Database Management System (IT214)

Group:5

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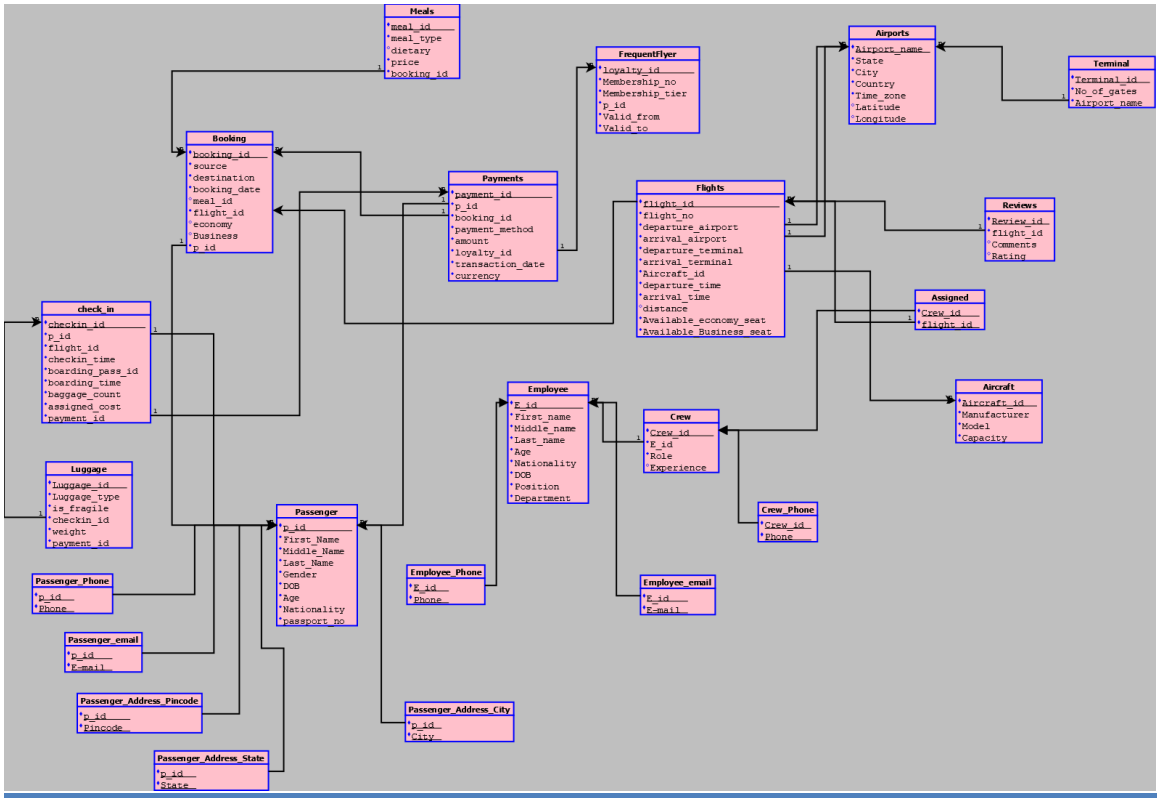
Relational Schema



Final Minimal Functional Dependencies (FDs)

✈ Passenger-Related

- p_id → First_Name
- p_id → Middle_Name
- p_id → Last_Name
- p_id → Pincode
- p_id → City
- p_id → State
- p_id → Gender
- p_id → DOB
- p_id → Age
- p_id → Nationality
- p_id → Phone
- p_id → passport_no
- p_id → E-mail
- p_id → loyalty_id

- loyalty_id → Membership_no
- loyalty_id → Membership_tier
- loyalty_id → Valid_from
- loyalty_id → Valid_to

🧳 Booking & Check-in

- booking_id → source
- booking_id → destination
- booking_id → booking_date
- booking_id → meal_id
- booking_id → flight_id
- booking_id → economy

- booking_id → Business
- booking_id → p_id

- checkin_id → payment_id
- checkin_id → checkin_time
- checkin_id → boarding_pass_id
- checkin_id → boarding_time
- checkin_id → baggage_count
- checkin_id → assigned_cost

- Luggage_id → Luggage_type
- Luggage_id → is_fragile
- Luggage_id → checkin_id
- Luggage_id → weight
- Luggage_id → payment_id

Meals

- meal_id → meal_type
- meal_id → dietary
- meal_id → price

Payments

- payment_id → booking_id
- payment_id → payment_method
- payment_id → amount
- payment_id → loyalty_id
- payment_id → transaction_date
- payment_id → currency

