AIRLINE RESERVATION SYSTEM

COURSE PROJECT REPORT

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ABSTRACT

This project proposes a comprehensive airline reservation system designed to streamline flight operations for both passengers and airline personnel. The system caters to passengers by offering functionalities for booking flights, managing existing reservations, and accessing real-time flight information. Additionally, the passenger module captures details like names, identification documents, and luggage information to ensure a smooth travel experience. For airline staff, the system goes beyond just reservations.

It incorporates a crew management module, allowing for the creation and maintenance of pilot and crew member profiles. This module captures vital details like licensing information and contact details. Furthermore, the system facilitates management of flight information, including scheduling, aircraft details, and passenger capacity. To complete the booking cycle, the system offers functionalities for invoice generation and management. In essence, this database system serves as a one-stop solution for airlines, simplifying flight operations and passenger management.

In an effort to enhance efficiency within the airline industry, this project proposes a multifaceted airline reservation system. This comprehensive database caters to both passengers and airline personnel, offering a streamlined user experience. Passengers can leverage the system to search for and book flights, manage existing reservations, and access up-to-date flight information. To ensure a seamless travel experience, the system also captures passenger details such as identification documents and luggage specifications. For airline staff, the functionalities extend beyond just reservations.

The system incorporates a crew management module, allowing for the creation and maintenance of detailed profiles for both pilots and crew members. These profiles capture crucial information such as licensing and contact details, ensuring a well-equipped and informed crew. Furthermore, the system empowers staff to manage flight information meticulously. This includes scheduling details, aircraft specifications, and passenger capacity. To finalize the booking process, the system offers functionalities for invoice generation and management. By encompassing these diverse functionalities, this database system acts as a central hub for airlines, simplifying flight operations, passenger management, and crew administration.

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CHAPTER I
INTRODUCTION

In response to the evolving needs of the airline industry, our project introduces a comprehensive airline reservation system designed to optimize flight operations for both passengers and airline personnel. This integrated system revolutionizes the booking process, passenger management, and crew administration, offering a seamless experience from reservation to flight completion.

Passenger-Centric Features:
The system prioritizes passenger convenience by providing a user-friendly interface for booking flights, managing reservations, and accessing real-time flight information. Passengers can effortlessly search for flights, select preferred options, and complete bookings, all within a centralized platform. Moreover, the system captures essential passenger details, including identification documents and luggage specifications, ensuring a personalized and hassle-free travel experience.

Enhanced Functionality for Airline Personnel:
Beyond reservation management, the system empowers airline staff with advanced functionalities tailored to streamline flight operations. A comprehensive crew management module allows for the creation and maintenance of detailed profiles for pilots and crew members. This module captures critical information such as licensing details and contact information, facilitating efficient crew administration and resource allocation. Additionally, airline personnel can meticulously manage flight information, including scheduling, aircraft specifications, and passenger capacity, ensuring optimal resource utilization and operational efficiency.

In summary, our multifaceted airline reservation system represents a significant advancement in the airline industry, offering a comprehensive solution to optimize flight operations, enhance passenger experiences, and streamline crew administration. Through innovative technology and integrated functionalities, our project aims to revolutionize the way airlines manage their operations, setting new standards for efficiency and service excellence in the aviation industry.

1.1 SOFTWARE MySQL

In the development of our comprehensive airline reservation system, MySQL stands as the cornerstone of our database infrastructure, providing the robust foundation upon which our project is built. MySQL, a widely-used open-source relational database management system, offers a reliable and scalable solution for storing, managing, and retrieving vast amounts of data efficiently.

Data Management and Storage:
MySQL facilitates the efficient management and storage of diverse datasets essential to our airline reservation system. From passenger information and flight details to crew profiles and scheduling data, MySQL efficiently organizes and stores critical information, ensuring accessibility and reliability at all times. Its robust relational database model enables seamless handling of complex relationships between different data entities, facilitating efficient query execution and data retrieval.

Security and Reliability:
Security is of utmost importance in the aviation industry, where sensitive passenger information and operational data must be safeguarded against unauthorized access and breaches. MySQL provides robust security features, including user authentication, access control mechanisms, and encryption capabilities, ensuring the confidentiality, integrity, and availability of data within our system. Additionally, MySQL's reliability features, such as transaction support and data replication, guarantee data consistency and durability, minimizing the risk of data loss or corruption.

Integration and Compatibility:
MySQL's compatibility with a wide range of programming languages, frameworks, and development tools makes it an ideal choice for our project. Whether integrating with backend server-side technologies or front-end user interfaces, MySQL seamlessly interoperates with various components of our system, facilitating smooth data exchange and communication. Its support for standard SQL syntax and industry-standard protocols ensures compatibility with existing systems and technologies, simplifying integration efforts and reducing development time.

In summary, MySQL serves as the backbone of our airline reservation system, providing a reliable, scalable, and secure platform for managing data, optimizing performance, and ensuring seamless integration with other system components. With MySQL powering our database infrastructure, we can confidently deliver a robust and efficient solution that meets the demanding requirements of the aviation industry while providing a superior experience for both passengers and airline personnel.

1.2 ADVANTAGE OF MySQL

- Cost-Effectiveness: MySQL's open-source nature provides a cost-effective solution for building the airline reservation system, minimizing licensing fees and reducing overall project costs.
- Scalability: With MySQL, the airline reservation system can seamlessly scale to accommodate the growing volume of flight reservations, passenger data, and operational information as the airline expands its services.
- Reliability: MySQL's reliability features ensure the consistent availability and integrity of critical data, such as passenger details, flight schedules, and crew information, minimizing the risk of disruptions to flight operations.
- Performance: MySQL's optimized query execution and indexing mechanisms enable fast retrieval and processing of data, ensuring quick response times for passenger bookings, flight updates, and administrative tasks.
- Security: MySQL's robust security features, including user authentication and access control mechanisms, safeguard sensitive passenger information and operational data from unauthorized access and breaches, maintaining the confidentiality and integrity of data.
- Compatibility: MySQL's compatibility with various programming languages and frameworks simplifies integration with other system components, such as the passenger module, crew management module, and administrative functionalities, ensuring seamless communication and data exchange.
- Community Support: MySQL's large and active community of developers and users provides access to resources, forums, and documentation for troubleshooting and optimization, ensuring continuous support and improvement of the airline reservation system.

CHAPTER II
PROJECT FEATURES AND OBJECTIVES

2.1 MAIN FEATURES AND FUNCTIONALITY

1. **Passenger Management:**

- Create and Manage Profiles: Capture passenger information such as name, contact details, and frequent flyer information.
- Flight Search and Booking: Allow passengers to search for flights based on criteria like origin, destination, date, and time. Book flights, select seats, and manage reservations.
- Invoice Access: Provide access to invoices for bookings, allowing passengers to view payment details.

2. **Flight Information:**

- View Flight Details: Access flight schedules, aircraft information, and crew details.
- Flight Search: Enable users to search for flights using various filters such as date, time, origin, and destination.
- Availability and Fare Management: Manage flight availability and fares to optimize revenue and accommodate passenger demand.

3. **Booking Management:**

- Flight Selection and Booking: Allow users to select flights, choose fares, enter passenger information, and manage booking details.
- Secure Payment Processing: Facilitate secure payment transactions for flight bookings to ensure the safety of financial data.
- Ticket Management: Generate and manage tickets for confirmed bookings, providing passengers with essential travel documentation.

4. **Crew Management:**

- Crew Profile Management: Maintain detailed profiles for crew members, including contact information, licenses, and roles.
- Assignment and Scheduling: Assign crew members to specific flights and manage their schedules to ensure adequate staffing.

5. **Airport Information:**

- View Airport Details: Provide information about departure and arrival airports, including facilities, amenities, and services.
- Real-time Flight Information: Display real-time arrival and departure information for flights, enhancing passenger convenience and travel planning.

6. **Aircraft Information:**

- Aircraft Details: Access detailed information about aircraft types, including model, capacity, and features.
- Maintenance Tracking: Track aircraft maintenance schedules and availability to ensure safe and efficient operations.

7. **Luggage Management:**

- Luggage Information: Manage passenger luggage details such as weight, dimensions, and special needs.
- Tracking: Track luggage throughout the journey, including check-in, transit, and claim
- processes. Handle lost and found luggage cases efficiently.

