Project 1 - Clinic Appointment and Treatment Management System

MedSync is a medium-scale multi-specialty clinic with branches in Colombo, Kandy, and Galle. The clinic management has been using a mixture of paper records and Excel sheets to manage patient appointments, doctor schedules, and billing. With the increasing number of patients and specialists, the management has decided to develop an integrated Clinic Appointment and Treatment Management System (CATMS) to streamline operations.

Your team has been hired to design the database for this system. The objective of the first phase is to digitise appointment booking, treatment recording, and billing processes. A UI must be built to allow the QA team to test key features, but the primary focus is on database correctness.

The system requirements are as follows:

- The clinic operates several **branches**, each with a **branch manager** and multiple **medical and non-medical staff**. Each doctor works at a specific branch but can serve in more than one specialty (e.g., General Medicine, ENT, Paediatrics).
- Patients can be registered at any branch, and their **patient record** should be accessible across branches. Records include personal details, emergency contact, and health insurance information.
- **Appointments** are made between a patient and a doctor for a given time slot. The same doctor cannot have two overlapping appointments. Each appointment can either be **Scheduled**, **Completed**, or **Cancelled**.
- Once an appointment is marked **Completed**, a set of **treatments** and/or **consultation notes** are recorded against it. Doctors may prescribe one or more treatments from a pre-defined **treatment catalogue** (e.g., Consultation, X-Ray, ECG, Injection).
- Each treatment has a price and a service code. The **billing system** generates invoices based on the completed treatments and consultation.
- Patients may make **full or partial payments** for a bill. The system must track outstanding dues.
- The clinic also wants to support **insurance claims** for certain treatments. If a patient is insured, some treatments may be reimbursed partly or fully based on policy terms.
- The system must allow **rescheduling** of appointments and also support **emergency walk-ins**, which are appointments created directly by staff without prior booking.

The management needs the following reports from the system:

1. Branch-wise appointment summary per day (scheduled, completed, cancelled)
2. Doctor-wise revenue report
3. List of patients with outstanding balances
4. Number of treatments per category over a given period
5. Insurance coverage vs. out-of-pocket payments

Task

Your task is to model the database design to encapsulate these requirements. It should consider all entities and relationships mentioned in the description. Moreover, you need to identify the places where procedures, functions, and triggers can be employed to guarantee **ACID** properties. Foreign keys and primary keys must be set to maintain consistency. Indexing should be done when necessary.

Additionally, you must gain a domain understanding by reviewing related material and take assumptions when not explicitly provided (e.g., treatment prices, insurance terms). The database must be populated with dummy data before presentation. There is no need to implement UI control to specifically input data—SQL queries can be used to manually input the dummy data.