HOSPITAL MANAGEMENT SYSTEM

A PROJECT REPORT

For

Mini Project-I (ID-202B)

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Under the Supervisionof
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CERTIFICATE

Certified that Mradul Tyagi 202410116100125, Muskan Choudhary 202410116100127, Nainsi Jain 202410116100128 have carried out the project work having "Hospital Management System" (Mini Project-I, ID-202B) for Master of Computer Application from Dr.A.P.J. Abdul Kalam Technical University (AKTU) (formerly UPTU), Lucknow under my supervision. The project report embodies original work, and studies are carried out by the student himself/herself and the contents of the project report do not form the basis for the award of any other degree to the candidate or to anybody else from this or any other University/Institution.

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ABSTRACT

Our project **Hospital Management system** includes registration of patients, storing their details into the system, and also booking their appointments with doctors. Our software has the facility to give a unique id for every patient and stores the details of every patient and the staff automatically. User can search availability of a doctor and the details of a patient using the id.

The Hospital Management System can be entered using a username and password. It is accessible either by an administrator or receptionist. Only they can add data into the database. The data can be retrieved easily. The interface is very user-friendly. The data are well protected for personal use and makes the data processing very fast. It is having mainly two modules. One is at Administration Level and other one is of user I.e. of patients and doctors.

The Application maintains authentication in order to access the application. Administrator task includes managing doctors information, patient's information. To achieve this aim a database was designed one for the patient and other for the doctors which the admin can access. The complaints which are given by user will be referred by authorities. The Patient modules include checking appointments, prescription. User can also pay doctor's Fee online.

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INTRODUCTION

1.1 Project Description

The **Hospital Management System (HMS)** is a robust and comprehensive software solution designed to streamline and manage all hospital operations efficiently. Hospitals are complex organizations that deal with multiple stakeholders, including patients, doctors, nurses, administrative staff, and external agencies. Managing these operations manually often leads to inefficiencies, mismanagement of patient records, scheduling conflicts, and a lack of real-time monitoring. The HMS is designed to address these challenges by integrating multiple hospital functions into a single, unified system.

The system ensures that all patient-related data, including medical history, prescriptions, treatment records, and billing details, are securely stored and easily accessible when needed. It also automates appointment scheduling, allowing patients to book and manage their consultations seamlessly. Additionally, the system optimizes staff allocation, ensuring that doctors and nurses are efficiently assigned to patients, reducing wait times, and improving hospital workflow. The HMS includes modules for **patient management, doctor scheduling, pharmacy inventory, billing, and reporting**, making it a comprehensive solution for modern healthcare institutions.

1.2 Scope

The **Hospital Management System (HMS)** encompasses a wide range of functionalities aimed at improving the efficiency, accuracy, and accessibility of hospital services. The scope of the system extends to **patient registration, appointment scheduling, electronic medical record (EMR) management, staff allocation, billing automation, pharmacy stock control, and comprehensive reporting.** By integrating all these functions, HMS ensures seamless coordination between different hospital departments and minimizes manual errors.

One of the critical areas of scope is **real-time data access and security.** Doctors can instantly retrieve patient histories, view diagnostic results, and update treatment plans from any location,

ensuring better patient care. Additionally, the system enables hospital administrators to generate reports on patient demographics, treatment trends, financial transactions, and operational performance, helping them make informed decisions.

The HMS is designed to be **scalable** and **customizable**, allowing it to be implemented in hospitals of different sizes, from small clinics to large multi-specialty medical centers. It supports **multi-location hospitals**, ensuring data synchronization across different branches. The system also ensures compliance with **healthcare regulations such as HIPAA and GDPR**, safeguarding patient data from unauthorized access.

1.3 Objectives

- **Improve Hospital Efficiency**: The HMS automates administrative processes, reducing manual workload and human errors, which results in improved efficiency in hospital operations.
- **Enhance Patient Care**: By providing real-time access to patient records, the system ensures better decision-making by healthcare professionals.
- **Ensure Data Security**: The system implements role-based access, encryption, and compliance measures to protect sensitive patient information.
- **Reduce Paperwork**: By transitioning to a digital system, hospitals can significantly reduce paperwork, leading to better organization and resource optimization.
- **Facilitate Real-time Monitoring**: Hospital administrators can monitor operations, track patient records, and manage staff efficiently using real-time data insights.