8. **Management and Administration:**

- User and Access Control: Manage user accounts and permissions to ensure secure access to system features.
- Administrative Tasks: Add new flights, update fares, manage aircraft and airport details. Generate reports on bookings, revenue, crew performance, and luggage handling efficiency.

2.2 OBJECTIVES

1. **Streamline Booking Process**:

- Simplify the flight booking process for passengers by offering a user-friendly interface with efficient search and booking functionalities.

2. **Enhance Passenger Experience:**

- Provide passengers with convenient features such as seat selection, invoice access, and real-time flight information to enhance their overall travel experience.

3. **Optimize Flight Operations:**

- Improve operational efficiency by enabling airline staff to manage flight schedules, crew assignments, and aircraft details effectively.

4. **Ensure Data Security and Privacy:**

- Implement robust security measures to safeguard passenger information, payment details, and operational data against unauthorized access and breaches.

5. **Facilitate Crew Management:**

- Streamline crew administration tasks by providing tools for managing crew profiles, assignments, and schedules efficiently.

6. **Improve Airport and Aircraft Management:**

- Enhance airport and aircraft management by providing access to detailed information and tracking capabilities for better resource allocation and maintenance planning.

7. **Enhance Luggage Handling:**

- Improve luggage management processes by tracking luggage throughout the journey and efficiently handling lost and found cases.

8. **Enable Effective Reporting and Analysis:**

- Generate comprehensive reports on bookings, revenue, crew performance, and luggage handling efficiency to facilitate data-driven decision-making and optimization of airline operations.

9. **Ensure Scalability and Flexibility:**

- Design the system to be scalable and adaptable to accommodate future growth and changes in airline operations and industry requirements.

10. **Provide Seamless Integration:**

- Ensure seamless integration with existing airline systems and technologies to facilitate smooth data exchange and communication between different components of the reservation system.

2.3 IDENTIFICATION OF PROJECT MODULES

- Passenger Module
- Flight Module
- Booking Module
- Crew Management Module
- Airport Module
- Aircraft Module
- Luggage Management Module
- Management Module

2.4 MODULE DESCCRIPTION

2.4.1 Passenger Module:

- Create and manage passenger profiles (personal information, contact details, frequent flyer information).
- Search for flights based on various criteria (origin, destination, date, time).
- Book flights, select seats, and manage existing reservations.
- Access and view invoices for bookings.

2.4.2 Flight Module:

- View flight information (schedule, aircraft, crew).
- Search for flights based on various criteria.
- Manage flight availability and fares

2.4.3 Booking Module:

- Select flights and fares.
- Enter passenger information and manage booking details.
- Process secure payments for flight bookings.
- Generate and manage tickets for confirmed bookings.

2.4.4 Crew Management Module:

- Manage crew member profiles (full name, contact details, licenses, occupation).
- Assign crew members to specific flights.
- Track crew availability and manage schedules.

2.4.5 Airport Module:

- View information about departure and arrival airports (facilities, amenities, services).
- Display real-time arrival and departure information.

2.4.6 Aircraft Module:

- View detailed information about aircraft types (model, capacity, features).
- Track aircraft maintenance schedules and availability.

2.4.7 Luggage Management Module:

- Manage passenger luggage information (weight, dimensions, special needs).
- Track luggage throughout the journey (check-in, transit, claim).
- Handle lost and found luggage cases.

2.4.8 Management Module:

- Manage users and access control.
- Add new flights, update fares, manage aircraft and airport details.
- Generate reports on bookings, revenue, crew performance, and luggage handling efficiency.

CHAPTER III
BACK-END, FRONT-END DESIGN & CONNECTIVITY

3.1 BACK-END DESIGN

Database:

The system will utilize a relational database management system (RDBMS) like MySQL,

Tables:

The back-end will be comprised of several tables representing the different entities in the system. Here are some potential tables based on the functionalities:

- Passenger: This table will store passenger information such as name, ID, contact details, and date of birth.
- Reservation: This table will store details about flight reservations made by passengers, including passenger ID, flight ID, booking date, and seat number.
- Flight: This table will hold information about flights such as departure and arrival airports, date and time, aircraft details, and capacity.
- Crew: This table will store information about airline crew members, including pilots and attendants, such as name, ID, contact details, and license information.
- Invoice: This table will contain details about invoices generated for flight bookings, including reservation ID, cost, and date.

Relationships:

The tables will be connected through relationships. These relationships will define how data is linked between tables. For example:

A Passenger can have many Reservations (One-to-Many).

A Reservation belongs to one Passenger (Many-to-One) and one Flight (Many-to-One).

A Flight can have many Reservations (One-to-Many).

A Crew member can be assigned to many Flights (Many-to-Many) through a separate "Crew_Assignment" table.

Cardinality	Relationship
One-to-Many	Passenger has many Bookings
One-to-Many	Flight has many Bookings
One-to-Many	Crew Member can be assigned to many Flights
Many-to-One	Booking is for one Passenger
Many-to-One	Booking is for one Flight
Many-to-Many	Flight can have many Crew Members
One-to-One	Flight is operated by one Aircraft
One-to-One	Invoice is generated for one Booking

Backend Technologies:

- The back-end can be developed using various technologies depending on the chosen programming language and framework. Here are some options:
- Programming Languages: Python, Java, Node.js
- Frameworks: Django (Python), Spring (Java), Express.js (Node.js)
- Object-Relational Mapping (ORM): SQLAlchemy (Python), JPA (Java), Mongoose (Node.js) - ORMs help translate between database tables and objects in the code.

Additional Considerations:

Security: The back-end should implement strong security measures to protect passenger data and prevent unauthorized access.

Scalability: The system should be designed to scale efficiently to handle a large number of users and transactions.

API (Application Programming Interface): An API can be developed to allow external applications to interact with the reservation system data.

