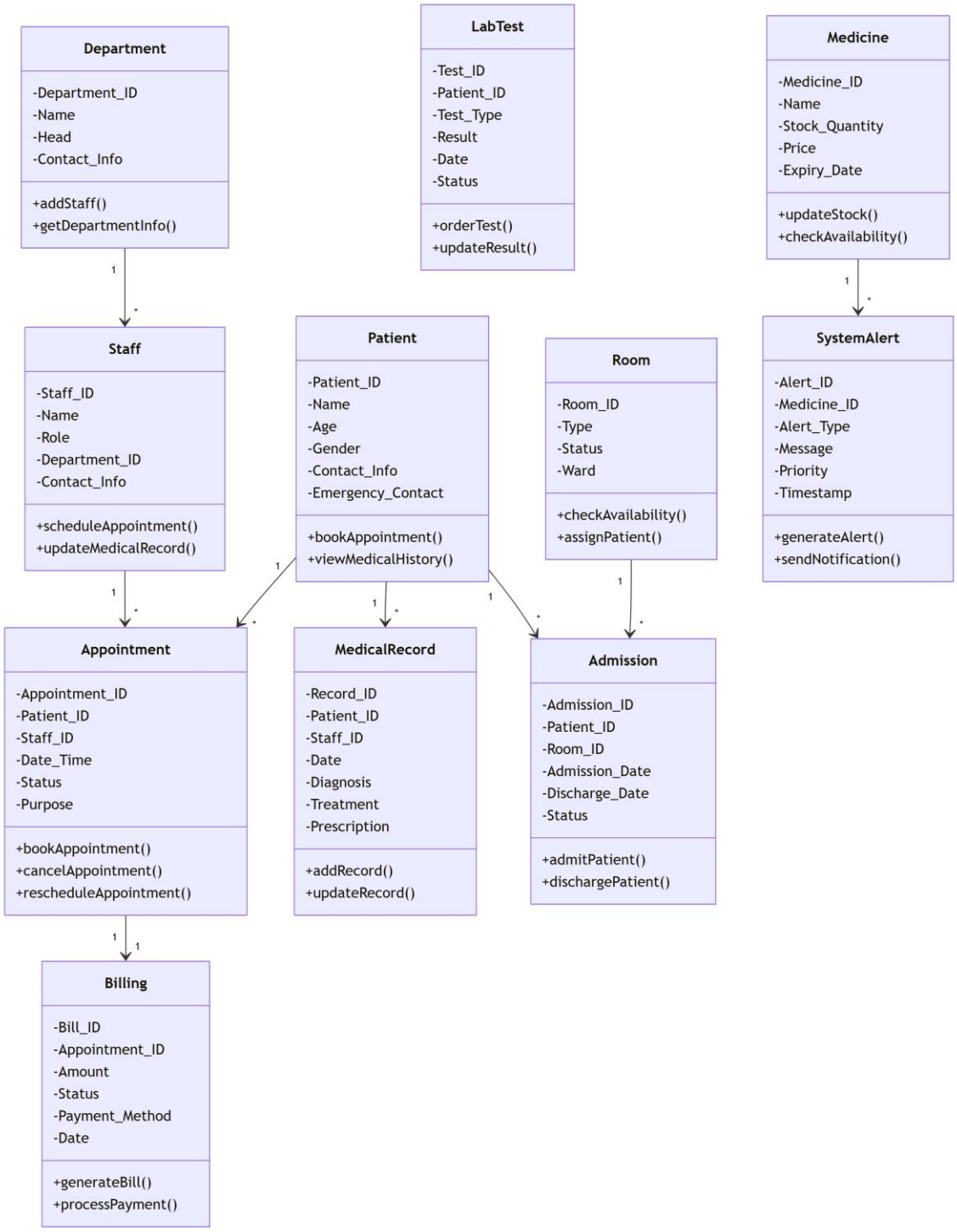




3.3 Entity Relationship Diagram (ERD)



3.4 UML Class Diagram



3.5 Database Schema Design Example Code

Patients Table:

sql

```
CREATE TABLE Patients (
    patient_id INT PRIMARY KEY AUTO_INCREMENT,
    cnic VARCHAR(15) UNIQUE,
    first_name VARCHAR(50) NOT NULL,
    last_name VARCHAR(50) NOT NULL,
    date_of_birth DATE NOT NULL,
    gender ENUM('Male','Female','Other'),
    blood_group VARCHAR(5),
    phone_number VARCHAR(15),
    email VARCHAR(100),
    address TEXT,
    emergency_contact VARCHAR(15),
    registration_date DATETIME DEFAULT CURRENT_TIMESTAMP
);
```

