UNIVERSITY OF ASIA PACIFIC

Department of Computer Science & Engineering

Course Code: CSE 212
Course Title: Database Systems Lab

Project Title:

Airline Ticketing Management System

Submitted To:

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Table of Contents

1. Introduction

1.1 Objective

The objective of this project is to design and implement a Ticketing Management System for Airplane that efficiently manages and organizes data related to airline operations, including customers, bookings, tickets, payments, flights, airplanes, and airports. This system aims to simplify the airline booking process and provide a reliable and scalable solution to handle various operations in industries related to aviation.

1.2 Functionalities

This system can be primarily used to:

- Track customer bookings and payment transactions.

- Provide real-time updates on ticket types, prices, seat numbers, and ticket status

- Track flight schedules, flight status and availability.

- Track airport and airplane information for efficient scheduling.

1.3 Target Users

- Airline staff to manage flights, bookings, and payments.

- Customers to make bookings and retrieve ticket information.
- Travel agencies that help customers book airplane tickets.

2. Database Design

2.1 Entities

1. **Customer**: Contains customer details such as name, contact information, and nationality.
2. **Booking**: Tracks the bookings made by customers for flights.
3. **Ticket**: Stores ticket details issued against bookings.
4. **Payment**: Manages payment transactions associated with bookings.
5. **Airport**: Maintains details of airports such as location and airport codes.
6. **Airplane**: Tracks airplane details, including seating capacity and maintenance status.
7. **Flight**: Contains the schedule, details of departures and arrivals, and status of flights.

2.2 Attributes

Primary Key

Foreign key

Not Null

1. **Customer**: <u>Customer_ID</u>, *First_Name, Last_Name, Email, Phone_Number, Date_of_Birth, Gender, Address, Nationality* **.**

2. **Booking**: <u>Booking_ID</u>, *Customer_ID*, *Flight_ID* , *Booking_Date, Booking_Status, Total_Amount, Number_of_Tickets* .

3. **Ticket**: <u>Ticket_ID</u>, *Booking_ID*, *Ticket_Type, Seat_Number, Ticket_Price, Issuance_Date, Ticket_Status* .

4. **Payment**: <u>Payment_ID</u>, *Booking_ID*, *Payment_Method, Payment_Date, Transaction_Status* .

5. **Airport**: <u>ICAO_Code</u>, *IATA_Code, Airport_Name, Location, Country* .

6. **Airplane**: <u>Airplane_ID</u>, *Airline, Model, Seating_Capacity, Maintenance_Status* **.**

7. **Flight**: <u>Flight_ID</u>, *Flight_Number*, *Airplane_ID*, *Departure_Airport*, *Arrival_Airport*, *Departure_Time, Arrival_Time, Seats_Available, Flight_Status.*

2.3 Relationships

1. **Customer - Booking**: One-to-Many

    A customer can make multiple bookings, but each booking is associated with only one customer.

2. **Booking – Flight**: Many-to-One

    A single flight can be associated with many different bookings. However, each booking may only be made on a single flight.

3. **Booking – Payment**: One-to-One

    Each booking has one corresponding payment, and vice-versa.