3.1.1 CONCEPTUAL DATABASE DESIGN (ER-DIAGRAM)

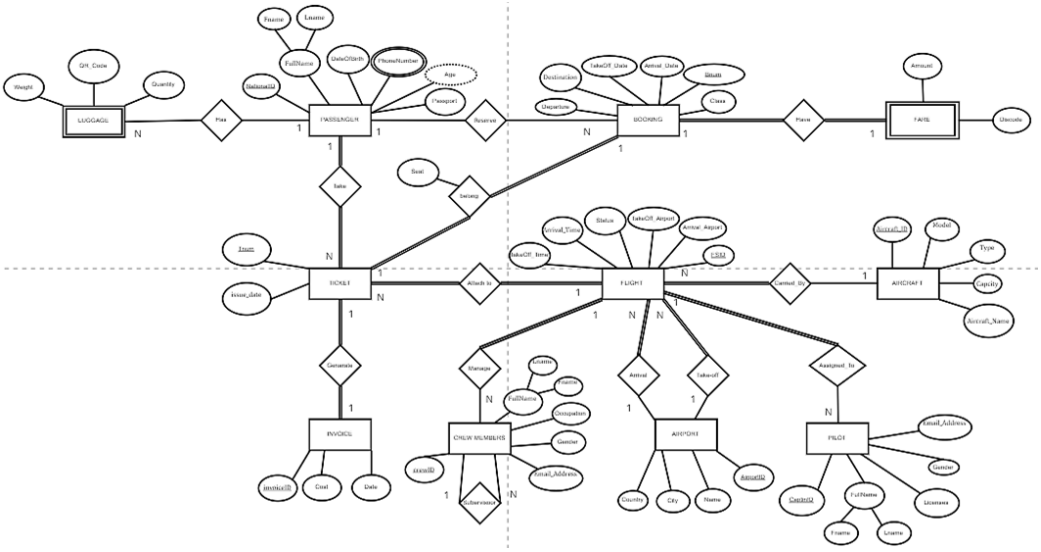

Fig 3.1.1.1: ER Diagram of Airline Reservation System

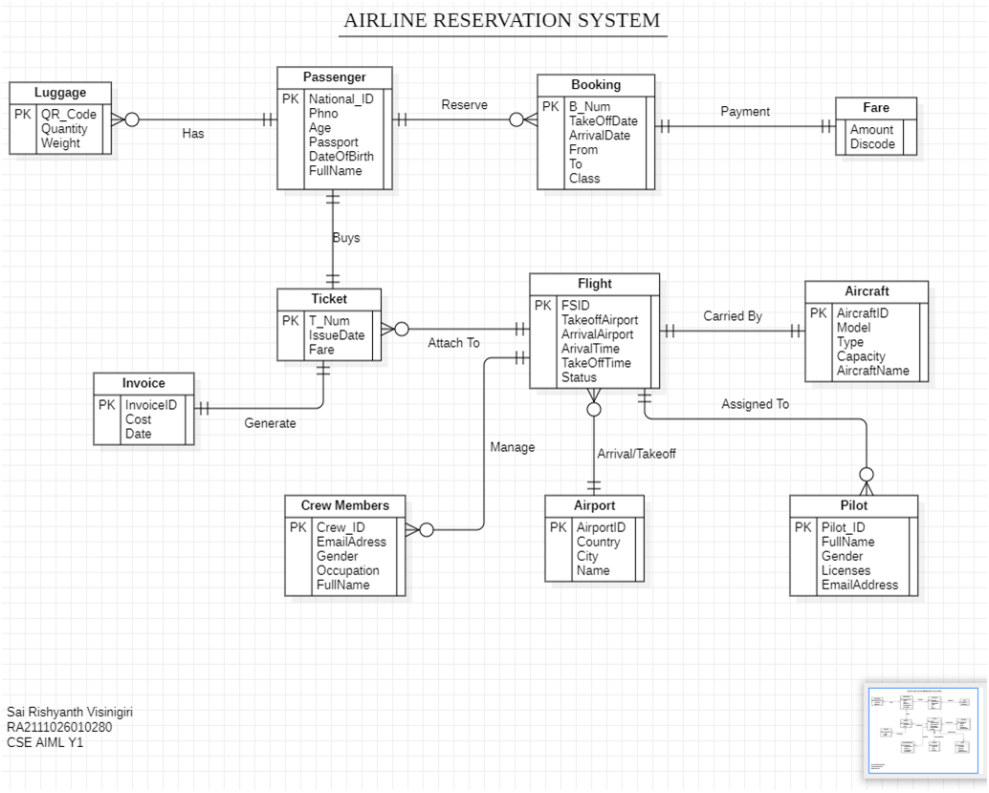

Fig 3.1.1.2: ER Diagram of Airline Reservation System using StarUML

Fig 3.1.1.1 describes the Entity Relationship Diagram of the proposed Airline Reservation System portraying all the entities,their attributes and the relationship between the entities. Fig 3.1.1.2 shows the ER diagram developed using the tool StarUML.

Entities and Attributes:

1. Passenger:

- National ID (primary key)
- Full Name
- Date of Birth
- Phone number
- Passport information

2. Booking:

- Booking number (primary key)
- Passenger ID (foreign key)
- Flight ID (foreign key)
- Fare
- Discounts applied

3. Flight:

- Flight number (primary key)
- Departure airport (foreign key)
- Arrival airport (foreign key)
- Departure date
- Arrival date
- Take-off time
- Arrival time
- Aircraft ID (foreign key)
- Fare

4. Ticket:

- Ticket number (primary key)
- Flight ID (foreign key)
- Passenger ID (foreign key)

5. Invoice:

- Invoice ID (primary key)
- Booking ID (foreign key)
- Cost
- Date

6. Aircraft:

- Aircraft ID (primary key)
- Model
- Capacity
- Aircraft name

7. Crew Member:

- Crew ID (primary key)
- Full Name
- Email address
- Gender
- Occupation
- Licenses

8. Airport:

- Airport ID (primary key)
- Name
- City
- Country

9. Fare:

- Amount
- Discount code

3.2 FRONT-END DESIGN

3.2.1 FRONT-END WEB DEVELOPMENT DETAILS

HTML (Hypertext Markup Language):

- HTML forms the basic structure of web pages in the airline reservation system.
- It provides the foundation upon which other technologies such as CSS and JavaScript enhance and modify the user interface.
- HTML is essential for creating content and structuring elements such as forms, tables, and navigation menus.

CSS (Cascading Style Sheets):

- CSS is utilized to control the presentation, formatting, and layout of the airline reservation system's user interface.
- It defines the visual aspects of HTML elements, including colors, fonts, spacing, and responsiveness.
- CSS helps create a visually appealing and consistent design across different pages and devices.

JavaScript:

- JavaScript is employed to control the behavior and functionality of various elements within the airline reservation system.
- It enables interactive features such as dynamic form validation, real-time updates, and asynchronous data loading.
- JavaScript enhances the user experience by providing smoother interactions and more responsive interfaces.

In summary, front-end web development for the airline reservation system relies on HTML for structure, CSS for styling, and JavaScript for interactivity, ensuring a seamless and user-friendly experience for passengers and airline staff alike.

3.3 CONNECTIVITY (FRONT END AND BACK END)

In the context of the airline reservation system project, PHP can play a crucial role in facilitating connectivity between the front-end and back-end components. Here's how PHP can be utilized for this purpose:

Server-Side Processing:

- PHP scripts can handle user requests submitted through the front-end interface, such as searching for flights, booking tickets, or managing reservations.
- These PHP scripts process the incoming requests, perform necessary operations, interact with the database, and generate responses dynamically.

Integration with HTML/CSS/JavaScript:

- PHP seamlessly integrates with HTML, CSS, and JavaScript to create the user interface of the airline reservation system.
- PHP code can be embedded within HTML files or separated into separate PHP files that are included or referenced in HTML templates.
- This integration allows for the dynamic generation of HTML content based on data retrieved from the database or user input.

Database Interaction:

- PHP interacts with the back-end database, such as MySQL, to store and retrieve data related to flights, passengers, reservations, crew members, and more.
- PHP scripts execute SQL queries to perform CRUD operations (Create, Read, Update, Delete) on the database, ensuring data consistency and integrity.

Form Handling:

- PHP handles form submissions from the front-end interface, processing user input and validating it as necessary.
- Form submissions, such as flight search parameters or booking details, are sent to PHP scripts via HTTP POST or GET requests, which are then parsed and processed accordingly.

Session Management:

- PHP manages user sessions to maintain session state across multiple requests and track user interactions.
- Sessions can be used to store user-specific data, such as login credentials, user preferences, or temporary booking information, ensuring a personalized experience for users.

Dynamic Content Generation:

- PHP generates dynamic content on web pages, such as search results, flight details, booking confirmations, and error messages.
- This dynamic content is generated based on user interactions, back-end data processing, and business logic implemented within PHP scripts.

By leveraging PHP for front-end and back-end connectivity, the airline reservation system can achieve seamless communication between the user interface and server-side components, providing users with a responsive, interactive, and secure booking experience.

CHAPTER IV

MODULE IMPLEMENTATION

4.1 CONSTRUCTION OF RELATIONAL TABLE FROM THE ER DIAGRAM

```
mysql> create database Airline;
Query OK, 1 row affected (0.02 sec)

mysql> use Airline;
Database changed
```

Created a database named Airline
Using database Airline to create more entity sets

```
mysql> show tables;
+------------------+
| Tables_in_airline |
+------------------+
| aircraft          |
| airport           |
| booking           |
| crewmembers       |
| fare              |
| flight            |
| invoice           |
| luggage           |
| passenger         |
| pilot             |
| ticket            |
+------------------+
11 rows in set (0.04 sec)
```

Show tables command displays the all the entity sets or relations created in a database.

4.1.1 DDL, DML, DCL, TCL OF AIRLINE RESERVATION SYSTEM

I. DDL COMMANDS

1.Create Command

```
mysql> create table Passenger(NationalID varchar(10) primary key not null,FName varchar(10),
LName varchar(10), DOB date not null, PhNo integer, age integer, Passport varchar(5),BNum va
rchar(10),QRCode varchar(10));
Query OK, 0 rows affected (0.08 sec)
```

Table Passengers stores passenger details such as National ID, Name, DOB, Phone No, Passport No.

```
mysql> create table Luggage(QRCode varchar(10) primary key not null, Quantity integer defaul
t 0, Weight float check (weight<=23));
Query OK, 0 rows affected (0.09 sec)
```

Table Luggage contains details of the QR_Code, Quantity and Weight of the luggage.

```
mysql> create table Booking(BNum varchar(10) primary key not null, Source varchar(10), Destination v
archar(10), ArrivalDate date, TakeOffDate date,Class varchar(10),Amount integer,DisCode varchar(5));

Query OK, 0 rows affected (0.04 sec)
```

Table Booking contains passenger booking details like Booking ID, Source, Destination, Date, Class, Amount

```
mysql> create table Airport(AirportID varchar(10) primary key not null, AirportName varchar(10), Cit
y varchar(10), Country varchar(10));
Query OK, 0 rows affected (0.05 sec)
```