Appointments Table:

sql

```
CREATE TABLE Appointments (
    appointment_id INT PRIMARY KEY AUTO_INCREMENT,
    patient_id INT NOT NULL,
    staff_id INT NOT NULL,
    appointment_date DATETIME NOT NULL,
    status ENUM('Scheduled','Completed','Cancelled'),
```

```
    reason VARCHAR(200),
    notes TEXT,
    FOREIGN KEY (patient_id) REFERENCES Patients(patient_id),
    FOREIGN KEY (staff_id) REFERENCES Staff(staff_id)
);
```

Chapter 4: System Implementation

4.1 Modules Description

Admin Module:

- System configuration and user management
- Department and staff management
- Comprehensive reporting and analytics
- System backup and recovery

Doctor Module:

- Patient medical records management
- Appointment scheduling and management
- Prescription and treatment planning
- Lab test orders and results viewing

Receptionist Module:

- Patient registration and information updates
- Appointment scheduling and coordination
- Billing and payment processing
- Room allocation and management

Patient Module:

- Personal information management
- Appointment booking and history
- Medical records access
- Bill payment and history

Billing Module:

- Automated bill generation
- Multiple payment method support
- Payment status tracking
- Financial reporting

Laboratory Module:

- Test order management
- Result entry and tracking
- Test cost management
- Quality control

4.2 Hardware and Software Requirements

Hardware Requirements:

- Processor: Intel Core i3 or higher
- RAM: 4GB minimum (8GB recommended)
- Storage: 500GB HDD or 256GB SSD
- Network: LAN connection with internet access

Software Requirements:

- Operating System: Windows 10/11, Linux, macOS
- Web Server: Apache 2.4+
- Database: MySQL 8.0+
- Programming Language: PHP 8.0+
- Browser: Chrome, Firefox, Edge (latest versions)

4.3 Implementation Steps

1. Database Design and Creation
2. Backend Development (PHP)
3. Frontend Development (HTML, CSS, JavaScript)
4. Integration and Testing
5. Security Implementation
6. User Training and Deployment
7. Maintenance and Support

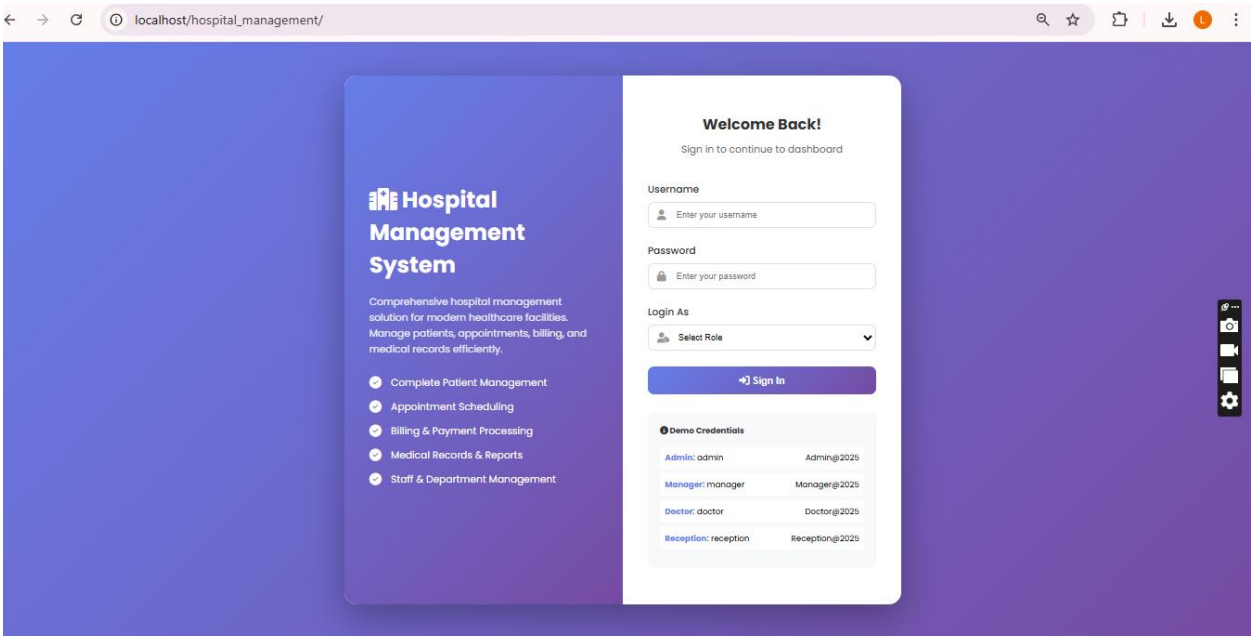
4.4 System Features

- **User Authentication**: Secure login for different user roles
- **Data Encryption:** AES encryption for sensitive data
- **Real-time Updates:** Instant data synchronization
- **Reporting:** Comprehensive analytics and reports
- **Backup System:** Automated database backups
- **Audit Trail:** Complete activity logging
- **Multi-user Support:** Concurrent access handling

