Practical 5

System Analysis and Design for the Selected System

Aim: Perform system analysis on Hospital Management System. 1)Systems analysis "what the system should do". 2) Systems design "how to accomplish the objective of the system".

5. System Analysis and Design

The Hospital Management System (HMS) is a software solution designed to facilitate the management of a library by automating various operations, including patient recording, patient management, patient admission, discharges, and billings calculation. The system improves efficiency, reduces manual errors, and enhances patient experience.

5.1 System Analysis

The **Hospital Management** System aims to achieve the **following objectives:**

- **Efficient Patient Management:** Maintain an up-to-date and organized patient record of patients, ensuring easy accessibility and tracking.
- **Automated Medical Records:** Reduce manual intervention in patient admission and discharge processes, ensuring timely updates to patient availability.
- **Patient Authentication and Role-Based Access:** Provide a secure access mechanism for different patients (students, faculty, doctors) with appropriate privileges.
- **Billing Management:** Automate the calculation and tracking of overdue billings, ensuring transparency in financial medical records.
- **Medical Reporting and Analytics:** Generate detailed medical reports on patient admission, overdue records, and billing collections, aiding in better decision-making.
- **Scalability:** Support increasing numbers of patients and patient collections over time, ensuring long-term sustainability and growth.

5.1.1Gather System Requirements

Functional Requirements: The system includes a Patient Management Module, allowing administrators to create, update, and delete patient accounts. Patients have different roles such as Admin, Doctor, and Member, each with distinct privileges. The Patient Management Module enables doctors to add, update, and remove patient records while categorizing patients based on genre, author, and availability. The Patient Search and Patient Record Module allows patients to search patients using filters like title, author, ISBN, and availability.

The Patient Issuance and Return Module automates the schedule appointment in process with prebilling due dates, ensuring that patient status is updated in real time. The Billing Calculation Module tracks overdue patients and calculates billings, accordingly, notifying patients of pending payments. The Appointment Scheduling Module allows patients to reserve unavailable patients and

notifies them when they become available. The Medical Report Generation Module generates medical reports on issued patients, overdue records, and billing collections, aiding in library management. Lastly, the system incorporates Security and Authentication measures such as encryption-based secure login and session-based access control.

Non-Functional Requirements: The system must ensure high performance by providing fast response times for patient searches and medical records. Scalability is crucial to handle an increasing number of patients efficiently. The patient interface should be intuitive and patient-friendly, ensuring ease of access. Security is a priority, with encrypted sensitive data and restricted unauthorized access. Maintainability is also important, allowing for easy updates and feature enhancements. Finally, the system must be highly reliable, ensuring uninterrupted operation without failures

5.1.2 Analyze the Current System

Existing Issues

The current manual record-keeping system is prone to errors and inconsistencies, making patient availability tracking difficult. Overdue billing calculations lack automation, leading to discrepancies. Without automated medical reporting, data analysis becomes cumbersome. Additionally, the absence of real-time notifications means that patients are not promptly informed about patient availability or overdue billings.

Gaps Identified

To improve efficiency, a centralized database is required for managing records effectively. Patient medical records should be automated to reduce manual workload. Security measures need to be enhanced to protect sensitive data. A medical reporting system is essential for tracking key performance indicators and improving decision-making.

5.2 System Design

System Design is the process of defining the architecture, modules, interfaces, and data for a system to satisfy specified requirements. It involves creating a blueprint for the Hospital Management System (HMS) that ensures efficiency, scalability, and security. The design phase transforms the functional requirements into a structured solution that dictates how the system components interact.

5.2.1 Architectural Design

The **Hospital Management System** follows a **three-tier architecture** to ensure efficient functionality:

1. **Presentation Layer:** A web-based patient interface that allows patients to interact with the system.
2. **Business Logic Layer:** Handles core functionalities such as patient medical records, patient authentication, and billing calculations.
3. **Database Layer:** Stores all essential records, including patient details, patient patient records, medical record history, and billing records.