1.4 Advantages

- **Faster Patient Record Retrieval**: Doctors can quickly access a patient's complete medical history, ensuring accurate diagnosis and treatment.
- **Reduced Workload for Staff**: Automating tasks such as appointment scheduling, billing, and inventory management minimizes the burden on hospital staff.
- **Enhanced Coordination Between Departments**: With an integrated system, all hospital departments function seamlessly, ensuring better communication and workflow.

- **Secure Data Management**: Encryption and access control measures protect patient records from unauthorized access.
- **Efficient Resource Utilization**: The system enables hospitals to allocate resources such as staff, beds, and medical equipment optimally.

1.5 Disadvantages

- **High Initial Cost**: Implementing an HMS requires a significant investment in software, hardware, and training.
- **Technical Expertise Required**: Hospitals need trained IT staff to manage and maintain the system effectively.
- **Data Security Risks**: Without proper security measures, patient data may be vulnerable to cyber threats.
- **System Downtime**: Any technical failure or system crash can disrupt hospital operations.

METHODOLOGY AND FEASIBILITY

2.1 Methodology

The development of the **Hospital Management System (HMS)** follows a structured and systematic approach to ensure efficiency, security, and scalability. The methodology is based on the **Software Development Life Cycle (SDLC)**, which includes various phases such as planning, requirement analysis, design, implementation, testing, deployment, and maintenance. The first phase involves gathering requirements from hospitals, medical professionals, and administrative staff to identify key functionalities needed in the system. Surveys and interviews are conducted to understand pain points in current hospital workflows, and a feasibility study is performed to ensure that the proposed system meets technical, operational, and economic constraints.

Once the requirements are finalized, the system architecture is designed, focusing on creating an intuitive and user-friendly interface, a robust back-end infrastructure, and a secure database to store sensitive patient information. Prototypes and wireframes are developed to visualize the user journey within the system, allowing for early feedback and necessary modifications before full-scale development begins. During the development phase, the system is implemented using programming languages such as **Python with Django for back-end processing and MySQL for database management**. Front-end development is handled using **HTML, CSS, JavaScript, and Bootstrap** to ensure a responsive and accessible interface.

Integration of various modules is performed to ensure smooth interoperability among different hospital functions such as patient registration, appointment scheduling, billing, pharmacy, and medical records management. Security features such as **role-based access control, data encryption, and secure authentication mechanisms** are integrated to ensure compliance with healthcare regulations like **HIPAA and GDPR**. Extensive testing, including **unit testing, integration testing, security testing, and user acceptance testing (UAT)**, is conducted before deployment to ensure system reliability and performance. After deployment, ongoing **maintenance and updates** are performed to address any technical issues, improve functionality, and enhance system security.

2.2 Feasibility

The feasibility of the **Hospital Management System (HMS)** is assessed based on **technical, operational, and economic factors**. **Technical feasibility** ensures that the system can be developed using the available technology stack, which includes a secure database, web-based interfaces, and scalable cloud-based deployment options. The system is designed to run on **multiple platforms**, ensuring compatibility with hospital desktops, mobile devices, and tablets, allowing seamless access for doctors, nurses, and administrative staff.

Operational feasibility evaluates how well the system can be integrated into existing hospital workflows. Since hospitals deal with large amounts of patient data, **HMS automates tasks such as patient record management, appointment scheduling, billing, and medical inventory tracking**, ensuring reduced manual workload and enhanced efficiency. Training programs for hospital staff ensure that the transition to the new system is smooth and user-friendly, with minimal disruption to existing operations.

Economic feasibility is analyzed by comparing the costs of system development, deployment, and maintenance with the benefits gained from automation, accuracy, and time efficiency. While the **initial investment may be high**, the long-term savings from **reduced paperwork, improved patient handling, and error minimization** make HMS a financially viable solution.

SOFTWARE REQUIREMENT SPECIFICATION

3.1 Product Perspective

This Hospital Patient Info Management System is a self-contained system that manages activities of the hospital. Due to improperly managed details medical center faces quite a lot of difficulties in accessing past data as well as managing present data. The fully functional automated hospital management system which will be developed through this project will eliminate the disadvantages caused by the manual system by improving the reliability, efficiency and performance. The usage of a database to store patient, employee, stock details etc. will accommodate easy access, retrieval, and search and manipulation of data. The access limitations provided through access privilege levels will enhance the security of the system. The system will facilitate concurrent access and convenient management of activities of the medical center.