4. **Booking – Ticket**: One-to-Many

    A booking can have multiple tickets, but a ticket can be associated with only a single booking.
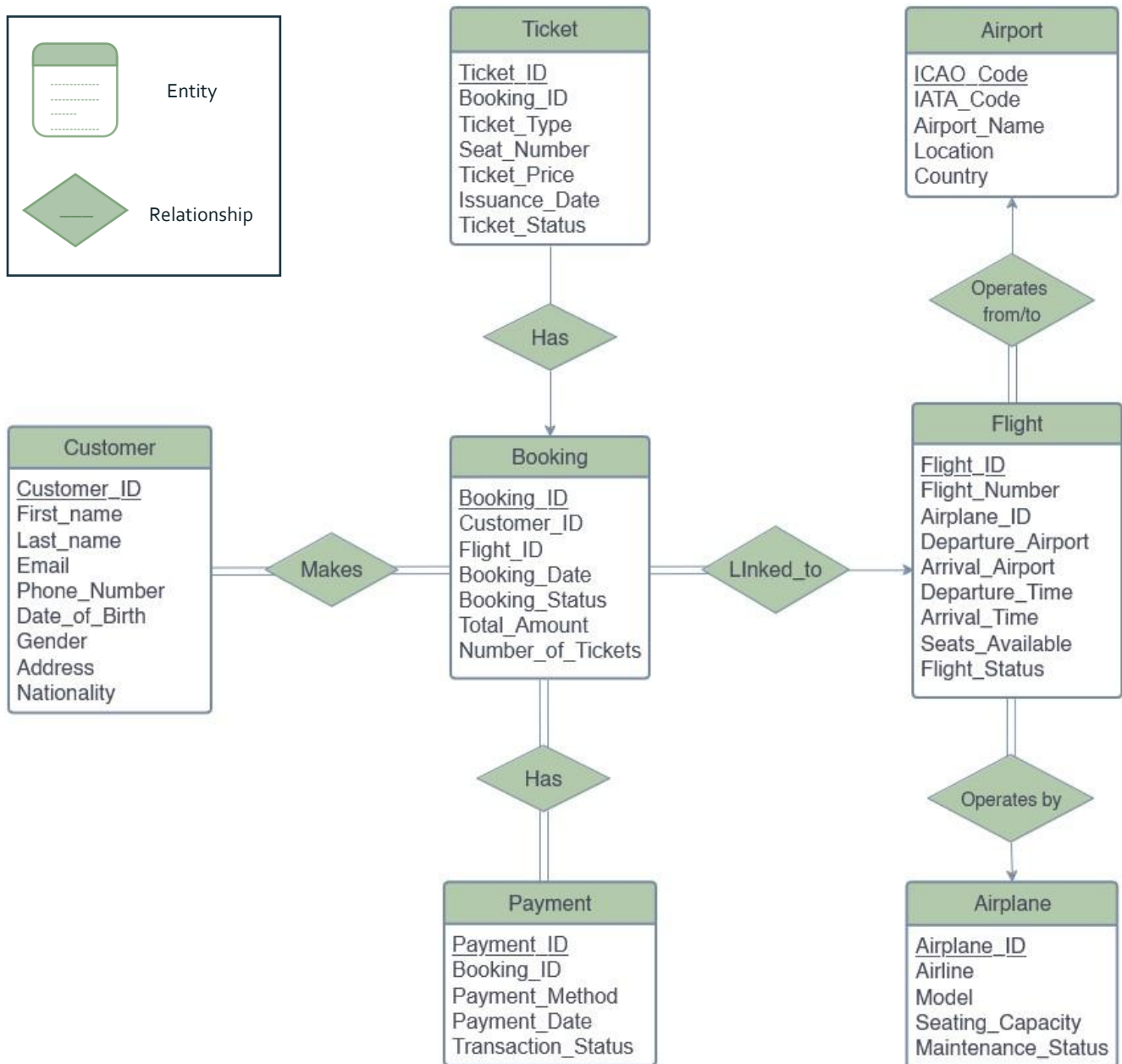
5. **Flight – Airport**: Many-to-One

    A flight departs from and arrives at a single specific airport, and an airport can be the arrival or departure destination of multiple flights.

6. **Flight – Airplane**: Many-to-One

    Each flight is operated by only one airplane, and an airplane can operate multiple flights at different times.

3. Entity-Relationship Diagram (ERD)

Legend:
- Entity
- Relationship

Ticket
- Ticket_ID
- Booking_ID
- Ticket_Type
- Seat_Number
- Ticket_Price
- Issuance_Date
- Ticket_Status

Airport
- ICAO_Code
- IATA_Code
- Airport_Name
- Location
- Country

Customer
- Customer_ID
- First_name
- Last_name
- Email
- Phone_Number
- Date_of_Birth
- Gender
- Address
- Nationality

Booking
- Booking_ID
- Customer_ID
- Flight_ID
- Booking_Date
- Booking_Status
- Total_Amount
- Number_of_Tickets