Table Airport contains Airport ID, Name, City and Country.

```
mysql> create table Ticket(TNum varchar(10) primary key not null,IssueDate date,Fare integer,Seat va
rchar(4) unique, BNum varchar(10) references Booking(BNum));
Query OK, 0 rows affected (0.03 sec)
```

Table Ticket contains Ticked ID, Issue Date, Fare.

```
mysql> create table Invoice(InvoiceID varchar(10) primary key not null, IssueDate date,Cost float);
Query OK, 0 rows affected (0.07 sec)
```

Table Invoice contains Invoice ID, Issue Date, Cost.

```
mysql> create table CrewMembers(crewID varchar(10) primary key not null,FName varchar(10),LName varc
har(10),Occupation varchar(10),Gender varchar(10),EmailAddress varchar(25));
Query OK, 0 rows affected (0.07 sec)
```

Table Crew Members contains Crew Details such as Crew ID, Gender, Occupation, Name, Email Address.

```
mysql> create table Pilot(PilotID varchar(10) primary key not null,FName varchar(10),LName varchar(1
0),License varchar(10) not null, Gender varchar(10),EmailAddress varchar(25) unique);
Query OK, 0 rows affected (0.08 sec)
```

Table Pilot contains Pilot Details such as Name, Gender, Pilot ID, License, Email Address.

```
mysql> create table Aircraft(AircraftID varchar(10) primary key not null,Model varch
ar(10) not null, Type varchar(10) not null, Capacity integer check(Capacity>0),Name
varchar(10) unique);
Query OK, 0 rows affected (0.05 sec)
```

Table Aircraft contains Aircraft ID, Model, Type and Capacity.

```
mysql> create table Flight(FSID varchar(10) primary key not null, ArrivalAirport varchar(10), DepartureAir
port varchar(10),Status varchar(10), ArrivalTime varchar(5), DepartureTime varchar(5), crewID varchar(10)
references CrewMembers(crewID), AirportID varchar(10) references Airport(AirportID), PilotID varchar(10) r
eferences Pilot(PilotID),AircraftID varchar(10) references Airfcraft(AircraftID));
Query OK, 0 rows affected (0.06 sec)
```

Table Flight contains all the flight details catered both for the passenger and the airlines which includes FSID, Source and Destination Airport, Departure and Arrival Time.

2.Alter Command:

```
mysql> alter table Passenger add column TNum varchar(10);
Query OK, 0 rows affected (0.08 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter command to add column Ticket Number to table Passenger

```
mysql> alter table Ticket add (FSID varchar(10), InvoiceID varchar(10));
Query OK, 0 rows affected (0.04 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter command to add multiple columns Booking Number, Invoice ID to table Ticket.

```
mysql> alter table passenger add foreign key (BNum) references Booking(BNum);
Query OK, 0 rows affected (0.13 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter command to add foreign key to table Passenger making the column BNum which refers to the primary key BNum in Booking Table.

```
mysql> alter table Passenger add foreign key (QRCode) references Luggage(QRCode);
Query OK, 0 rows affected (0.13 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter command to add QRCode as foreign key in Passenger.

```
mysql> alter table flight modify ArrivalTime TIME;
Query OK, 0 rows affected (0.19 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> alter table flight modify DepartureTime TIME;
Query OK, 0 rows affected (0.12 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter Command to modify the data type of the Arrival and Departure Time from varchar to Time format ‘hh:mm:ss’ .

```
mysql> alter table CrewMembers add constraint unique(EmailAddress);
Query OK, 0 rows affected (0.04 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter command to add a constraint Unique to column Email Address in table Crew Members.

```
mysql> alter table Airport modify AirportName varchar(25);
Query OK, 0 rows affected (0.02 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Alter command to modify the data type of Airport Name in table Airport

3.Drop Command:

Drop command drops the table data along with its structure from the database.

```
mysql> drop table fare;
Query OK, 0 rows affected (0.04 sec)
```

```
mysql> show tables;
+------------------+
| Tables_in_airline |
+------------------+
| aircraft         |
| airport          |
| booking          |
| crewmembers      |
| fare             |
| flight           |
| invoice          |
| luggage          |
| passenger        |
| pilot            |
| ticket           |
+------------------+
11 rows in set (0.04 sec)
```

Before Drop

```
mysql> show tables;
+------------------+
| Tables_in_airline |
+------------------+
| aircraft         |
| airport          |
| booking          |
| crewmembers      |
| flight           |
| invoice          |
| luggage          |
| passenger        |
| pilot            |
| ticket           |
+------------------+
10 rows in set (0.01 sec)
```

After Drop

4.Truncate Command:

Truncate command removes all the tuples from the table Fare. It returns an empty set when retrieved using the Select command. The structure of the table Fare remains intact.

```
mysql> SELECT * FROM FARE;
+--------+-----------+
| Amount | DisCode   |
+--------+-----------+
|   5000 | WELCOME50 |
|   2500 | NEW50     |
|    780 | NEW78     |
+--------+-----------+
3 rows in set (0.01 sec)

mysql> truncate fare;
Query OK, 0 rows affected (0.06 sec)

mysql> SELECT * FROM FARE;
Empty set (0.00 sec)
```

1. Ticket Table

```
mysql> desc Ticket;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| TNum      | varchar(10) | NO   | PRI | NULL    |       |
| IssueDate | date        | YES  |     | NULL    |       |
| Fare      | int         | YES  |     | NULL    |       |
| Seat      | varchar(4)  | YES  | UNI | NULL    |       |
| BNum      | varchar(10) | YES  |     | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

2. Luggage Table

```
mysql> desc Luggage;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| QRCode   | varchar(10) | NO   | PRI | NULL    |       |
| Quantity | int         | YES  |     | 0       |       |
| Weight   | float       | YES  |     | NULL    |       |
+----------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

3. Pilot Table

```
mysql> desc Pilot;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| PilotID      | varchar(10) | NO   | PRI | NULL    |       |
| FName        | varchar(10) | YES  |     | NULL    |       |
| LName        | varchar(10) | YES  |     | NULL    |       |
| License      | varchar(10) | NO   |     | NULL    |       |
| Gender       | varchar(10) | YES  |     | NULL    |       |
| EmailAddress | varchar(25) | YES  | UNI | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
6 rows in set (0.02 sec)
```

4. Aircraft Table

```
mysql> desc Aircraft;
+------------+-------------+------+-----+---------+-------+
| Field      | Type        | Null | Key | Default | Extra |
+------------+-------------+------+-----+---------+-------+
| AircraftID | varchar(10) | NO   | PRI | NULL    |       |
| Model      | varchar(10) | NO   |     | NULL    |       |
| Type       | varchar(10) | NO   |     | NULL    |       |
| Capacity   | int         | YES  |     | NULL    |       |
| Name       | varchar(10) | YES  | UNI | NULL    |       |
+------------+-------------+------+-----+---------+-------+
5 rows in set (0.02 sec)
```

5. Fare Table

```
mysql> desc Fare;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| Amount  | float       | YES  |     | NULL    |       |
| DisCode | varchar(10) | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
2 rows in set (0.02 sec)
```

6. Crew Members Table

```
mysql> desc CrewMembers;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| crewID       | varchar(10) | NO   | PRI | NULL    |       |
| FName        | varchar(10) | YES  |     | NULL    |       |
| LName        | varchar(10) | YES  |     | NULL    |       |
| Occupation   | varchar(10) | YES  |     | NULL    |       |
| Gender       | varchar(10) | YES  |     | NULL    |       |
| EmailAddress | varchar(25) | YES  | UNI | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
6 rows in set (0.00 sec)
```

7. Airport Table

```
mysql> desc Airport;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| AirportID   | varchar(10) | NO   | PRI | NULL    |       |
| AirportName | varchar(25) | YES  | UNI | NULL    |       |
| City        | varchar(10) | YES  | UNI | NULL    |       |
| Country     | varchar(10) | YES  |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
4 rows in set (0.02 sec)
```

8. Invoice Table

```
mysql> desc Invoice;
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| InvoiceID | varchar(10) | NO   | PRI | NULL    |       |
| IssueDate | date        | YES  |     | NULL    |       |
| Cost      | float       | YES  |     | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
3 rows in set (0.01 sec)
```

9. Booking Table

