Backend System Design Assignment – Mini Appointment Booking System

🎯 Objective

Design a scalable backend system for booking doctor appointments at multiple clinics. Focus on backend architecture, data modeling, and scalability. You are expected to propose a clean and extensible design, keeping in mind real-world constraints.

💼 Business Scenario

You're building the backend of a platform where:
- Each clinic has multiple doctors.
- Each doctor can define available time slots.
- A patient can search and book an available slot.
- Each slot must be booked by only one patient.
- New clinics and doctors can be added dynamically.

You do not need to implement authentication, front-end, or third-party integrations.

🔍 Your Tasks

1. Entity Design & Data Modeling (30–45 mins)

Identify and define key entities: e.g., Clinic, Doctor, Patient, Schedule, Appointment. Design a relational database schema with appropriate relationships, constraints, and indexes.

2. System Architecture (60–75 mins)

Present a high-level architecture showing different backend layers:
- API Layer (REST/gRPC)
- Service Layer (e.g., Booking Service)
- Data Layer (DB + optional cache)
- Background workers (optional)

Provide a diagram or flow showing the booking operation.
Describe how you prevent double bookings and ensure data consistency.

3. Scalability & Extensibility (30–40 mins)

Propose how the system could scale:
- Support thousands of users and clinics
- Use caching, queues, replication, or load balancers

Describe how the system could later support features like:
- SMS/Email reminders
- Online consultations
- Payment integration

✅ Submission Guidelines

- Submit a PDF or Markdown document.
- Diagrams can be hand-drawn or digital.
- Clearly label each section.
- Focus on clarity over code.

🔍 Evaluation Focus

- Data Modeling
- System Design
- Scalability Strategy
- Extensibility
- Communication Clarity