Flight
- Flight_ID
- Flight_Number
- Airplane_ID
- Departure_Airport
- Arrival_Airport
- Departure_Time
- Arrival_Time
- Seats_Available
- Flight_Status

Payment
- Payment_ID
- Booking_ID
- Payment_Method
- Payment_Date
- Transaction_Status

Airplane
- Airplane_ID
- Airline
- Model
- Seating_Capacity
- Maintenance_Status

Relationships: Has, Operates from/to, Makes, LInked_to, Has, Operates by
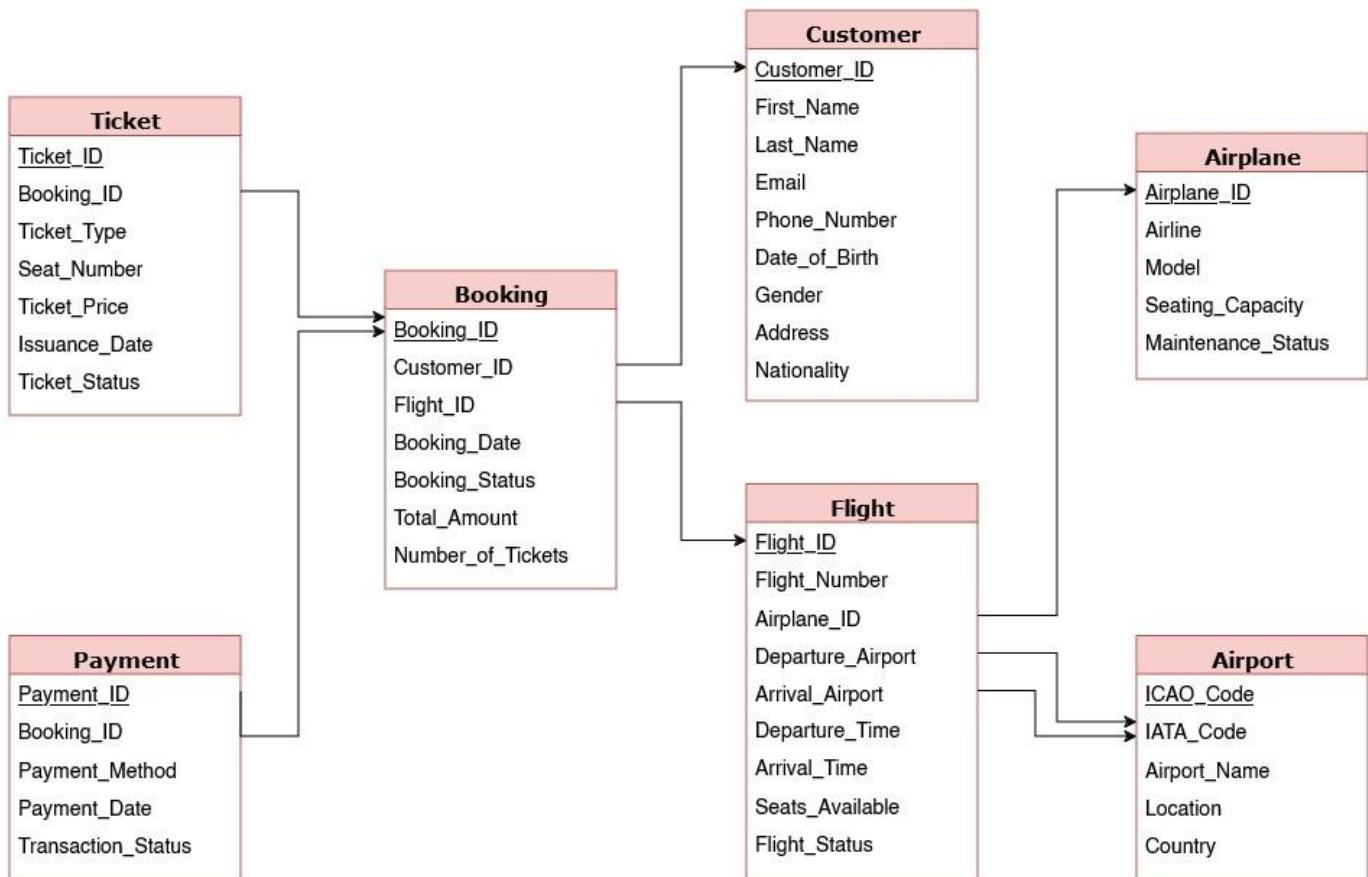
For Better View, Visit the link:

https://lucid.app/lucidchart/8e64f480-4420-4e5d-9fd7-3db665637047/edit?viewport_loc=-1487%2C-871%2C3200%2C1480%2C0_0&invitationId=inv_883aca6b-939b-46a9-9ac4-1e36e4107685