3.1.1 System Interfaces

- ❖ **User Interfaces**
  - ▪ This section provides a detailed description of all inputs into and outputs from the system. It also gives a description of the hardware, software and communication interfaces and provides basic prototypes of the user interface.
  - ▪ The protocol used shall be HTTP.
  - ▪ The Port number used will be 80.
  - ▪ There shall be logical address of the system in IPv4 format.
- ❖ **Hardware Interfaces**
  - ▪ Laptop/Desktop PC-Purpose of this is to give information when Patients ask information about doctors, medicine available lab tests etc. To perform such Action it need very efficient computer otherwise due to that reason patients have to wait for a long time to get what they ask for.
  - ▪ Laser Printer (B/W) - This device is for printing patients' info etc.
  - ▪ Wi-Fi router - Wi-Fi router is used to for internetwork operations inside of a hospital and simply data transmission from pc's to sever.

- ❖ **Software Interfaces**

- JDK 1.8 - Java is fast, secure, and reliable. From laptops to data centers, game consoles to scientific supercomputers, cell phones to the Internet,
- Mysql server - Database connectivity and management
- OS Windows 7/8/8.1- Very user friendly and common OS
- JRE 1.8 - JAVA Runtime Environment for run Java Application and System

3.1.2 System Specifications

3.1.2.1 H/W Requirement

- Core i5 processor
- 2GB Ram.
- 20GB of hard disk space in terminal machines
- 1TB hard disk space in Server Machine

3.1.2.2 S/W Requirement

- Windows 7 or above operating system
- JRE 1.8
- Mysql server

DATABASE DESIGN

4.1 Data Flow Diagram (DFD)

A **Data Flow Diagram (DFD)** represents how data moves through the **Hospital Management System (HMS)** by illustrating the interactions between different system components and data sources. The **Level 0 DFD** provides a high-level overview of how patients, doctors, and hospital administrators interact with the system. It shows how data flows between various modules such as **patient registration, appointment booking, medical record updates, pharmacy, and billing systems**. As we break down the system further into **Level 1 and Level 2 DFDs**, more detailed steps of each process are highlighted. For example, patient registration involves data input for personal information, validation, database storage, and record retrieval for future use. Similarly, appointment booking interacts with the doctor's schedule, checking availability, confirming appointments, and sending notifications. The **DFD** is an essential design component that helps in identifying data bottlenecks, optimizing system efficiency, and ensuring seamless communication between modules.

4.1.1 DATA FLOW DIAGRAM (DFD)

CONTEXT LEVEL DIAGRAM
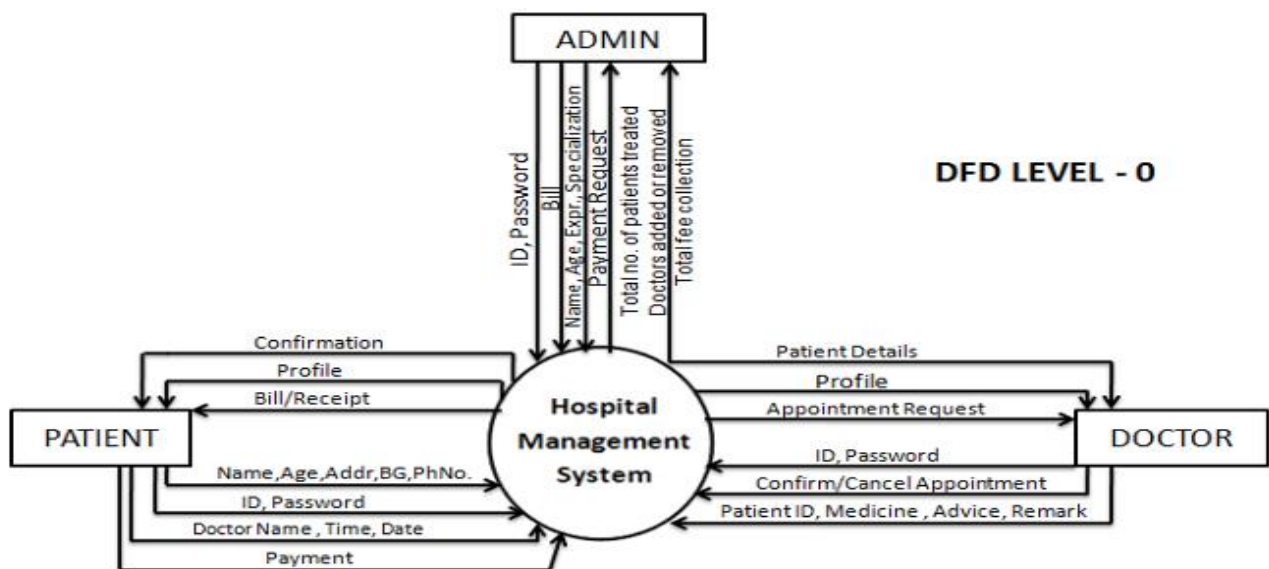
## 4.1.2 DFD LEVEL – 1