5.2.2 User Interface Design

The patient interface (UI) is designed to be intuitive, visually appealing, and easy to navigate. The system provides different dashboards for patients based on their roles (Admin, Doctor, and Member). Key UI components include:

- **Login Page:** A secure login screen with role-based authentication.
- **Admin Dashboard:** Displays system statistics, patient management, and medical report generation options.
- **Doctor Dashboard:** Includes options for patient management, medical records, and billing tracking.
- **Member Dashboard:** Allows patients to search patients, view schedule appointmented patients, and track due dates.
- **Patient Search Interface:** A search bar with filters such as title, author, ISBN, and availability status.
- **Patient Issuance and Return Screen:** Displays patient details, patient information, and due dates.
- **Billing Payment Screen:** Provides overdue details, billing amount, and payment options.
- **Notification System:** Pop-up and email notifications for patient availability, due dates, and overdue billings.

5.2.3 Module Description

Patient Management Module

This module facilitates patient registration, login, and role-based access control. It implements authentication and authorization mechanisms to ensure secure access. Patient profiles and activity logs are maintained to track system usage. Doctors can use this module to add, modify, and remove patient records. It maintains a structured database of patients and their metadata, ensuring patients are categorized properly for easy retrieval.

Patient Search and Patient Record Module

This module enables patients to search patients using various filters such as author, genre, and publication year. It provides a detailed patient record view with patient descriptions and availability status.

Patient Issuance and Return Module

This module automates the checkout and discharge process, ensuring that patient availability updates in real-time. It keeps a medical record history for tracking schedule appointmented patients and due dates.

Billing Calculation Module

The system automatically calculates billings based on overdue days. It maintains a record of billing payments and pending dues while sending automated notifications to patients with outstanding billings.

Appointment Scheduling Module

Patients can reserve patients that are currently unavailable through this module. Notifications are sent when reserved patients become available, and a queue system manages appointment scheduling priority.

Medical Report Generation Module

This module generates medical reports on patient medical records, overdue records, and billing collections. It provides analytical insights into library usage and includes visual representations of key metrics.

5.2.4 Database Design and ER diagram

The **database design** of the Hospital Management System is structured to efficiently store and manage information related to patients, patients, medical records, appointment scheduling's, and billings. It ensures **data integrity**, **consistency**, and fast retrieval of information. The database follows a **relational model**, with multiple interconnected tables representing different entities and their relationships.

The **ER Diagram** visually represents how different entities in the system interact with each other. Below are the key entities and their relationships:

Entities and Relationships:

1. **Patient (Patient_ID, Name, Email, Gender, Phone, Email, Address, Medical History, Appointment History, Blood Group, DOB)** – A patient can schedule appointment for treatment.
2. **Appointment (Appointment_ID, status, date, Doctor_Id, Patient_Id,)**
3. **Billing (Bill_ID, Patient_ID, Appointment_ID, Patient Name, Total Amount)** – Tracks billings and payment status.
4. **Doctor (Doctor_ID, Specialization, Name, Availability, Phone, Email)** – check & treat the patient.
5. **Staff (Staff_Id, Name, Email, Phone, Position)** – Hospital related works like nurse.
6. **Medical Records (Doctor_ID, Patient_ID, Record_ID, Diagnosis, Prescription) –** Medical Records helps doctors to which treatment & medicine is needed.
7. **Rooms (Room_ID, Patient_ID, Room Type, Availability) –** Rooms for any patient requires operation as a treatment.
8. **Users (user_ID, Created_at, Role, Password_Hash, Name) –** Visiting user in Hospital.

The ER diagram ensures a structured relationship between books, users, and transactions, facilitating efficient data management and retrieval.