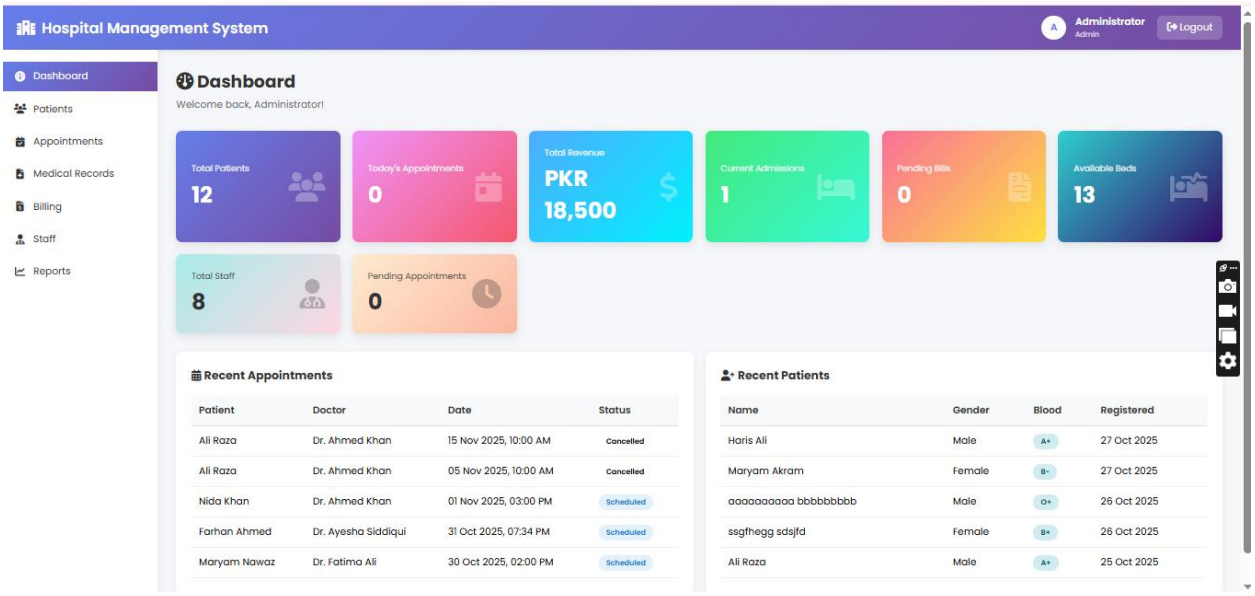
Chapter 5: Implementation Results

5.1 System Screenshots