DFD Level 1
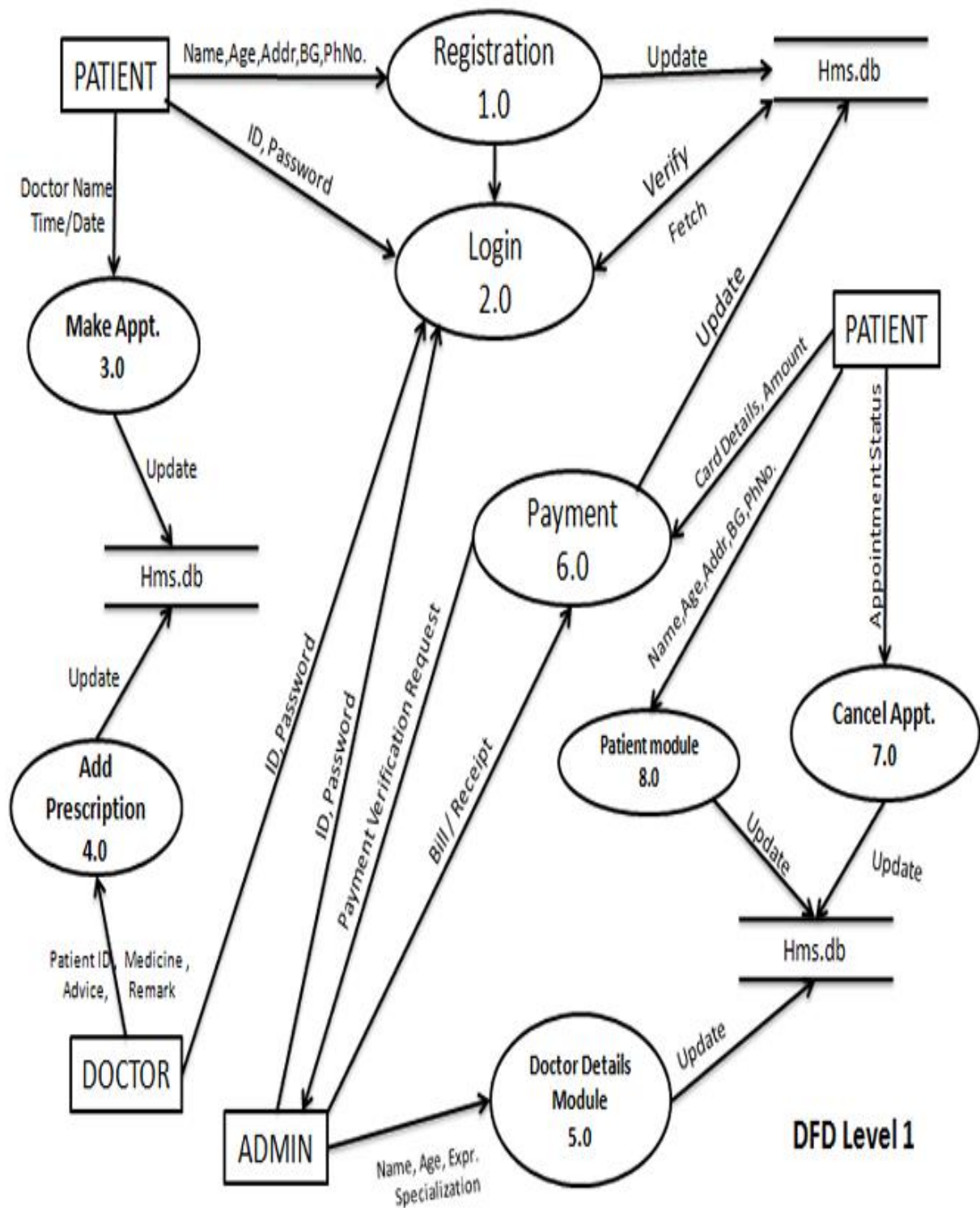
4.2 Use Case Diagram

A **Use Case Diagram** is used to depict the interaction of different user roles with the **Hospital Management System (HMS)**. The primary actors in the system include **patients, doctors, hospital staff, and administrators**, each with distinct responsibilities and access levels. **Patients** can register, book appointments, view medical history, and receive prescriptions. **Doctors** have the ability to access patient medical records, update treatment details, and provide prescriptions. **Hospital staff** members handle administrative functions such as