```
mysql> desc Booking;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| BNum        | varchar(10) | NO   | PRI | NULL    |       |
| Source      | varchar(10) | YES  |     | NULL    |       |
| Destination | varchar(10) | YES  |     | NULL    |       |
| ArrivalDate | date        | YES  |     | NULL    |       |
| TakeOffDate | date        | YES  |     | NULL    |       |
| Class       | varchar(10) | YES  |     | NULL    |       |
| Amount      | int         | YES  |     | NULL    |       |
| DisCode     | varchar(5)  | YES  |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
```

10. Passenger Table

```
mysql> desc Booking;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| BNum        | varchar(10) | NO   | PRI | NULL    |       |
| Source      | varchar(10) | YES  |     | NULL    |       |
| Destination | varchar(10) | YES  |     | NULL    |       |
| ArrivalDate | date        | YES  |     | NULL    |       |
| TakeOffDate | date        | YES  |     | NULL    |       |
| Class       | varchar(10) | YES  |     | NULL    |       |
| Amount      | int         | YES  |     | NULL    |       |
| DisCode     | varchar(5)  | YES  |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
```

11. Flight Table

```
mysql> desc Flight;
+-----------------+------------+------+-----+---------+-------+
| Field           | Type       | Null | Key | Default | Extra |
+-----------------+------------+------+-----+---------+-------+
| FSID            | varchar(10) | NO   | PRI | NULL    |       |
| ArrivalAirport  | varchar(10) | YES  |     | NULL    |       |
| DepartureAirport | varchar(10) | YES  |     | NULL    |       |
| Status          | varchar(10) | YES  |     | NULL    |       |
| ArrivalTime     | time       | YES  |     | NULL    |       |
| DepartureTime   | time       | YES  |     | NULL    |       |
| crewID          | varchar(10) | YES  | MUL | NULL    |       |
| AirportID       | varchar(10) | YES  | MUL | NULL    |       |
| PilotID         | varchar(10) | YES  | MUL | NULL    |       |
| AircraftID      | varchar(10) | YES  | MUL | NULL    |       |
+-----------------+------------+------+-----+---------+-------+
10 rows in set (0.01 sec)
```

II. DML COMMANDS

1.Insert Command:

```
mysql> insert into Aircraft values('A320N','A320-Neo','Commercial',150,'Airbus');
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Aircraft

```
mysql> insert into Pilot values('P101','Suhas','Ganga','E026010281','Male','sg281@airindia.com');
Query OK, 1 row affected (0.03 sec)
```

Insert command to add a tuple into Table Pilot

```
mysql> insert into Airport values('BOM','CSMIA','Mumbai','India');
Query OK, 1 row affected (0.07 sec)
```

Insert command to add a tuple into Table Airport

```
mysql> insert into CrewMembers values('C109','Lea','Weathers','Hostess','Female','lw.host@ap.com');
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table crewMembers

```
mysql> insert into Luggage values('Q008',2,23);
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Luggage

```
mysql> insert into Flight values('AI100','CSMIA','MAA','Landed','16:00:00','18:00:00','C104','BOM','P101','A320N');
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Flight

```
mysql> insert into Invoice values('I010','2024-03-06',36000);
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Invoice

```
mysql> insert into Ticket values('T007','2024-02-04',245000,'18A','B007','IN004','I007');
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Ticket

```
mysql> insert into Booking values('B008','Anna International','RGIA','2024-04-1','2024-04-1','Economy',1900,'NULL');
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Booking

```
mysql> insert into Passenger values('IND07','Kishore','Reddy','2001-10-31',7656899232,21,'IND','B008','Q008','T008');
Query OK, 1 row affected (0.01 sec)
```

Insert command to add a tuple into Table Passenger

2. Update Command:

Update Airport Name = ‘Charles De’ where Airport ID=‘CDG’ in Table Airport.

```
mysql> update Airport set AirportName='Charles De' where AirportID='CDG';
Query OK, 1 row affected (0.03 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

Update Aircraft Model = ‘320-Neo’ where Aircraft ID=‘A320N’ in Table Aircraft.

```
mysql> update Aircraft set model='320-Neo' where AircraftID='A320N';
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

Update Departure Airport = ‘Heathrow’ where FSID=IN004 in Table Flight.

```
mysql> UPDATE flight set DepartureAirport='Heathrow' where FSID='IN004';
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

Update Cost = 5200 where Invoice ID=‘I006’ in Table Invoice.

```
mysql> update Invoice set cost=5200 where InvoiceID='I006';
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

Update DOB = ‘1996-02-12’ where QR Code=‘Q005’ in Table Passenger.

```
mysql> update Passenger set DOB='1996-02-12' where QRCode='Q005';
Query OK, 1 row affected (0.01 sec)
Rows matched: 1  Changed: 1  Warnings: 0
```

3. Delete Command:

Before Delete Command:

```
mysql> select * from Aircraft;
+------------+---------+------------+----------+----------+
| AircraftID | Model   | Type       | Capacity | Name     |
+------------+---------+------------+----------+----------+
| A320N      | 320-Neo | Commercial |      150 | Airbus   |
| A330       | A330    | Commercial |      250 | Airbus   |
| A350       | 330     | Commercial |      220 | Airbus   |
| A380       | 380     | Commercial |      450 | Airbus   |
| B333       | 333     | Commercial |        1 | Boeing   |
| B707       | 707     | Commercial |      150 | Boeing   |
| B717       | 717     | Commercial |      150 | Boeing   |
| B727       | 727     | Commercial |      175 | Boeing   |
| B737       | 737     | Commercial |      250 | Boeing   |
| B747       | 747     | Commercial |      400 | Boeing   |
| B767       | 767     | Cargo      |        5 | Boeing   |
| B777       | 777     | Cargo      |        2 | Boeing   |
| B787       | 787     | Commercial |      220 | Boeing   |
| B787-3     | 787-300 | Commercial |      250 | Boeing   |
| IND01      | 350     | Govt       |      250 | IndiaOne |
+------------+---------+------------+----------+----------+
15 rows in set (0.00 sec)
```

```
mysql> delete from Aircraft where Type='Cargo';
Query OK, 2 rows affected (0.01 sec)
```

Delete command to remove tuples where the aircraft type is ‘Cargo’ from the table Aircraft

```
mysql> delete from Aircraft where Capacity<10;
Query OK, 1 row affected (0.02 sec)
```

Delete Command removes tuples that have aircraft capacity of less than 10

After Delete Command:

```
mysql> select * from Aircraft;
+------------+---------+------------+----------+----------+
| AircraftID | Model   | Type       | Capacity | Name     |
+------------+---------+------------+----------+----------+
| A320N      | 320-Neo | Commercial |      150 | Airbus   |
| A330       | A330    | Commercial |      250 | Airbus   |
| A350       | 330     | Commercial |      220 | Airbus   |
| A380       | 380     | Commercial |      450 | Airbus   |
| B707       | 707     | Commercial |      150 | Boeing   |
| B717       | 717     | Commercial |      150 | Boeing   |
| B727       | 727     | Commercial |      175 | Boeing   |
| B737       | 737     | Commercial |      250 | Boeing   |
| B747       | 747     | Commercial |      400 | Boeing   |
| B787       | 787     | Commercial |      220 | Boeing   |
| B787-3     | 787-300 | Commercial |      250 | Boeing   |
| IND01      | 350     | Govt       |      250 | IndiaOne |
+------------+---------+------------+----------+----------+
12 rows in set (0.01 sec)
```

Illustration:

The tuples in the table Aircraft having Type as Cargo and capacity less than 10 are permanently removed from the table Aircraft. Initially, the no. of rows was 15 in the table after the delete transactions the no. of rows is reduced to 12.