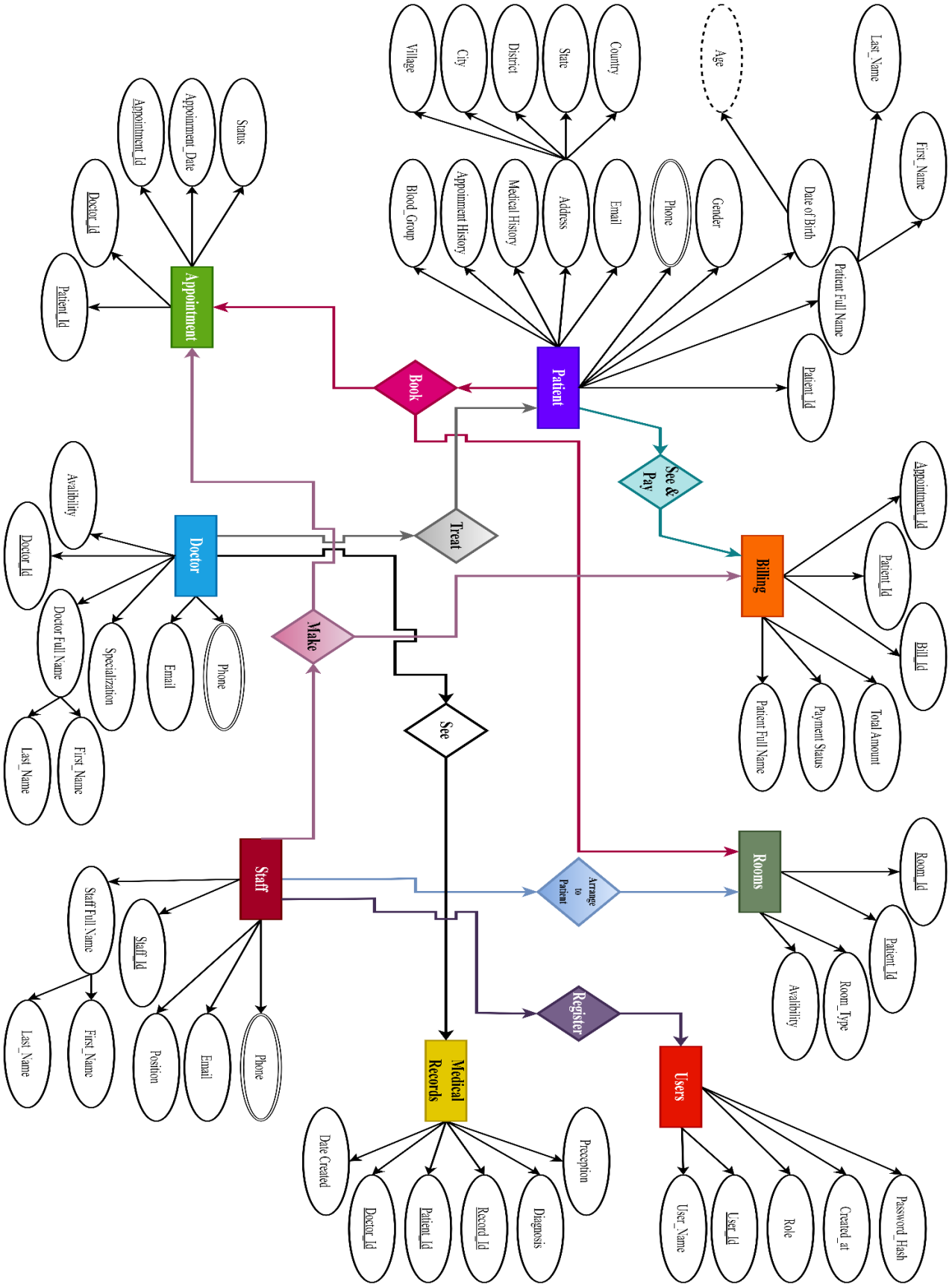

Figure 5.1 - ER Diagram for HMS