billing, appointment confirmation, and pharmacy management, while **administrators** oversee the entire system, manage users, and generate reports.

Each use case represents a specific functionality, such as **registering a new patient, scheduling an appointment, generating a bill, or accessing medical records**. The use case diagram ensures that all user interactions are clearly mapped, preventing conflicts and redundancies. Additionally, assigning different access levels to different actors enhances data security by ensuring that only authorized personnel can access sensitive information.
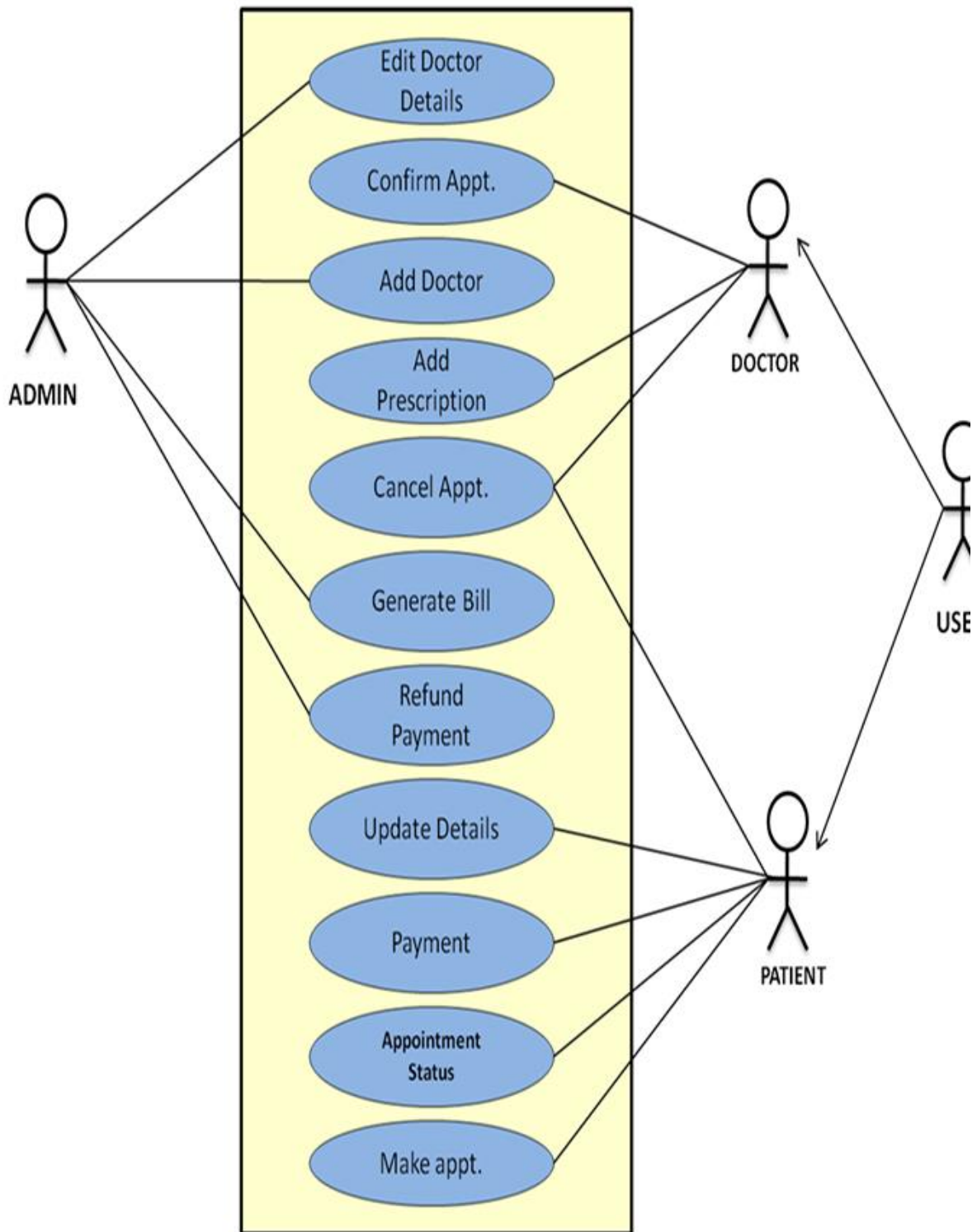
4.3 ER Diagram