4. Schema Diagram

For Better View, Visit the link:

https://dbdiagram.io/d/68104f911ca52373f5bf67ce

5. Example Queries

5.1 -- View all data from customer table

SELECT * FROM customer;

```
+-------------+-------------+------------+--------------------+--------------+---------------+--------+------------------------+-------------+
| Customer_ID | First_Name  | Last_Name  | Email              | Phone_Number | Date_of_Birth | Gender | Address                | Nationality |
+-------------+-------------+------------+--------------------+--------------+---------------+--------+------------------------+-------------+
| CU001       | Mizan       | Hossain    | mizan@email.com    | 9876543210   | 1990-03-15    | Male   | Dhaka, Bangladesh      | Bangladeshi |
| CU002       | Nabila      | Ahmed      | nabila@email.com   | 9876500000   | 1995-08-19    | Female | Chittagong, Bangladesh | Bangladeshi |
| CU003       | Rahim       | Chowdhury  | rahim@email.com    | 9876512345   | 1987-02-28    | Male   | Sylhet, Bangladesh     | Bangladeshi |
| CU004       | Ayesha      | Sultana    | ayesha@email.com   | 9876523456   | 1992-11-10    | Female | Rajshahi, Bangladesh   | Bangladeshi |
| CU005       | Arif        | Hossain    | arif@email.com     | 9876534567   | 1991-07-22    | Male   | Barishal, Bangladesh   | Bangladeshi |
| CU006       | Farah       | Islam      | farah@email.com    | 9876545678   | 1985-05-15    | Female | Khulna, Bangladesh     | Bangladeshi |
| CU007       | Jamil       | Khan       | jamil@email.com    | 9876556789   | 1993-12-05    | Male   | Mymensingh, Bangladesh | Bangladeshi |
| CU008       | Shabana     | Begum      | shabana@email.com  | 9876567890   | 1988-04-17    | Female | Jessore, Bangladesh    | Bangladeshi |
| CU009       | Nashit      | Iqbal      | nashit@email.com   | 9876578901   | 1996-01-12    | Male   | Comilla, Bangladesh    | Bangladeshi |
| CU010       | Sultana     | Rashid     | sultana@email.com  | 9876589012   | 1994-09-25    | Female | Barisal, Bangladesh    | Bangladeshi |
| CU011       | Shamim      | Akter      | shamim@email.com   | 9876590123   | 1989-06-30    | Male   | Tangail, Bangladesh    | Bangladeshi |
| CU012       | Lina        | Jahan      | lina@email.com     | 9876601234   | 1992-12-13    | Female | Narsingdi, Bangladesh  | Bangladeshi |
| CU013       | Junaid      | Mahmud     | junaid@email.com   | 9876612345   | 1986-02-09    | Male   | Rajshahi, Bangladesh   | Bangladeshi |
| CU014       | Meher       | Jahan      | meher@email.com    | 9876623456   | 1990-08-03    | Female | Sylhet, Bangladesh     | Bangladeshi |
| CU015       | Fahim       | Rahman     | fahim@email.com    | 9876634567   | 1995-11-18    | Male   | Chittagong, Bangladesh | Bangladeshi |
| CU016       | Tania       | Banu       | tania@email.com    | 9876645678   | 1993-07-25    | Female | Dhaka, Bangladesh      | Bangladeshi |
| CU017       | Sami        | Ahmed      | sami@email.com     | 9876656789   | 1994-04-12    | Male   | Khulna, Bangladesh     | Bangladeshi |
| CU018       | Rima        | Akter      | rima@email.com     | 9876667890   | 1992-09-10    | Female | Jessore, Bangladesh    | Bangladeshi |
| CU019       | Imran       | Chowdhury  | imran@email.com    | 9876678901   | 1987-03-05    | Male   | Barisal, Bangladesh    | Bangladeshi |
| CU020       | Sadia       | Jahan      | sadia@email.com    | 9876689012   | 1995-10-30    | Female | Comilla, Bangladesh    | Bangladeshi |
| CU021       | Mushfiq     | Islam      | mushfiq@email.com  | 9876690123   | 1993-01-18    | Male   | Mymensingh, Bangladesh | Bangladeshi |
| CU022       | Rukaiya     | Begum      | rukaiya@email.com  | 9876701234   | 1990-11-07    | Female | Tangail, Bangladesh    | Bangladeshi |
| CU023       | Samir       | Rahman     | samir@email.com    | 9876712345   | 1988-04-29    | Male   | Narsingdi, Bangladesh  | Bangladeshi |
| CU024       | Farhana     | Sultana    | farhana@email.com  | 9876723456   | 1994-06-11    | Female | Dhaka, Bangladesh      | Bangladeshi |
| CU025       | Hassan      | Khan       | hassan@email.com   | 9876734567   | 1991-05-25    | Male   | Khulna, Bangladesh     | Bangladeshi |
+-------------+-------------+------------+--------------------+--------------+---------------+--------+------------------------+-------------+
```