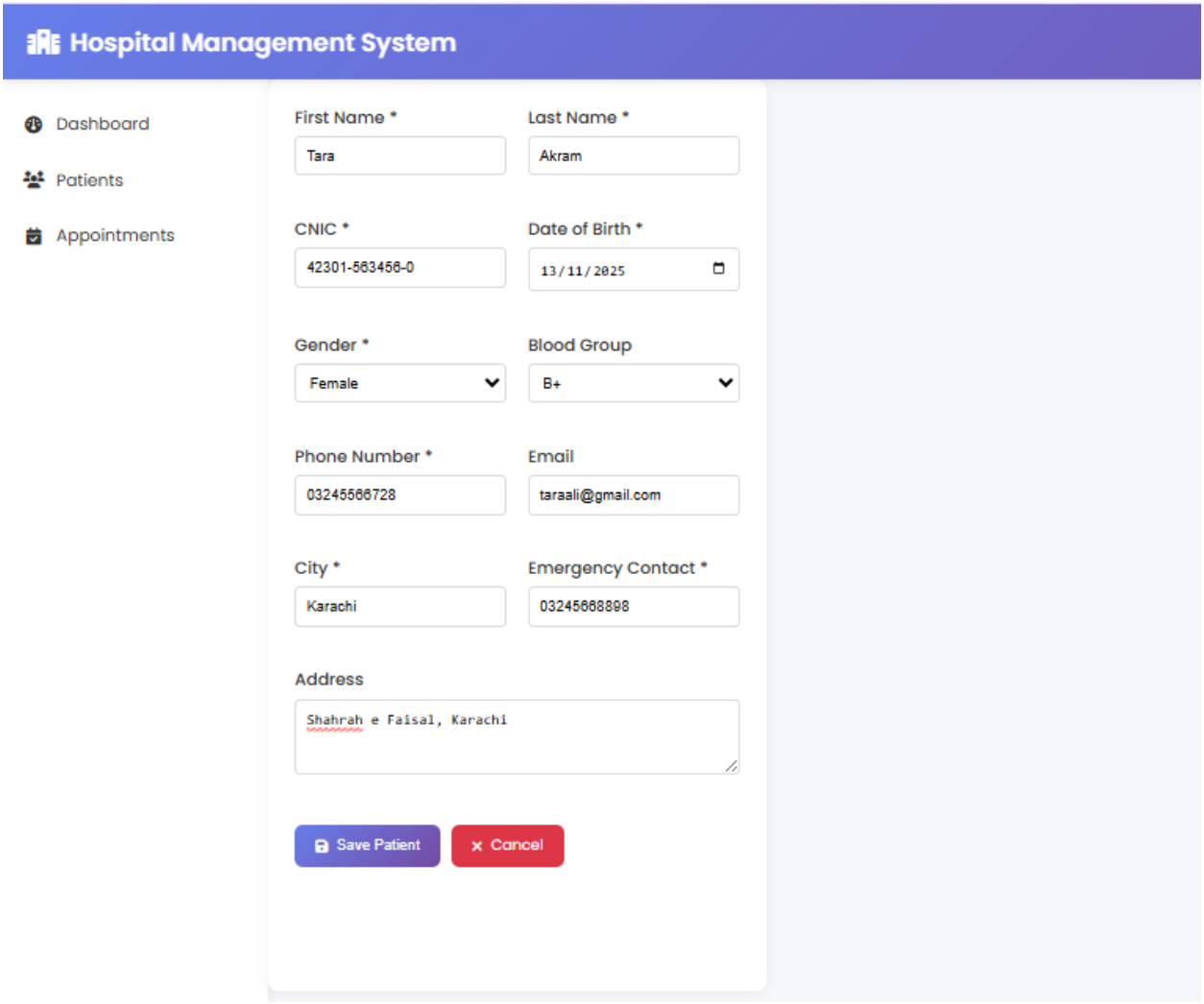
Login Page:



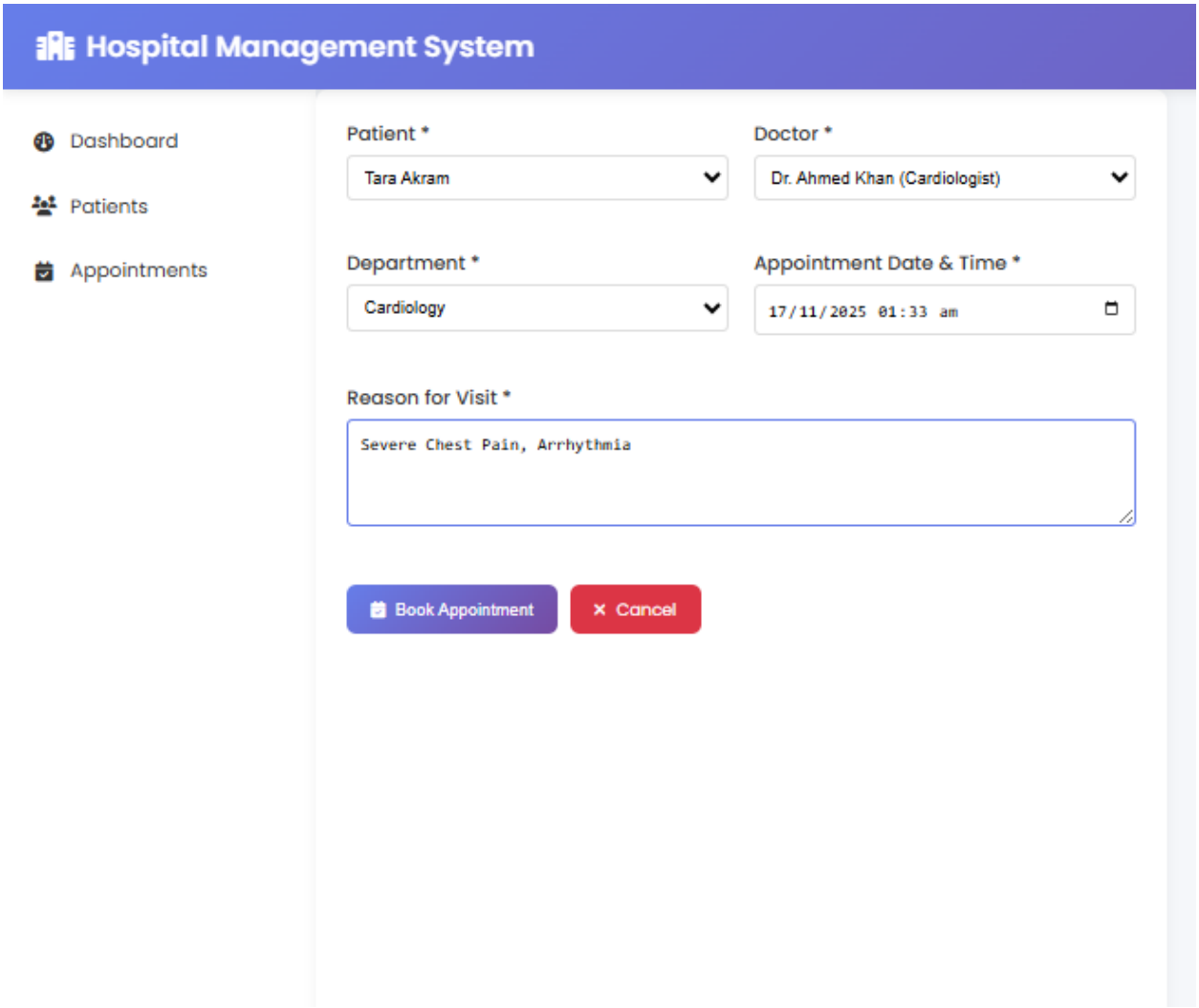
Admin Dashboard:



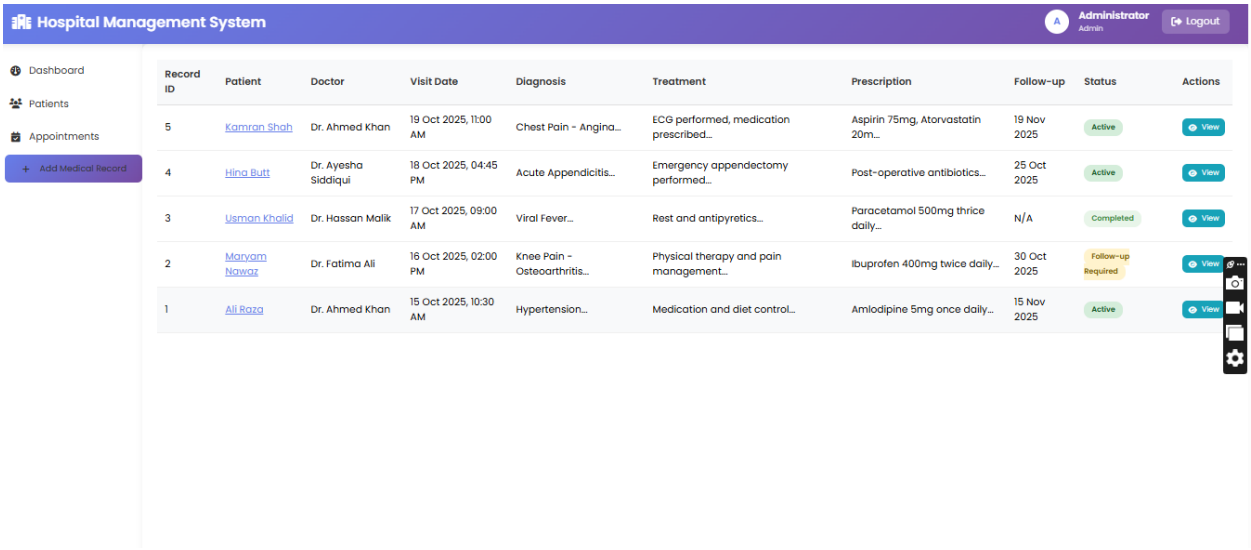
Patient Registration:



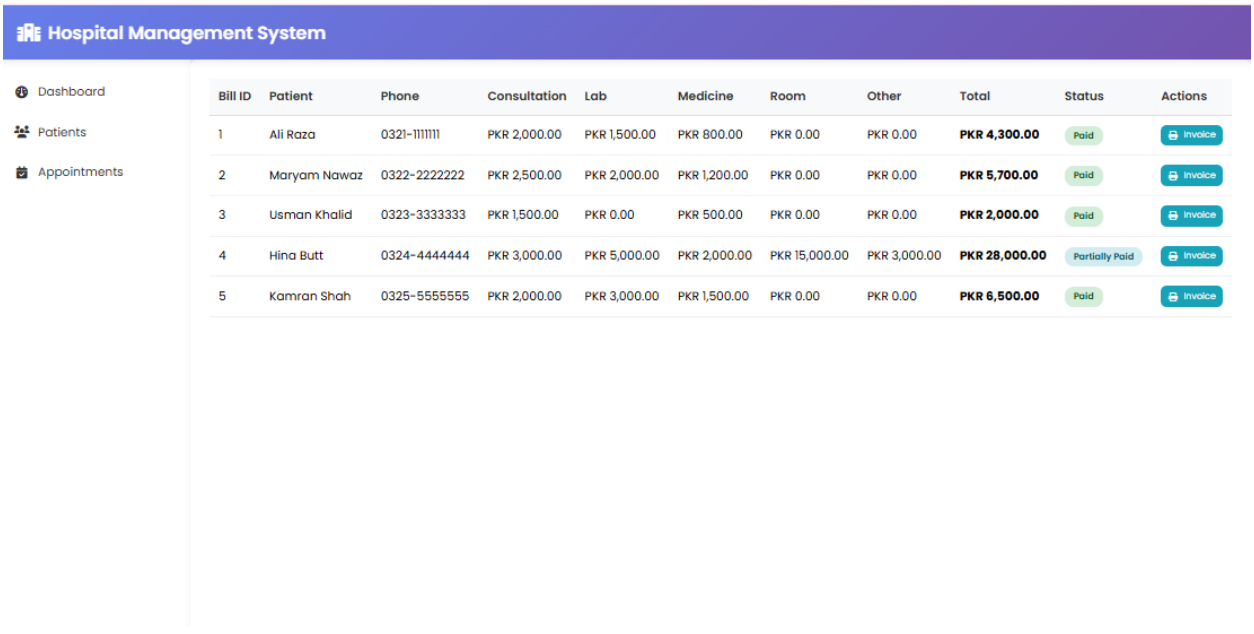
Appointment Scheduling:

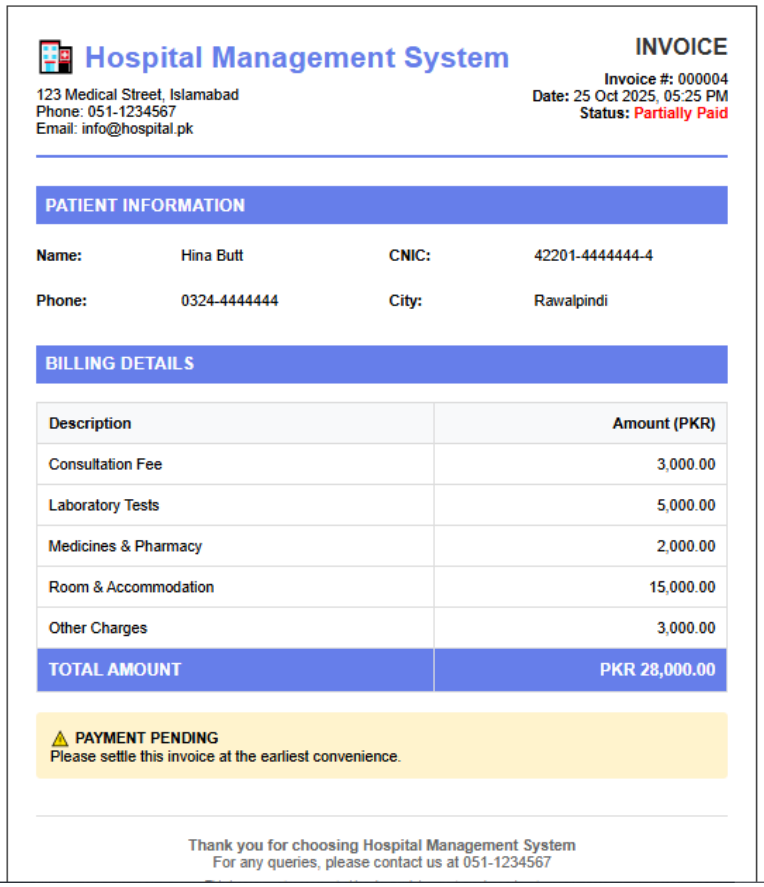


Medical Records:



Billing:





Hospital Management System

123 Medical Street, Islamabad
Phone: 051-1234567
Email: info@hospital.pk

INVOICE

Invoice #: 000004
Date: 25 Oct 2025, 05:25 PM
Status: Partially Paid

PATIENT INFORMATION

Name:	Hina Butt	CNIC:	42201-4444444-4
Phone:	0324-4444444	City:	Rawalpindi

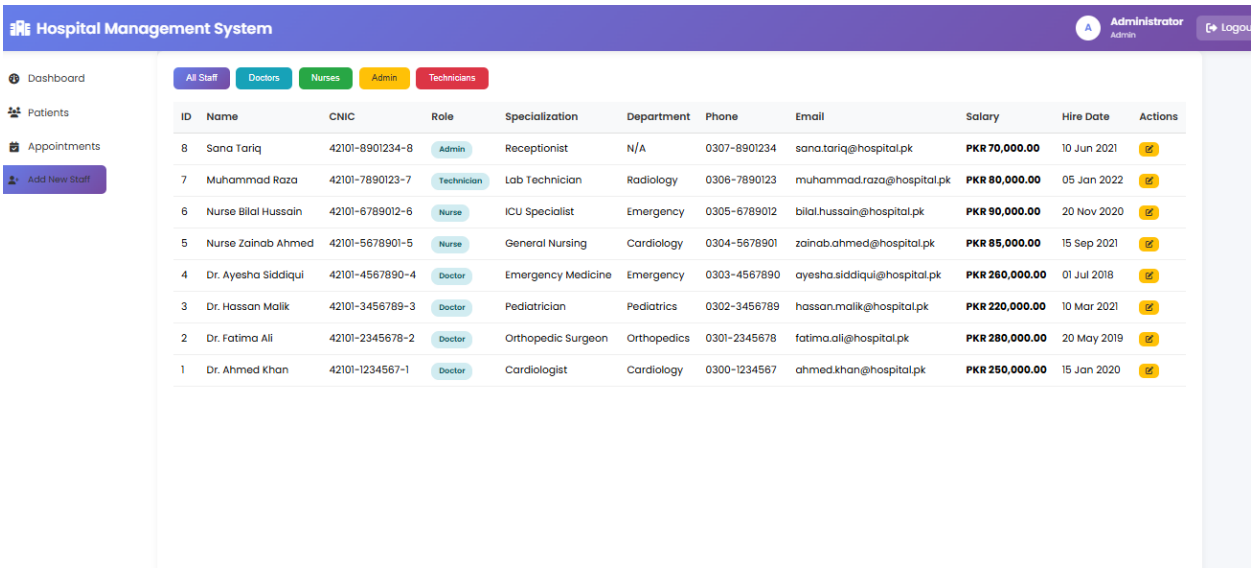
BILLING DETAILS

Description	Amount (PKR)
Consultation Fee	3,000.00
Laboratory Tests	5,000.00
Medicines & Pharmacy	2,000.00
Room & Accommodation	15,000.00
Other Charges	3,000.00
TOTAL AMOUNT	PKR 28,000.00

⚠ PAYMENT PENDING
Please settle this invoice at the earliest convenience.

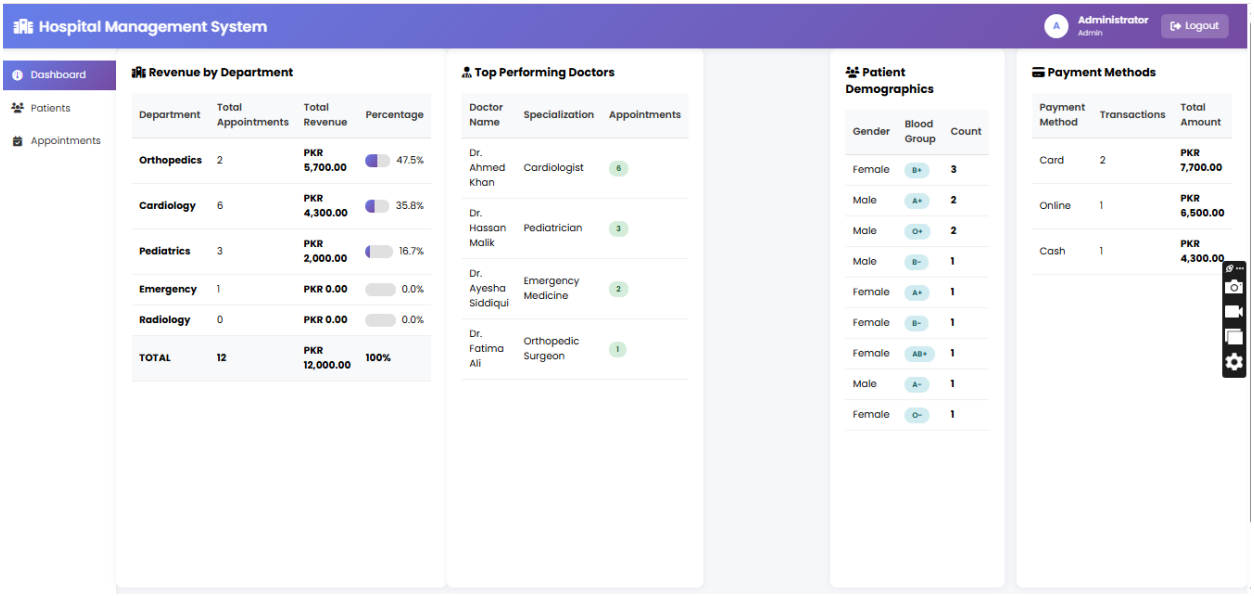
Thank you for choosing Hospital Management System
For any queries, please contact us at 051-1234567

Staff:



ID	Name	CNIC	Role	Specialization	Department	Phone	Email	Salary	Hire Date	Actions
8	Sana Tariq	42101-8901234-8	Admin	Receptionist	N/A	0307-8901234	sana.tariq@hospital.pk	PKR 70,000.00	10 Jun 2021	
7	Muhammad Raza	42101-7890123-7	Technician	Lab Technician	Radiology	0306-7890123	muhammad.raza@hospital.pk	PKR 80,000.00	05 Jan 2022	
6	Nurse Bilal Hussain	42101-6789012-6	Nurse	ICU Specialist	Emergency	0305-6789012	bilal.hussain@hospital.pk	PKR 90,000.00	20 Nov 2020	
5	Nurse Zainab Ahmed	42101-5678901-5	Nurse	General Nursing	Cardiology	0304-5678901	zainab.ahmed@hospital.pk	PKR 85,000.00	15 Sep 2021	
4	Dr. Ayesha Siddiqui	42101-4567890-4	Doctor	Emergency Medicine	Emergency	0303-4567890	ayesha.siddiqui@hospital.pk	PKR 260,000.00	01 Jul 2018	
3	Dr. Hassan Malik	42101-3456789-3	Doctor	Pediatrician	Pediatrics	0302-3456789	hassan.malik@hospital.pk	PKR 220,000.00	10 Mar 2021	
2	Dr. Fatima Ali	42101-2345678-2	Doctor	Orthopedic Surgeon	Orthopedics	0301-2345678	fatima.ali@hospital.pk	PKR 280,000.00	20 May 2019	
1	Dr. Ahmed Khan	42101-1234567-1	Doctor	Cardiologist	Cardiology	0300-1234567	ahmed.khan@hospital.pk	PKR 250,000.00	15 Jan 2020	

Reports:



5.2 Sample Code

Database Connection (config.php):

```php
<?php
define('DB_HOST', 'localhost');
define('DB_USER', 'root');
define('DB_PASS', '');
define('DB_NAME', 'hospital_management');

$conn = new mysqli(DB_HOST, DB_USER, DB_PASS, DB_NAME);

if ($conn->connect_error) {
```

```
    die("Connection failed: " . $conn->connect_error);
}
?>
```

Patient Registration (add_patient.php):

```php
<?php
require_once 'config.php';

if ($_SERVER['REQUEST_METHOD'] == 'POST') {
    $first_name = $_POST['first_name'];
    $last_name = $_POST['last_name'];
    $cnic = $_POST['cnic'];
    $date_of_birth = $_POST['date_of_birth'];
    $gender = $_POST['gender'];
    $phone_number = $_POST['phone_number'];

    $sql = "INSERT INTO Patients (first_name, last_name, cnic, date_of_birth, gender, phone_number)
            VALUES (?, ?, ?, ?, ?, ?)";

    $stmt = $conn->prepare($sql);
    $stmt->bind_param("ssssss", $first_name, $last_name, $cnic, $date_of_birth, $gender, $phone_number);

    if ($stmt->execute()) {
        echo "Patient registered successfully!";
    } else {
        echo "Error: " . $conn->error;
```

```
    }
}
?>
```

Appointment Booking Function:

```php
function bookAppointment($patient_id, $doctor_id, $appointment_date, $reason) {
    global $conn;

    $sql = "INSERT INTO Appointments (patient_id, staff_id, appointment_date, reason, status)
            VALUES (?, ?, ?, ?, 'Scheduled')";

    $stmt = $conn->prepare($sql);
    $stmt->bind_param("iiss", $patient_id, $doctor_id, $appointment_date, $reason);

    return $stmt->execute();
}
```

Chapter 6: Conclusion and Future Scope

6.1 Conclusion

The Hospital Management System successfully addresses the critical needs of modern healthcare facilities by providing a comprehensive, secure, and efficient digital solution. The system demonstrates

robust database design, secure data handling, and user-friendly interfaces that significantly improve hospital operations.

Key achievements include:

- Successful implementation of a normalized database schema
- Effective role-based access control system
- Comprehensive module integration
- Efficient data retrieval and reporting capabilities
- Enhanced patient care through streamlined processes

The system reduces administrative overhead, minimizes errors, and provides healthcare professionals with timely access to critical patient information, ultimately leading to improved patient outcomes.

6.2 Future Enhancements

Short-term Improvements:

- Mobile application for doctors and patients
- SMS and email notifications for appointments
- Online payment gateway integration
- Enhanced reporting with data visualization

The Hospital Management System provides a solid foundation that can be continuously enhanced to incorporate emerging technologies and meet evolving healthcare requirements.

Developed By: Layba Akram (B2433059) & Marwa Nawaz (B2433061)

Group 1, BS-AI 4th Semester

BBSUL University, Karachi