The **Entity-Relationship (ER) Diagram** is crucial in defining the database structure of the **Hospital Management System (HMS)**. The key entities in the system include **Patient, Doctor, Appointment, Medical Record, Billing, and Pharmacy**. Each of these entities has multiple attributes, for example, the **Patient entity** includes details such as patient ID, name, age, gender, contact information, and medical history. Similarly, the **Doctor entity** includes doctor ID, name, specialization, and schedule.

The relationships between entities define how data flows through the system. For example, a **patient can book multiple appointments**, but each appointment is associated with only one doctor. A **doctor can have multiple patients**, and a **patient's medical record is linked to multiple visits**. The **Billing entity** connects with both the **Patient and Appointment entities**, ensuring seamless financial transactions. The **Pharmacy entity** is linked to both **Prescriptions and Patients**, allowing efficient tracking of medications provided.

The **ER Diagram** is fundamental in designing an optimized and scalable database structure that supports the real-time operations of a hospital while ensuring data integrity and security.

4.3.1 ER DIAGRAM
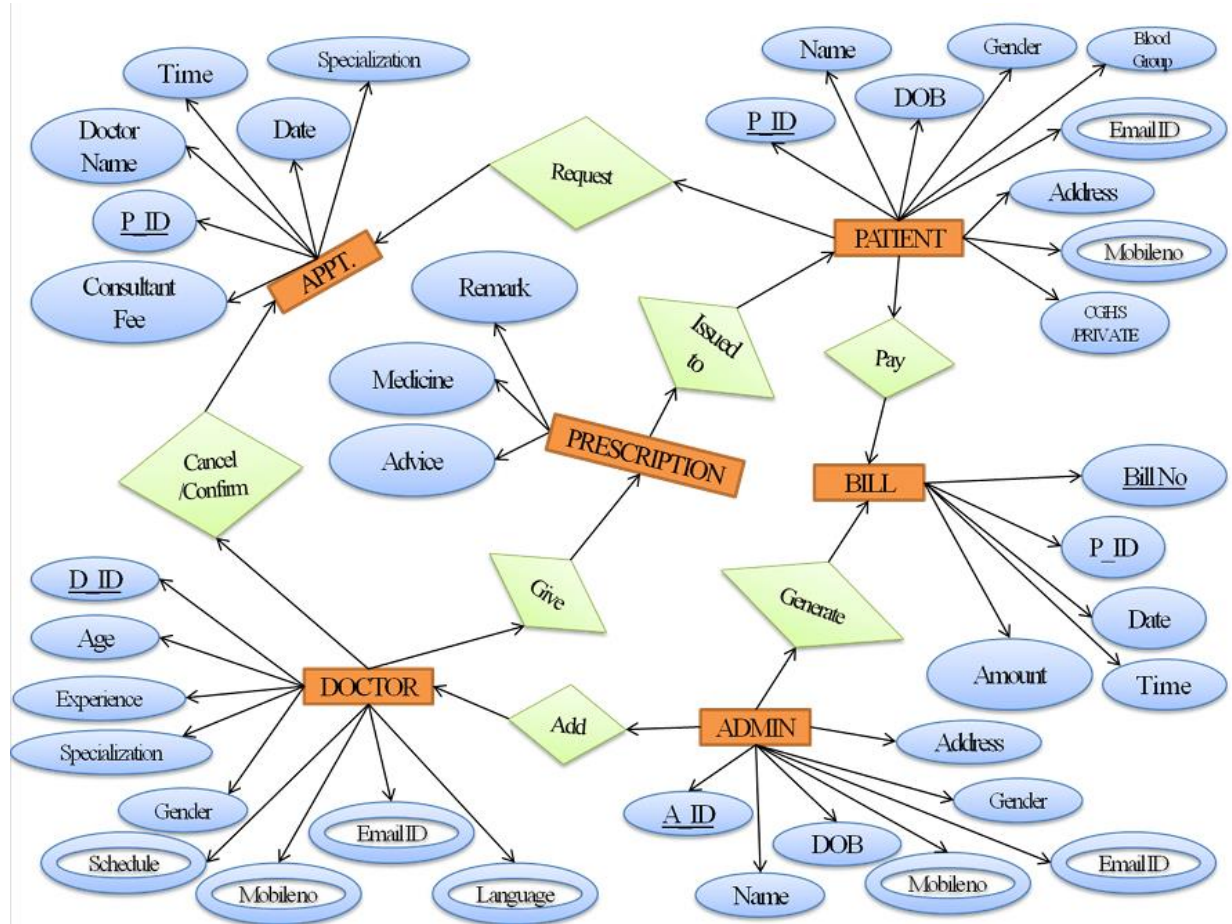
DESIGN (OUTPUT)

4.1 Login Page

The **Login Page** serves as the gateway to the **Hospital Management System (HMS)**, ensuring secure authentication for different user roles including **patients, doctors, hospital staff, and administrators**. The login interface is designed with a **simple yet secure user experience**, providing fields for **username, password, and a security authentication mechanism such as multi-factor authentication (MFA)**. Role-based access ensures that each type of user is redirected to the appropriate dashboard upon successful login. The system also incorporates **password encryption** to prevent unauthorized access and supports **account recovery options** such as email verification and OTP-based password reset functionality.

4.2 Patient Registration Page

The **Patient Registration Page** is a critical component of the system that collects and stores all essential patient information. This page includes fields for **personal details (name, age, gender, contact information), medical history, emergency contact details, and insurance provider information**. The registration system integrates with the hospital database to prevent duplicate entries and allows patients to **update their details** as needed. The form includes built-in **validation mechanisms** to ensure accurate data entry, such as checking for valid phone numbers, correct email formats, and mandatory fields. Once a patient is registered, the system generates a **unique patient ID**, which is used for future reference in **appointments, medical records, billing, and pharmacy transactions**.