5.2 -- show all flight from Dhaka

SELECT * FROM flight where Departure_Airport='VGEG';

```
+-----------+---------------+-------------+------------------+----------------+---------------------+---------------------+-----------------+---------------+
| Flight_ID | Flight_Number | Airplane_ID | Departure_Airport | Arrival_Airport | Departure_Time     | Arrival_Time        | Seats_Available | Flight_Status |
+-----------+---------------+-------------+------------------+----------------+---------------------+---------------------+-----------------+---------------+
| FL001     | BG101         | AP001       | VGEG             | VGHS           | 2025-05-10 08:00:00 | 2025-05-10 09:30:00 |             150 | On Time       |
| FL005     | BG105         | AP005       | VGEG             | VGBR           | 2025-05-11 09:00:00 | 2025-05-11 11:00:00 |             140 | On Time       |
+-----------+---------------+-------------+------------------+----------------+---------------------+---------------------+-----------------+---------------+
```

5.3 -- order airport by Name
SELECT * FROM airport ORDER BY Airport_Name;

```
+-----------+-----------+-------------------------------------+------------+------------+
| ICAO_Code | IATA_Code | Airport_Name                        | Location   | Country    |
+-----------+-----------+-------------------------------------+------------+------------+
| VGBR      | BZL       | Barishal International Airport       | Barishal   | Bangladesh |
| VGEG      | DAC       | Hazrat Shahjalal International Airport | Dhaka   | Bangladesh |
| VGBB      | JSR       | Osmani International Airport         | Sylhet     | Bangladesh |
| VGHS      | CGP       | Shah Amanat International Airport    | Chittagong | Bangladesh |
| VGRJ      | RJH       | Shah Makhdum International Airport   | Rajshahi   | Bangladesh |
+-----------+-----------+-------------------------------------+------------+------------+
```

5.4 -- Find airplane Seating Capacity more then 100
SELECT * FROM airplane WHERE Seating_Capacity>100;

```
+-------------+--------------------------+-------+-----------------+--------------------+
| Airplane_ID | Airline                  | Model | Seating_Capacity | Maintenance_Status |
+-------------+--------------------------+-------+-----------------+--------------------+
| AP001       | Biman Bangladesh Airlines | A320 |             150 | Operational        |
| AP002       | US-Bangla Airlines       | A321  |             180 | Operational        |
| AP005       | Regent Airways           | B737  |             140 | Operational        |
| AP006       | Biman Bangladesh Airlines | B777 |             400 | Operational        |
| AP007       | US-Bangla Airlines       | A330  |             250 | Operational        |
| AP009       | Air Astra                | A320  |             160 | Operational        |
| AP010       | Regent Airways           | B747  |             350 | Operational        |
+-------------+--------------------------+-------+-----------------+--------------------+
```