4. Select Command:

Retrieving all the rows in the table Flight

```
mysql> select * from flight;
+-------+------------------+------------------+----------+-------------+---------------+--------+----------+---------+------------+
| FSID  | ArrivalAirport   | DepartureAirport | Status   | ArrivalTime | DepartureTime | crewID | AirportID | PilotID | AircraftID |
+-------+------------------+------------------+----------+-------------+---------------+--------+----------+---------+------------+
| AA001 | Heathrow         | CSMIA            | InAir    | 06:30:00    | 23:00:00      | C108   | LHR      | P108    | B737       |
| AA002 | Kempagowda       | Charles De       | Scheduled| 01:30:00    | 23:00:00      | C109   | BLR      | P109    | B747       |
| AI001 | CSMIA            | Dubai International | Scheduled | 10:00:00 | 18:00:00      | C102   | BOM      | P102    | A330       |
| AI002 | Anna International | John F Kennedy | InAir    | 12:00:00    | 17:00:00      | C101   | MAA      | P103    | A350       |
| AI100 | CSMIA            | Anna International | Landed | 16:00:00    | 18:00:00      | C104   | BOM      | P101    | A320N      |
| IN003 | Kempegowda       | IGI              | Scheduled| 08:00:00    | 09:45:00      | C103   | BLR      | P104    | A380       |
| IN004 | RGIA             | Heathrow         | InGate   | 05:00:00    | 23:45:00      | C105   | HYD      | P105    | B747       |
| SJ001 | MAA              | HYD              | Cancelled| 12:30:00    | 14:00:00      | C110   | MAA      | P110    | A320N      |
| UK001 | RGIA             | Dubai International | Scheduled | 14:00:00 | 17:00:00      | C106   | DXB      | P106    | B787       |
| UK002 | CSMIA            | RGIA             | Scheduled| 05:00:00    | 07:00:00      | C107   | BOM      | P107    | B787-3     |
+-------+------------------+------------------+----------+-------------+---------------+--------+----------+---------+------------+
10 rows in set (0.00 sec)
```

Retrieving the average, maximum and minimum weight from the table Luggage

```
mysql> select avg(Weight) as Avg_Weight, max(Weight) as Max_Weight, min(Weight) as Min_Weight from Luggage;
+-------------------+------------+------------+
| Avg_Weight        | Max_Weight | Min_Weight |
+-------------------+------------+------------+
| 17.150000047683715 |         23 |        6.9 |
+-------------------+------------+------------+
1 row in set (0.01 sec)
```

Retrieve all the Airports in India

```
mysql> select * from Airport where Country='India';
+-----------+--------------------+-----------+---------+
| AirportID | AirportName        | City      | Country |
+-----------+--------------------+-----------+---------+
| BLR       | Kempegowda         | Bangalore | India   |
| BOM       | CSMIA              | Mumbai    | India   |
| DEL       | IGI                | New Delhi | India   |
| HYD       | RGIA               | Hyderabad | India   |
| MAA       | Anna International | Chennai   | India   |
+-----------+--------------------+-----------+---------+
5 rows in set (0.00 sec)
```

Retrieve the Name and Count of Aircrafts group by Name

```
mysql> select Name,Count(Name) from Aircraft group by Name;
+----------+-------------+
| Name     | Count(Name) |
+----------+-------------+
| Airbus   |           4 |
| Boeing   |           7 |
| IndiaOne |           1 |
+----------+-------------+
3 rows in set (0.01 sec)
```

Retrieve all the Airports not in India

```
mysql> select * from Airport where Country not in (select country from airport where
 country='India');
+-----------+--------------------+---------+-----------+
| AirportID | AirportName        | City    | Country   |
+-----------+--------------------+---------+-----------+
| CDG       | Charles            | Paris   | France    |
| DXB       | Dubai International | Dubai   | UAE       |
| JFK       | John F Kennedy     | New York | USA       |
| LHR       | Heathrow           | London  | UK        |
| SYD       | Sydney Kingsford   | Sydney  | Australia |
+-----------+--------------------+---------+-----------+
5 rows in set (0.01 sec)
```

Retrieve the Name and Count of Aircrafts having more than one

```
mysql> select Name,Count(Name) from Aircraft group by Name having count(Name)>1;
+--------+-------------+
| Name   | Count(Name) |
+--------+-------------+
| Airbus |           4 |
| Boeing |           7 |
+--------+-------------+
2 rows in set (0.00 sec)
```

III. TRANSACTION CONTROL LANGUAGE

1.Savepoint Command:

```
mysql> insert into Fare values(3000,'WELCOME10');
Query OK, 1 row affected (0.02 sec)

mysql> insert into Fare values(3200,'WELCOME20');
Query OK, 1 row affected (0.01 sec)

mysql> select * from Fare;
+--------+-----------+
| Amount | DisCode   |
+--------+-----------+
|   3000 | WELCOME10 |
|   3200 | WELCOME20 |
+--------+-----------+
2 rows in set (0.00 sec)

mysql> Savepoint Fare1;
Query OK, 0 rows affected (0.01 sec)
```

Savepoint Fare1 set after inserting two rows into table Fare

```
mysql> insert into Fare values(1000,'NEW');
Query OK, 1 row affected (0.01 sec)

mysql> insert into Fare values(1300,'NEW500');
Query OK, 1 row affected (0.02 sec)

mysql> insert into Fare values(2000,'USER10');
Query OK, 1 row affected (0.01 sec)

mysql> Savepoint Fare2;
Query OK, 0 rows affected (0.00 sec)

mysql> select * from Fare;
+--------+-----------+
| Amount | DisCode   |
+--------+-----------+
|   3000 | WELCOME10 |
|   3200 | WELCOME20 |
|   1000 | NEW       |
|   1300 | NEW500    |
|   2000 | USER10    |
+--------+-----------+
5 rows in set (0.00 sec)
```

Savepoint Fare2 set after inserting three rows into table Fare

2. Rollback Command:

```
mysql> delete from fare where Amount<2000;
Query OK, 2 rows affected (0.01 sec)

mysql> select * from fare;
+--------+-----------+
| Amount | DisCode   |
+--------+-----------+
|   3000 | WELCOME10 |
|   3200 | WELCOME20 |
|   2000 | USER10    |
+--------+-----------+
3 rows in set (0.01 sec)

mysql> rollback to new;
Query OK, 0 rows affected (0.01 sec)

mysql> select * from fare;
+--------+-----------+
| Amount | DisCode   |
+--------+-----------+
|   3000 | WELCOME10 |
|   3200 | WELCOME20 |
|   2000 | USER10    |
|   1200 | NEW2      |
|   1500 | NEW10     |
+--------+-----------+
```

Rollback to the specified savepoint. After deleting the tuples rollback command executed which retains the deleted rows by returning to the savepoint state.

3. Commit Command:

```
mysql> commit;
Query OK, 0 rows affected (0.01 sec)
```

Permanently saves the transactions and changes made to the database.

4.1.2 IN-BUILT FUNCTIONS OF AIRLINE RESERVATION SYSTEM

I. Aggregate Functions:

```
mysql> select Destination, max(Amount) as Max_Fare, min(Amount) as Min_Fare, avg(Amount) as Avg_Fare from booking group by Destination;
+--------------------+----------+----------+--------------+
| Destination        | Max_Fare | Min_Fare | Avg_Fare     |
+--------------------+----------+----------+--------------+
| CSMIA              |  1470000 |  1470000 | 1470000.0000 |
| Charles De         |   250000 |   250000 |  250000.0000 |
| Dubai International |    57000 |    36000 |   46500.0000 |
| John F Kennedy     |   400000 |   400000 |  400000.0000 |
| Anna International |     3400 |     3400 |    3400.0000 |
| IGI                |     5200 |     5200 |    5200.0000 |
| Heathrow           |   245000 |   245000 |  245000.0000 |
| RGIA               |    36000 |     1900 |   18950.0000 |
+--------------------+----------+----------+--------------+
8 rows in set (0.01 sec)
```

Explanation:
The aggregate functions, MAX(), MIN(), AVG() are utilized to show the maximum, minimum and average fare to all the destinations.

II. Numerical Functions:

```
mysql> select source,destination,round(amount) as fare from booking where discode is not null;
+--------------------+--------------------+--------+
| source             | destination        | fare   |
+--------------------+--------------------+--------+
| CSMIA              | Dubai International |  57000 |
| Anna International | John F Kennedy      | 400000 |
| Kempagowda         | IGI                |   5200 |
| RGIA               | Heathrow           | 245000 |
| Anna International | RGIA               |   1900 |
| RGIA               | Dubai International |  36000 |
| CSMIA              | RGIA               |  36000 |
+--------------------+--------------------+--------+
7 rows in set (0.00 sec)
```

Explanation:
The numerical function round() is used to round the fare to the nearest whole number for those bookings in which discount code is applied.