4.3 Appointment Booking

The **Appointment Booking Module** is designed to simplify and streamline the scheduling of patient consultations with doctors. Patients can access this module via the hospital's online portal, where they can **select their preferred doctor, choose an available time slot, and confirm the appointment**. The system automatically checks for scheduling conflicts, preventing double-booking. Once the appointment is confirmed, both the patient and the doctor receive

automated reminders via email or SMS to reduce the likelihood of missed appointments. The system also allows **rescheduling and cancellation** in case of any changes, ensuring flexibility for both patients and doctors. Additionally, administrators can generate reports on appointment trends, helping in hospital resource allocation and workflow optimization.

CONCLUSION

The **Hospital Management System (HMS)** is a transformative solution that enhances the efficiency and effectiveness of hospital operations by integrating digital tools to automate key administrative and clinical processes. This system enables hospitals to streamline patient management, appointment scheduling, billing, and medical record handling, ensuring smooth coordination between different departments. By minimizing manual intervention and reducing paperwork, the HMS significantly improves **operational efficiency**, allowing healthcare professionals to focus more on patient care rather than administrative burdens.

A major advantage of this system is its ability to provide **real-time access to patient records**, ensuring that doctors and medical staff have the necessary information at their fingertips to make informed medical decisions. This capability not only enhances the accuracy of diagnosis and treatment but also minimizes errors that can occur due to misplaced or incomplete medical records. The **data encryption and role-based access control mechanisms** embedded in the system further ensure that sensitive patient data remains secure and compliant with **healthcare regulations** such as **HIPAA and GDPR**.

In conclusion, the **Hospital Management System (HMS) is an essential tool** for modern healthcare institutions aiming to deliver **efficient, secure, and patient-centric services**. By leveraging digital innovation, hospitals can not only enhance operational effectiveness but also create a more **seamless and responsive healthcare experience** for patients. As the demand for healthcare services continues to grow, adopting intelligent and automated hospital management solutions will become an integral part of ensuring **quality healthcare for all.**

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