5.5 -- view name of female customer

    SELECT
        First_Name,
        Last_Name
    FROM customer
    WHERE Gender = 'Female';

```
+------------+------------+
| First_Name | Last_Name  |
+------------+------------+
| Nabila     | Ahmed      |
| Ayesha     | Sultana    |
| Farah      | Islam      |
| Shabana    | Begum      |
| Sultana    | Rashid     |
| Lina       | Jahan      |
| Meher      | Jahan      |
| Tania      | Banu       |
| Rima       | Akter      |
| Sadia      | Jahan      |
| Rukaiya    | Begum      |
| Farhana    | Sultana    |
+------------+------------+
```

5.6 -- count total male customer

    SELECT COUNT(*) AS Total_Male_Customers
    FROM customer
    WHERE Gender = 'Male';

```
+----------------------+
| Total_Male_Customers |
+----------------------+
|                   13 |
+----------------------+
```

5.7 -- names (numbers) of all flights operated by Biman Bangladesh Airlines

SELECT
  f.Flight_ID,
  f.Flight_Number,
  a.Airline
FROM flight f
JOIN airplane a ON f.Airplane_ID = a.Airplane_ID
WHERE a.Airline = 'Biman Bangladesh Airlines';

```
+-----------+---------------+----------------------------+
| Flight_ID | Flight_Number | Airline                    |
+-----------+---------------+----------------------------+
| FL001     | BG101         | Biman Bangladesh Airlines  |
| FL006     | BG106         | Biman Bangladesh Airlines  |
+-----------+---------------+----------------------------+
```

5.8 -- list customers who were born before the year 2000
SELECT
  Customer_ID,
  First_Name,
  Last_Name,
  Date_of_Birth
FROM customer
WHERE Date_of_Birth < '2000-01-01';

```
--------------+-------------+------------+----------------+
Customer_ID | First_Name | Last_Name | Date_of_Birth |
--------------+-------------+------------+----------------+
  CU001       | Mizan       | Hossain    | 1990-03-15     |
  CU002       | Nabila      | Ahmed      | 1995-08-19     |
  CU003       | Rahim       | Chowdhury  | 1987-02-28     |
  CU004       | Ayesha      | Sultana    | 1992-11-10     |
  CU005       | Arif        | Hossain    | 1991-07-22     |
  CU006       | Farah       | Islam      | 1985-05-15     |
  CU007       | Jamil       | Khan       | 1993-12-05     |
  CU008       | Shabana     | Begum      | 1988-04-17     |
  CU009       | Nashit      | Iqbal      | 1996-01-12     |
  CU010       | Sultana     | Rashid     | 1994-09-25     |
  CU011       | Shamim      | Akter      | 1989-06-30     |
  CU012       | Lina        | Jahan      | 1992-12-13     |
  CU013       | Junaid      | Mahmud     | 1986-02-09     |
  CU014       | Meher       | Jahan      | 1990-08-03     |
  CU015       | Fahim       | Rahman     | 1995-11-18     |
  CU016       | Tania       | Banu       | 1993-07-25     |
  CU017       | Sami        | Ahmed      | 1994-04-12     |
  CU018       | Rima        | Akter      | 1992-09-10     |
  CU019       | Imran       | Chowdhury  | 1987-03-05     |
  CU020       | Sadia       | Jahan      | 1995-10-30     |
  CU021       | Mushfiq     | Islam      | 1993-01-18     |
  CU022       | Rukaiya     | Begum      | 1990-11-07     |
  CU023       | Samir       | Rahman     | 1988-04-29     |
  CU024       | Farhana     | Sultana    | 1994-06-11     |
  CU025       | Hassan      | Khan       | 1991-05-25     |
--------------+-------------+------------+----------------+
```

5.9-- customer details for those traveling in Business Class

SELECT *

FROM customer

WHERE Customer_ID IN (

SELECT Customer_ID

FROM booking

WHERE Booking_ID IN (

SELECT Booking_ID

FROM ticket

WHERE Ticket_Type = 'Business'

