

Initial Tables and Attributes for ER Diagram

1. Airplane_type:

- Airplane_ID
- Passenger_Capacity
- Weight
- Manufacturer

2. Flight:

- Flight_ID
- Flight_Number
- Departure_Time
- Arrival_Time
- Flight_Date
- Airplane_ID
- Route_ID

3. Route:

- Route_ID
- Origin_Airport_Code
- Destination_Airport_Code
- Distance
- Duration

4. Airport:

- Airport_Code
- Airport_Name
- City
- Country
- State

5. Employee:

- Employee_ID
- Employee_Name
- Airline
- Contact_Number
- Email_Address

6. Passengers:

- Passenger_ID
- Passenger_Name
- Age
- Gender
- Address
- Contact_Number
- Email

7. Booking:

- Booking_ID

- Booking_Status
- Seat_Number
- Class
- Transaction_ID
- Flight_ID
- Passenger_ID

8. Transactions:

- Transaction_ID
- Booking_Date
- Payment_Method
- Payment_Status
- Amount
- Passenger_ID

9. AirFare:

- Fare_ID
- Base_Amount
- Tax_Amount
- Discount
- Class
- Flight_ID

10. Flight_Status:

- Status_ID

- Flight_ID
- Status
- Status_Update_Time
- Delay_Reason

Normalization Steps

First Normal Form (1NF)

Ensuring all tables have atomic values and primary keys:

1. Airplane_type Table:

- Airplane_ID (PK)
- Passenger_Capacity
- Weight
- Manufacturer

2. Route Table:

- Route_ID (PK)
- Origin_Airport_Code
- Destination_Airport_Code
- Distance
- Duration

3. Airport Table:

- Airport_Code (PK)

- Airport_Name
- City
- Country
- State

4. Flight Table:

- Flight_ID (PK)
- Flight_Number
- Departure_Time
- Arrival_Time
- Flight_Date
- Airplane_ID (FK)
- Route_ID (FK)

5. Employee Table:

- Employee_ID (PK)
- Employee_Name
- Airline
- Contact_Number
- Email_Address

6. Passengers Table:

- Passenger_ID (PK)
- Passenger_Name
- Age

- Gender
- Address
- Contact_Number
- Email

7. Booking Table:

- Booking_ID (PK)
- Booking_Status
- Seat_Number
- Class
- Transaction_ID (FK)
- Flight_ID (FK)
- Passenger_ID (FK)

8. Transactions Table:

- Transaction_ID (PK)
- Booking_Date
- Payment_Method
- Payment_Status
- Amount
- Passenger_ID (FK)

9. AirFare Table:

- Fare_ID (PK)
- Base_Amount

- Tax_Amount
- Discount
- Class
- Flight_ID (FK)

10. Flight_Status Table:

- Status_ID (PK)
- Flight_ID (FK)
- Status
- Status_Update_Time
- Delay_Reason

Second Normal Form (2NF)

Removing partial dependencies:

1. Airplane_type Table (already in 2NF):

- Airplane_ID (PK)
- Passenger_Capacity
- Weight
- Manufacturer

2. Route Table (already in 2NF):

- Route_ID (PK)
- Origin_Airport_Code
- Destination_Airport_Code

- Distance
- Duration

3. **Airport Table** (already in 2NF):

- Airport_Code (PK)
- Airport_Name
- City
- Country
- State

4. **Flight Table** (already in 2NF):

- Flight_ID (PK)
- Flight_Number
- Departure_Time
- Arrival_Time
- Flight_Date
- Airplane_ID (FK)
- Route_ID (FK)

5. **Employee Table** (already in 2NF):

- Employee_ID (PK)
- Employee_Name
- Airline
- Contact_Number
- Email_Address

6. **Passengers Table** (already in 2NF):

- Passenger_ID (PK)
- Passenger_Name
- Age
- Gender
- Address
- Contact_Number
- Email

7. **Booking Table** (already in 2NF):

- Booking_ID (PK)
- Booking_Status
- Seat_Number
- Class
- Transaction_ID (FK)
- Flight_ID (FK)
- Passenger_ID (FK)

8. **Transactions Table** (already in 2NF):