III. Character Functions:

```
mysql> select Name,upper(Type), Count(Type) from aircraft group by name;
+----------+--------------+--------------+
| Name     | upper(Type) | Count(Type) |
+----------+--------------+--------------+
| Airbus   | COMMERCIAL  |            4 |
| Boeing   | COMMERCIAL  |           10 |
| IndiaOne | GOVT        |            1 |
+----------+--------------+--------------+
3 rows in set (0.00 sec)
```

Explanation:
Converting the aircraft type to uppercase using upper() and display the aircraft type and its count using the count() function

IV. Date Functions:

```
mysql> select Source,last_day(TakeOffDate) as Last_Flight_Date from booking group by Source;
+--------------------+------------------+
| Source             | Last_Flight_Date |
+--------------------+------------------+
| Heathrow           | 2024-05-31       |
| Kempagowda         | 2024-07-31       |
| CSMIA              | 2024-03-31       |
| Anna International | 2024-04-30       |
| RGIA               | 2024-04-30       |
+--------------------+------------------+
5 rows in set (0.00 sec)
```

Explanation:
Using the last_day() function display the last flight of the month from each source airport.

4.1.3 NESTED QUERIES OF AIRLINE RESERVATION SYSTEM

```
mysql> select * from flight where AircraftID in (select AircraftID from aircraft where capacity>150);
+-------+--------------------+--------------------+-----------+-------------+---------------+-------+-----------+---------+------------+
| FSID  | ArrivalAirport     | DepartureAirport   | Status    | ArrivalTime | DepartureTime | crewID | AirportID | PilotID | AircraftID |
+-------+--------------------+--------------------+-----------+-------------+---------------+-------+-----------+---------+------------+
| AI001 | CSMIA              | Dubai International | Scheduled | 10:00:00    | 18:00:00      | C102   | BOM       | P102    | A330       |
| AI002 | Anna International | John F Kennedy     | InAir     | 12:00:00    | 17:00:00      | C101   | MAA       | P103    | A350       |
| IN003 | Kempegowda         | IGI                | Scheduled | 08:00:00    | 09:45:00      | C103   | BLR       | P104    | A380       |
| AA001 | Heathrow           | CSMIA              | InAir     | 06:30:00    | 23:00:00      | C108   | LHR       | P108    | B737       |
| AA002 | Kempagowda         | Charles De         | Scheduled | 01:30:00    | 23:00:00      | C109   | BLR       | P109    | B747       |
| IN004 | RGIA               | Heathrow           | InGate    | 05:00:00    | 23:45:00      | C105   | HYD       | P105    | B747       |
| UK001 | RGIA               | Dubai International | Scheduled | 14:00:00    | 17:00:00      | C106   | DXB       | P106    | B787       |
| UK002 | CSMIA              | RGIA               | Scheduled | 05:00:00    | 07:00:00      | C107   | BOM       | P107    | B787-3     |
+-------+--------------------+--------------------+-----------+-------------+---------------+-------+-----------+---------+------------+
8 rows in set (0.01 sec)
```

Explanation:
Display all the flight details of the aircraft having seating capacity greater than 150

```
mysql> select fsid,arrivalairport,departureairport from flight where pilotid in(select pilotid from pilot where gender='Female');
+-------+--------------------+------------------+
| fsid  | arrivalairport     | departureairport |
+-------+--------------------+------------------+
| AI002 | Anna International | John F Kennedy   |
| IN004 | RGIA               | Heathrow         |
| AA002 | Kempagowda         | Charles De       |
+-------+--------------------+------------------+
3 rows in set (0.01 sec)
```

Explanation:
Retrieving the flight details of the flights flown by female pilots.

```
mysql> select fsid,aircraftid,arrivalairport,departureairport from flight where pilotid in(select pilotid from pilot where gender='Male') and AircraftID like'B%';
+-------+-----------+---------------+--------------------+
| fsid  | aircraftid | arrivalairport | departureairport   |
+-------+-----------+---------------+--------------------+
| UK001 | B787      | RGIA          | Dubai International |
| UK002 | B787-3    | CSMIA         | RGIA               |
| AA001 | B737      | Heathrow      | CSMIA              |
+-------+-----------+---------------+--------------------+
3 rows in set (0.00 sec)
```

Explanation:
Retrieving the flight id, aircraft id, source and destination of those flights which are Boeing and flown by male pilots

```
mysql> select bnum,source,destination,arrivaldate from booking where bnum in(select bnum from ticket where fsid in(select fsid from flight where status='InAir'));
+------+--------------------+---------------+-------------+
| bnum | source             | destination   | arrivaldate |
+------+--------------------+---------------+-------------+
| B001 | Heathrow           | CSMIA         | 2024-05-01  |
| B004 | Anna International | John F Kennedy | 2024-04-25  |
| B007 | RGIA               | Heathrow      | 2024-04-29  |
+------+--------------------+---------------+-------------+
3 rows in set (0.01 sec)
```

Explanation:
The above query retrieves the booking details of the flight which have the status in air. Retrieving the booking number, source, destination and arrival date of flights from the table booking where the booking numbers are retrieved from the table ticket where the flight id in the table is checked against the where condition in the table flight where its status = ‘InAir’.

```
mysql> select * from passenger where TNum in (Select TNum from ticket where Bnum in(select BNum from Booking where TakeOffDate<(sysdate())));
+------------+---------+----------+------------+------------+------+----------+------+--------+------+
| NationalID | FName   | LName    | DOB        | PhNo       | age  | Passport | BNum | QRCode | TNum |
+------------+---------+----------+------------+------------+------+----------+------+--------+------+
| US003      | Adithya | Aggarwal | 1998-02-02 | 8000009976 |   26 | USA      | B003 | Q003   | T003 |
| IND07      | Kishore | Reddy    | 2001-10-31 | 7656899232 |   21 | IND      | B008 | Q008   | T008 |
+------------+---------+----------+------------+------------+------+----------+------+--------+------+
2 rows in set (0.01 sec)
```

Explanation:
Retrieve the passenger details of passengers whose travel date is before the system date.

4.1.4 SET OPERATORS & VIEWS OF AIRLINE RESERVATION SYSTEM

SET OPERATORS:

1.Union Operator

```
mysql> select source,destination from booking union select DepartureAirport,ArrivalAirport from flight where status='Scheduled';
+--------------------+--------------------+
| source             | destination        |
+--------------------+--------------------+
| Heathrow           | CSMIA              |
| Kempagowda         | Charles De         |
| CSMIA              | Dubai International |
| Anna International | John F Kennedy     |
| CSMIA              | Anna International |
| Kempagowda         | IGI                |
| RGIA               | Heathrow           |
| Anna International | RGIA               |
| RGIA               | Dubai International |
| CSMIA              | RGIA               |
| Kempegowda         | IGI                |
+--------------------+--------------------+
11 rows in set (0.01 sec)
```

Explanation:

Retrieve Source and Destination airports from booking and union with the Departure and Arrival Airport from flight where their status is scheduled. No duplicate rows are retrieved.

2. Union All Operator

```
mysql> select source,destination from booking union all select DepartureAirport,ArrivalAirport from flight where status='Scheduled';
+--------------------+--------------------+
| source             | destination        |
+--------------------+--------------------+
| Heathrow           | CSMIA              |
| Kempagowda         | Charles De         |
| CSMIA              | Dubai International |
| Anna International | John F Kennedy     |
| CSMIA              | Anna International |
| Kempagowda         | IGI                |
| RGIA               | Heathrow           |
| Anna International | RGIA               |
| RGIA               | Dubai International |
| CSMIA              | RGIA               |
| Kempagowda         | Charles De         |
| CSMIA              | Dubai International |
| Kempegowda         | IGI                |
| RGIA               | Dubai International |
| CSMIA              | RGIA               |
+--------------------+--------------------+
15 rows in set (0.00 sec)
```

Explanation:

Retrieve Source and Destination airports from booking and union with the Departure and Arrival Airport from flight where their status is scheduled. Duplicate rows are retrieved.

3. Intersect Operator

```
mysql> select source,destination from booking intersect select DepartureAirport,ArrivalAirport from flight where status='Scheduled';
+------------+--------------------+
| source     | destination        |
+------------+--------------------+
| Kempagowda | Charles De         |
| CSMIA      | Dubai International |
| CSMIA      | Anna International |
| Kempagowda | IGI                |
| RGIA       | Heathrow           |
| RGIA       | Dubai International |
| CSMIA      | RGIA               |
+------------+--------------------+
7 rows in set (0.00 sec)
```

Explanation:

Retrieve all the common rows from the table booking and flight to display the source and destination airports.