)

);

```
+------------+------------+-----------+---------------------+--------------+---------------+--------+------------------------+-------------+
| Customer_ID | First_Name | Last_Name | Email               | Phone_Number | Date_of_Birth | Gender | Address                | Nationality |
+------------+------------+-----------+---------------------+--------------+---------------+--------+------------------------+-------------+
| CU002      | Nabila     | Ahmed     | nabila@email.com    | 9876500000   | 1995-08-19    | Female | Chittagong, Bangladesh | Bangladeshi |
| CU004      | Ayesha     | Sultana   | ayesha@email.com    | 9876523456   | 1992-11-10    | Female | Rajshahi, Bangladesh   | Bangladeshi |
| CU006      | Farah      | Islam     | farah@email.com     | 9876545678   | 1985-05-15    | Female | Khulna, Bangladesh     | Bangladeshi |
| CU011      | Shamim     | Akter     | shamim@email.com    | 9876590123   | 1989-06-30    | Male   | Tangail, Bangladesh    | Bangladeshi |
| CU014      | Meher      | Jahan     | meher@email.com     | 9876623456   | 1990-08-03    | Female | Sylhet, Bangladesh     | Bangladeshi |
| CU018      | Rima       | Akter     | rima@email.com      | 9876667890   | 1992-09-10    | Female | Jessore, Bangladesh    | Bangladeshi |
| CU021      | Mushfiq    | Islam     | mushfiq@email.com   | 9876690123   | 1993-01-18    | Male   | Mymensingh, Bangladesh | Bangladeshi |
| CU024      | Farhana    | Sultana   | farhana@email.com   | 9876723456   | 1994-06-11    | Female | Dhaka, Bangladesh      | Bangladeshi |
+------------+------------+-----------+---------------------+--------------+---------------+--------+------------------------+-------------+
```

5.10-- buy more then 2 ticket

SELECT
   c.Customer_ID,
   c.First_Name,
   c.Last_Name,
   SUM(b.Number_of_Tickets) AS Total_Tickets
FROM customer c
JOIN booking b ON c.Customer_ID = b.Customer_ID
GROUP BY c.Customer_ID, c.First_Name, c.Last_Name
HAVING SUM(b.Number_of_Tickets) > 2;

```
+-------------+------------+-----------+---------------+
| Customer_ID | First_Name | Last_Name | Total_Tickets |
+-------------+------------+-----------+---------------+
| CU004       | Ayesha     | Sultana   |             3 |
| CU014       | Meher      | Jahan     |             3 |
| CU024       | Farhana    | Sultana   |             3 |
+-------------+------------+-----------+---------------+
```

5.11-- view most used payment method
SELECT payment_method, COUNT(payment_id) AS payment_count
FROM payment
GROUP BY payment_method
ORDER BY payment_count DESC
LIMIT 1;

```
+-----------------+-----------------+
| payment_method  | payment_count   |
+-----------------+-----------------+
| Card            |              11 |
+-----------------+-----------------+
```

5.12-- view highest ticket price
SELECT f.Flight_ID, f.Flight_Number, MAX(t.Ticket_Price) AS
Highest_Ticket_Price
FROM flight f
JOIN booking b ON f.Flight_ID = b.Flight_ID
JOIN ticket t ON b.Booking_ID = t.Booking_ID
GROUP BY f.Flight_ID, f.Flight_Number
ORDER BY Highest_Ticket_Price DESC
LIMIT 1;

```
+-----------+---------------+----------------------+
| Flight_ID | Flight_Number | Highest_Ticket_Price |
+-----------+---------------+----------------------+
| FL010     | BG110         |              7000.00 |
+-----------+---------------+----------------------+
```