Flights

- flight_id → flight_no
- flight_id → departure_airport
- flight_id → arrival_airport
- flight_id → departure_terminal
- flight_id → arrival_terminal
- flight_id → Aircraft_id
- flight_id → departure_time
- flight_id → arrival_time
- flight_id → distance
- flight_id → Available_economy_seat
- flight_id → Available_Business_seat

Airports & Terminals

- Airport_name → State
- Airport_name → City
- Airport_name → Country
- Airport_name → Time zone
- Airport_name → Latitude
- Airport_name → Longitude

- Terminal_id → No_of_gates
- Terminal_id → Airport_name

Aircraft

- Aircraft_id → Manufacturer
- Aircraft_id → Model
- Aircraft_id → Capacity

Employee & Crew

- E_id → First_name
- E_id → Middle_name
- E_id → Last_name
- E_id → Age
- E_id → Nationality
- E_id → DOB
- E_id → Phone
- E_id → E-mail
- E_id → Position
- E_id → Department

- Crew_id → E_id
- Crew_id → Phone
- Crew_id → Role
- Crew_id → Experience

Review

- Review_id → flight_id
- Review_id → Comments
- Review_id → Rating

Normalization to BCNF

Passenger

- The primary key is p_id (Passenger ID).
- All attributes — first name, middle name, last name, pincode, city, state, gender, DOB, age, nationality, phone number, passport number, email, and loyalty ID — depend only on p_id.
- That means p_id uniquely identifies every other attribute in the relation.
- There are no partial or transitive dependencies.
- Hence, the Passenger table is in BCNF.

Loyalty

- The primary key is loyalty_id.
- Attributes such as membership number, tier, valid from, and valid to dates depend only on loyalty_id.
- loyalty_id uniquely identifies each loyalty record.
- Therefore, this table satisfies BCNF.

Booking

- The key is booking_id.
- Attributes like source, destination, booking date, meal ID, flight ID, economy, business, and passenger ID depend entirely on booking_id.
- There are no non-key attributes that depend on anything other than the full primary key.
- So, the Booking table is in BCNF.

Check-in

- The key is checkin_id.
- Attributes such as payment ID, check-in time, boarding pass ID, boarding time, baggage count, and assigned cost are functionally dependent only on checkin_id.
- No partial or transitive dependency exists.
- Thus, the Check-in table is in BCNF.

Luggage

- The primary key is Luggage_id.
- Attributes like luggage type, fragility status, related check-in ID, weight, and payment ID all depend only on Luggage_id.
- Each luggage item is uniquely identifiable, and no other attribute has independent dependencies.
- So, the Luggage table is in BCNF.

Meals

- The key is meal_id.
- Attributes like meal type, dietary information, and price all depend directly on meal_id.
- Since meal_id is the only determinant and there are no transitive dependencies, this relation is in BCNF.
- Therefore, the Meals table is in BCNF.

Payments

- The key is payment_id.
- Other attributes such as booking ID, payment method, amount, loyalty ID, transaction date, and currency all depend on payment_id only.
- No attribute depends on any other non-key attribute.
- Hence, Payments is in BCNF.

Flights

- The primary key is flight_id.
- All other attributes — flight number, departure and arrival airports, terminals, aircraft ID, times, distance, and available seats — are functionally dependent on flight_id.
- The key determines the entire row.
- So, the Flights table is in BCNF.

Airports

- The primary key is Airport_name.
- Attributes like state, city, country, time zone, latitude, and longitude are uniquely determined by Airport_name.

- No non-prime attribute depends on another non-key attribute.
- Hence, the Airports table is in BCNF.

Terminals

- The key is Terminal_id.
- Terminal_id determines number of gates and which airport it belongs to.
- All attributes are fully functionally dependent on the key.
- Therefore, Terminals is in BCNF.

Aircraft

- The key is Aircraft_id.
- It determines manufacturer, model, and capacity of the aircraft.
- There are no other dependencies outside of this.
- So, Aircraft table is in BCNF.

Employee

- The key is E_id.
- From this ID, we can determine first name, middle name, last name, age, nationality, DOB, phone number, email, position, and department.
- All attributes are dependent only on E_id.
- Thus, Employee is in BCNF.

Crew

- The key is Crew_id.
- This determines which employee it refers to (E_id), their role, experience, and phone.
- No other functional dependencies exist.
- So, the Crew table is in BCNF.

Review

- The key is Review_id.
- It determines the flight being reviewed, the comments, and the rating given by the passenger.
- Every attribute is dependent on Review_id only.
- Hence, Review is in BCNF.

Conclusion

- In each and every relation above:
  - The left-hand side of each functional dependency is a superkey.
  - There are no partial dependencies, and no transitive dependencies.
- Therefore, every table is in Boyce-Codd Normal Form (BCNF).

Since all relations in the database are in BCNF, the entire database is in BCNF.