Airline Reservation – A Case Study

To ensure efficient and secure management of both domestic and international travel, a major airline company is implementing a robust Airline Reservation and Management System. Central to the system is the Flight entity, each uniquely identified by a flight number and linked to a scheduled route between two Airports—one serving as the point of departure and the other as the destination. These airports, each represented by a unique code, also carry essential information such as name, city, and country, enabling precise logistical operations.

Each Flight is operated using a designated Aircraft, described by its model, manufacturer, and passenger capacity, and identified by an aircraft ID. Over time, a single aircraft may be assigned to multiple flights. The time-specific aspects of a flight—such as departure and arrival times, duration, and days of operation—are captured using a related Flight Schedule, which allows flexible management of recurring or seasonal travel without changing the flight itself.

Managing both in-flight and ground operations involves coordination among airline staff, all of whom are modeled under a unified Employee entity. Each employee is given a unique ID and described by their name, designation, and hire date. Staff members such as pilots, co-pilots, and cabin crew are assigned to different flights through a many-to-many relationship, enabling efficient crew management across routes.

On the customer-facing side, individuals register as Passengers, providing key details such as nationality, contact information, and passport number. Each registered passenger is issued a unique ID, and optional loyalty features such as frequent flyer numbers and reward points are tracked. A passenger can book one or more Tickets, each tied to a specific flight and containing information like booking date, travel date, selected class, and booking status.

Seating is handled using a separate Seat entity, which defines the physical seat layout of each aircraft, including attributes such as seat number, class (Economy, Business), and position (Window, Aisle, or Middle). When a passenger books a ticket for a particular flight, a specific seat from the aircraft assigned to that flight is allocated to them, ensuring no duplication or mismatch in seat assignments.

Every confirmed ticket also generates a corresponding Payment, modeled as a one-to-one relationship. Each payment has a unique transaction ID, amount paid,

mode of payment (like UPI or credit card), status, and timestamp, ensuring traceability and compliance with financial protocols.

Together, these interconnected entities—and the structured relationships among them—form a scalable and modular system that supports operational efficiency and high-quality passenger service, while offering space for future extensions such as real-time flight updates, meal preferences, and dynamic pricing.

Your tasks are the following:

- Draw a complete and labelled **ER diagram**:
    - Include all entities, relationships, and attributes.
    - Use standard notation for entities and attributes.
    - Show cardinalities and participation in relationships.

- Translate the ER diagram **into a relational schema**.