5.13-- list most booked flight

```sql
SELECT
    f.Flight_ID,
    f.Flight_Number,
    COUNT(b.Booking_ID) AS Total_Bookings
FROM booking b
JOIN flight f ON b.Flight_ID = f.Flight_ID
GROUP BY f.Flight_ID, f.Flight_Number
ORDER BY Total_Bookings DESC
LIMIT 10;
```

```
+-----------+---------------+-----------------+
| Flight_ID | Flight_Number | Total_Bookings  |
+-----------+---------------+-----------------+
| FL001     | BG101         |               3 |
| FL002     | BG102         |               3 |
| FL003     | BG103         |               3 |
| FL004     | BG104         |               3 |
| FL005     | BG105         |               3 |
| FL006     | BG106         |               2 |
| FL007     | BG107         |               2 |
| FL008     | BG108         |               2 |
| FL009     | BG109         |               2 |
| FL010     | BG110         |               2 |
+-----------+---------------+-----------------+
```

5.14 -- list of total flight of Barishal

```sql
SELECT
    f.Flight_ID,
    f.Flight_Number,
    a1.IATA_Code AS Departure_IATA,
    a2.IATA_Code AS Arrival_IATA,
    f.Departure_Time,
    f.Arrival_Time
FROM flight f
JOIN airport a1 ON f.Departure_Airport = a1.ICAO_Code
JOIN airport a2 ON f.Arrival_Airport = a2.ICAO_Code
WHERE a1.IATA_Code = 'BZL' OR a2.IATA_Code = 'BZL';
```

```
+-----------+---------------+----------------+--------------+---------------------+---------------------+
| Flight_ID | Flight_Number | Departure_IATA | Arrival_IATA | Departure_Time      | Arrival_Time        |
+-----------+---------------+----------------+--------------+---------------------+---------------------+
| FL010     | BG110         | JSR            | BZL          | 2025-05-12 08:30:00 | 2025-05-12 10:30:00 |
| FL007     | BG107         | BZL            | DAC          | 2025-05-11 15:00:00 | 2025-05-11 16:30:00 |
| FL008     | BG108         | BZL            | JSR          | 2025-05-11 16:00:00 | 2025-05-11 18:00:00 |
| FL005     | BG105         | DAC            | BZL          | 2025-05-11 09:00:00 | 2025-05-11 11:00:00 |
| FL006     | BG106         | CGP            | BZL          | 2025-05-11 10:00:00 | 2025-05-11 12:00:00 |
| FL009     | BG109         | CGP            | BZL          | 2025-05-12 07:00:00 | 2025-05-12 09:00:00 |
+-----------+---------------+----------------+--------------+---------------------+---------------------+
```

5.15-- list of flight dhaka to Barishal

SELECT
   f.Flight_ID,
   f.Flight_Number,
   da.IATA_Code AS Departure_IATA,
   aa.IATA_Code AS Arrival_IATA,
   f.Departure_Time,
   f.Arrival_Time,
   f.Flight_Status
FROM flight f
JOIN airport da ON f.Departure_Airport = da.ICAO_Code
JOIN airport aa ON f.Arrival_Airport = aa.ICAO_Code
WHERE da.IATA_Code = 'DAC' AND aa.IATA_Code = 'BZL';

```
+-----------+---------------+----------------+--------------+---------------------+---------------------+---------------+
| Flight_ID | Flight_Number | Departure_IATA | Arrival_IATA | Departure_Time      | Arrival_Time        | Flight_Status |
+-----------+---------------+----------------+--------------+---------------------+---------------------+---------------+
| FL005     | BG105         | DAC            | BZL          | 2025-05-11 09:00:00 | 2025-05-11 11:00:00 | On Time       |
+-----------+---------------+----------------+--------------+---------------------+---------------------+---------------+
```

6.Conclusion

The Ticketing Management System for Airplane effectively manages customer data, bookings, payments, and flight schedules, streamlining operations and minimizing errors. By automating data handling, the system enhances operational efficiency. Future improvements could involve integrating customer feedback and adding functionality for connecting flights, further optimizing the user experience and operational workflow.

7. References

1. Silberschatz, Abraham, Henry F. Korth, and Shashank Sudarshan. "Database system concepts." (2011).
2. https://www.db-book.com/

Drive Link:

https://drive.google.com/drive/folders/1ZP-qz9iPxG4oKbUpBOjXz-h46FoKuf-B?usp=drive_link