Initial Tables and Attributes for ER Diagram

1. Airplane_type:

- o Airplane_ID
- Passenger_Capacity
- Weight
- Manufacturer

2. Flight:

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

3. Route:

- o Route_ID
- o Origin_Airport_Code
- o Destination_Airport_Code
- o Distance
- Duration

4. Airport:

- o Airport_Code
- o Airport_Name
- o City
- o Country
- o State

5. **Employee**:

- o Employee_ID
- o Employee_Name
- o Airline
- Contact_Number
- o Email_Address

6. Passengers:

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

7. Booking:

o Booking_ID

- Booking_StatusSeat_NumberClass
- o Transaction_ID
- Flight_ID
- o Passenger_ID

8. Transactions:

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

9. AirFare:

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

10. Flight_Status:

o Status_ID

- o Flight_ID
- o 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)
 - o Origin_Airport_Code
 - o Destination_Airport_Code
 - Distance
 - o Duration
- 3. Airport Table:
 - Airport_Code (PK)

- Airport_NameCityCountry
- State

4. Flight Table:

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

5. **Employee Table**:

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

6. Passengers Table:

- o Passenger_ID (PK)
- o Passenger_Name
- o Age

- o Gender
- o Address
- Contact_Number
- o Email

7. Booking Table:

- Booking_ID (PK)
- o Booking_Status
- o Seat_Number
- o 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)
- o Status
- o 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)
 - o Origin_Airport_Code
 - Destination_Airport_Code

	0	Distance
	0	Duration
3.	Airpoi	rt Table (already in 2NF):
	0	Airport_Code (PK)
	0	Airport_Name
	0	City
	0	Country
	0	State
4.	Flight	Table (already in 2NF):
	0	Flight_ID (PK)
	0	Flight_Number
	0	Departure_Time
	0	Arrival_Time
	0	Flight_Date
	0	Airplane_ID (FK)
	0	Route_ID (FK)
5.	Emplo	byee Table (already in 2NF):
	0	Employee_ID (PK)
	0	Employee_Name
	0	Airline
	0	Contact_Number
	0	Email_Address

6. Passengers Table (already in 2NF):Passenger_ID (PK)Passenger_Name

- o Age
- o Gender
- o Address
- Contact_Number
- o Email

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

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

8. Transactions Table (already in 2NF):

- Transaction_ID (PK)
- Booking_Date
- Payment_Method
- o 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):
 - o Status_ID (PK)
 - Flight_ID (FK)
 - Status
 - Status_Update_Time
 - o 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):		
	0	Route_ID (PK)	
	0	Origin_Airport_Code (FK)	
	0	Destination_Airport_Code (FK)	
	0	Distance	
	0	Duration	
3.	Airport Table (already in 3NF):		
	0	Airport_Code (PK)	
	0	Airport_Name	
	0	City	
	0	Country	
	0	State	
4.	Flight Table (already in 3NF):		
	0	Flight_ID (PK)	
	0	Flight_Number	
	0	Departure_Time	
	0	Arrival_Time	
	0	Flight_Date	
	0	Airplane_ID (FK)	
	0	Route_ID (FK)	
5.	Emplo	yee Table (already in 3NF):	
	0	Employee_ID (PK)	

6.	Passe	ngers Table (already in 3NF):	
	0	Passenger_ID (PK)	
	0	Passenger_Name	
	0	Age	
	0	Gender	
	0	Address	
	0	Contact_Number	
	0	Email	
7.	Booki	ng Table (already in 3NF):	
	0	Booking_ID (PK)	
	0	Booking_Status	
	0	Seat_Number	
	0	Class	
	0	Transaction_ID (FK)	
	0	Flight_ID (FK)	
	0	Passenger_ID (FK)	
8.	8. Transactions Table (already in 3NF):		
	0	Transaction_ID (PK)	

Employee_Name

Contact_Number

Email_Address

Airline

0	Booking_Date			
0	Payment_Method			
0	Payment_Status			
0	Amount			
0	Passenger_ID (FK)			
9. Fare_	Class Table (new table):			
0	Class_ID (PK)			
0	Class_Name (economy, business, first)			
0	Description			
10. AirFare Table (modified):				
0	Fare_ID (PK)			
0	Base_Amount			
0	Tax_Amount			
0	Discount			
0	Flight_ID (FK)			
0	Class_ID (FK)			
11. Flight_Status Table (already in 3NF):				
0	Status_ID (PK)			
0	Flight_ID (FK)			
0	Status			
0	Status_Update_Time			
0	Delay_Reason			

Final Normalized Tables

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

- Airplane_ID (PK)
- Passenger_Capacity
- Weight
- Manufacturer

2. Airport Table:

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

3. Route Table:

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

4. Flight Table:

- o Flight_ID (PK)
- Flight_Number

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

5. Flight_Status Table:

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

6. **Employee Table**:

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

7. Passengers Table:

- Passenger_ID (PK)
- Passenger_Name
- o Age
- o Gender

- o Address
- o Contact_Number
- o Email

8. Fare_Class Table:

- Class_ID (PK)
- Class_Name
- Description

9. AirFare Table:

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

10. Transactions Table:

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

11. Booking Table:

- Booking_ID (PK)
- o Booking_Status
- Seat_Number
- Class_ID (FK)
- Transaction_ID (FK)
- o 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.