- Transaction_ID (PK)
- Booking_Date
- Payment_Method
- Payment_Status
- Amount

- Passenger_ID (FK)

9. **AirFare Table:**

- Fare_ID (PK)
- Base_Amount
- Tax_Amount
- Discount
- Flight_ID (FK)
- Class

10. **Flight_Status Table** (already in 2NF):

- Status_ID (PK)
- Flight_ID (FK)
- Status
- Status_Update_Time
- Delay_Reason

Third Normal Form (3NF)

Removing transitive dependencies:

1. **Airplane_type Table** (already in 3NF):

- Airplane_ID (PK)
- Passenger_Capacity
- Weight
- Manufacturer

2. **Route Table** (already in 3NF):

- Route_ID (PK)
- Origin_Airport_Code (FK)
- Destination_Airport_Code (FK)
- Distance
- Duration

3. **Airport Table** (already in 3NF):

- Airport_Code (PK)
- Airport_Name
- City
- Country
- State

4. **Flight Table** (already in 3NF):

- Flight_ID (PK)
- Flight_Number
- Departure_Time
- Arrival_Time
- Flight_Date
- Airplane_ID (FK)
- Route_ID (FK)

5. **Employee Table** (already in 3NF):

- Employee_ID (PK)

- Employee_Name
- Airline
- Contact_Number
- Email_Address

6. **Passengers Table** (already in 3NF):

- Passenger_ID (PK)
- Passenger_Name
- Age
- Gender
- Address
- Contact_Number
- Email

7. **Booking Table** (already in 3NF):

- Booking_ID (PK)
- Booking_Status
- Seat_Number
- Class
- Transaction_ID (FK)
- Flight_ID (FK)
- Passenger_ID (FK)

8. **Transactions Table** (already in 3NF):

- Transaction_ID (PK)

- Booking_Date
- Payment_Method
- Payment_Status
- Amount
- Passenger_ID (FK)

9. **Fare_Class Table** (new table):

- Class_ID (PK)
- Class_Name (economy, business, first)
- Description

10. **AirFare Table** (modified):

- Fare_ID (PK)
- Base_Amount
- Tax_Amount
- Discount
- Flight_ID (FK)
- Class_ID (FK)

11. **Flight_Status Table** (already in 3NF):

- Status_ID (PK)
- Flight_ID (FK)
- Status
- Status_Update_Time
- Delay_Reason

Final Normalized Tables

After completing the normalization process, here are the final tables:

1. **Airplane_type Table:**

- Airplane_ID (PK)
- Passenger_Capacity
- Weight
- Manufacturer

2. **Airport Table:**

- Airport_Code (PK)
- Airport_Name
- City
- Country
- State

3. **Route Table:**

- Route_ID (PK)
- Origin_Airport_Code (FK)
- Destination_Airport_Code (FK)
- Distance
- Duration

4. **Flight Table:**

- Flight_ID (PK)
- Flight_Number

- Departure_Time
- Arrival_Time
- Flight_Date
- Airplane_ID (FK)
- Route_ID (FK)

5. Flight_Status Table:

- Status_ID (PK)
- Flight_ID (FK)
- Status
- Status_Update_Time
- Delay_Reason

6. Employee Table:

- Employee_ID (PK)
- Employee_Name
- Airline
- Contact_Number
- Email_Address

7. Passengers Table:

- Passenger_ID (PK)
- Passenger_Name
- Age
- Gender

- Address
- Contact_Number
- Email

8. Fare_Class Table:

- Class_ID (PK)
- Class_Name
- Description

9. AirFare Table:

- Fare_ID (PK)
- Base_Amount
- Tax_Amount
- Discount
- Flight_ID (FK)
- Class_ID (FK)

10. Transactions Table:

- Transaction_ID (PK)
- Booking_Date
- Payment_Method
- Payment_Status
- Amount
- Passenger_ID (FK)

11. Booking Table:

- Booking_ID (PK)
- Booking_Status
- Seat_Number
- Class_ID (FK)
- Transaction_ID (FK)
- Flight_ID (FK)
- Passenger_ID (FK)

These 11 normalized tables properly represent the airline management system while maintaining data integrity and minimizing redundancy. Each table has a clear purpose and well-defined relationships with other tables.