4. Minus Operator

```
mysql> select source,destination from booking minus select DepartureAirport,ArrivalAirport from flight where status='Scheduled';
+--------------------+--------------------+
| source             | destination        |
+--------------------+--------------------+
| Heathrow           | CSMIA              |
| CSMIA              | Dubai International |
| Anna International | John F Kennedy     |
| CSMIA              | Anna International |
| RGIA               | Heathrow           |
| Anna International | RGIA               |
| RGIA               | Dubai International |
| CSMIA              | RGIA               |
+--------------------+--------------------+
8 rows in set (0.00 sec)
```

Explanation:
Retrieve all the flight routes which are not currently scheduled using MINUS operator

VIEWS:

```
mysql> create view InAirFlights as select bnum,source,destination,arrivaldate from booking where bnum in(select bnum from ticket where fsid in(select fsid from flight where
 status='InAir'));
Query OK, 0 rows affected (0.06 sec)

mysql> select * from InAirFlights;
+------+--------------------+---------------+------------+
| bnum | source             | destination   | arrivaldate |
+------+--------------------+---------------+------------+
| B001 | Heathrow           | CSMIA         | 2024-05-01 |
| B004 | Anna International | John F Kennedy | 2024-04-25 |
| B007 | RGIA               | Heathrow      | 2024-04-29 |
+------+--------------------+---------------+------------+
3 rows in set (0.02 sec)
```

Explanation:
Create a view In Air Flights to display the booking details for the flight which has departed and has not arrived to the destination having flight status as ‘In Air’

```
mysql> create view JumboFlights as  select * from flight where AircraftID in (select AircraftID from aircraft where capacity>150);
Query OK, 0 rows affected (0.03 sec)

mysql> select * from JumboFlights;
+-------+--------------------+---------------------+-----------+-------------+---------------+--------+-----------+---------+------------+
| FSID  | DepartureAirport   | ArrivalAirport      | Status    | ArrivalTime | DepartureTime | crewID | AirportID | PilotID | AircraftID |
+-------+--------------------+---------------------+-----------+-------------+---------------+--------+-----------+---------+------------+
| AI001 | CSMIA              | Dubai International | Scheduled | 10:00:00    | 18:00:00      | C102   | BOM       | P102    | A330       |
| AI002 | Anna International | John F Kennedy      | InAir     | 12:00:00    | 17:00:00      | C101   | MAA       | P103    | A350       |
| IN003 | Kempegowda         | IGI                 | Scheduled | 08:00:00    | 09:45:00      | C103   | BLR       | P104    | A380       |
| AA001 | Heathrow           | CSMIA               | InAir     | 06:30:00    | 23:00:00      | C108   | LHR       | P108    | B737       |
| AA002 | Kempagowda         | Charles De          | Scheduled | 01:30:00    | 23:00:00      | C109   | BLR       | P109    | B747       |
| IN004 | RGIA               | Heathrow            | InAir     | 05:00:00    | 23:45:00      | C105   | HYD       | P105    | B747       |
| UK001 | RGIA               | Dubai International | Scheduled | 14:00:00    | 17:00:00      | C106   | DXB       | P106    | B787       |
| UK002 | CSMIA              | RGIA                | Scheduled | 05:00:00    | 07:00:00      | C107   | BOM       | P107    | B787-3     |
+-------+--------------------+---------------------+-----------+-------------+---------------+--------+-----------+---------+------------+
8 rows in set (0.01 sec)
```

Explanation:
Create a view Jumbo Flights to store all the flight details of the aircraft having the seating capacity above 150

```
mysql> create or replace view JourneySummary as select booking.bnum,booking.source,booking.destination,passenger.fname,passenger.lname from booking,passenger where passenge
r.bnum=booking.bnum;
Query OK, 0 rows affected (0.05 sec)

mysql> select * from JourneySummary;
+------+------------------+-------------------+--------+---------+
| bnum | source           | destination       | fname  | lname   |
+------+------------------+-------------------+--------+---------+
| B001 | Heathrow         | CSMIA             | Arun   | Kumar   |
| B002 | Kempagowda       | Charles De        | Ashok  | Sinha   |
| B003 | CSMIA            | Dubai International | Adithya | Aggarwal |
| B004 | Anna International | John F Kennedy  | Dev    | Singh   |
| B005 | CSMIA            | Anna International | Vishal | Raghavan |
| B006 | Kempagowda       | IGI               | Viraj  | Kumar   |
| B007 | RGIA             | Heathrow          | Surya  | Siraj   |
| B008 | Anna International | RGIA            | Kishore | Reddy  |
| B009 | RGIA             | Dubai International | Nandan | Bandaru |
| B010 | CSMIA            | RGIA              | Rahul  | Yadav   |
+------+------------------+-------------------+--------+---------+
10 rows in set (0.01 sec)
```

Explanation:
Create a view of the Journey Summary of the Passengers containing the attributes booking number, Source Airport, Destination Airport and Passenger Name.

```
mysql> create or replace view FlightID as select FSID,PilotID,AirportID,AircraftID,crewID as LeadCrewID from flight;
Query OK, 0 rows affected (0.04 sec)

mysql> select * from FlightID;
+-------+---------+-----------+------------+------------+
| FSID  | PilotID | AirportID | AircraftID | LeadCrewID |
+-------+---------+-----------+------------+------------+
| AA001 | P108    | LHR       | B737       | C108       |
| AA002 | P109    | BLR       | B747       | C109       |
| AI001 | P102    | BOM       | A330       | C102       |
| AI002 | P103    | MAA       | A350       | C101       |
| AI100 | P101    | BOM       | A320N      | C104       |
| IN003 | P104    | BLR       | A380       | C103       |
| IN004 | P105    | HYD       | B747       | C105       |
| SJ001 | P110    | MAA       | A320N      | C110       |
| UK001 | P106    | DXB       | B787       | C106       |
| UK002 | P107    | BOM       | B787-3     | C107       |
+-------+---------+-----------+------------+------------+
10 rows in set (0.01 sec)
```

Explanation:
Create view for all the unique id related to the flight such as the fsid, pilot id, aircraft id, airport id and lead crew id.

4.1.5 PL/SQL PROCEDURES AND FUNCTIOS OF AIRLINE RESERVATION SYSTEM

I. PROCEDURES

1.Check Baggage Weight

```
mysql> CREATE PROCEDURE CheckBaggageWeightLimit(
    ->     IN baggage_weight DECIMAL(10,2)
    -> )
    -> BEGIN
    ->     DECLARE error_message VARCHAR(100);
    ->
    ->     IF baggage_weight > 23 THEN
    ->         SET error_message = 'Baggage weight exceeds the limit of 23 kgs.';
    ->         SIGNAL SQLSTATE '45000' SET MESSAGE_TEXT = error_message;
    ->     ELSE
    ->         SELECT 'Baggage weight is within the limit.';
    ->     END IF;
    -> END//
Query OK, 0 rows affected (0.11 sec)

mysql>
mysql> DELIMITER ;
mysql> CALL CheckBaggageWeightLimit(20.5);
+-------------------------------------+
| Baggage weight is within the limit. |
+-------------------------------------+
| Baggage weight is within the limit. |
+-------------------------------------+
1 row in set (0.01 sec)

Query OK, 0 rows affected (0.02 sec)
```

Explanation:

The MySQL procedure CheckBaggageWeightLimit ensures that baggage weight remains under the 23 kg limit. If the weight exceeds this threshold, it triggers an error message. Otherwise, it confirms the weight falls within the acceptable range. This procedure aids in enforcing weight restrictions for efficient baggage handling and compliance with airline regulations. Its concise implementation streamlines the process of validating baggage weights, enhancing operational efficiency and customer satisfaction.

The procedure employs a decimal data type to accommodate precise weight measurements. It utilizes conditional logic to determine whether the baggage weight exceeds the specified limit, enhancing flexibility and accuracy in weight validation. By encapsulating this logic within a reusable procedure, it promotes code modularity and maintainability, facilitating integration into broader database systems.

2. Get Flight Details by Departure Airport

```
mysql> DELIMITER $$
mysql>
mysql> CREATE PROCEDURE GetFlightsByDepartureAirport(
    ->     IN inputDepartureAirport VARCHAR(255)
    -> )
    -> BEGIN
    ->     SELECT * FROM flight WHERE departureAirport = inputDepartureAirport;
    -> END$$
Query OK, 0 rows affected (0.01 sec)

mysql>
mysql> DELIMITER ;
mysql> CALL GetFlightsByDepartureAirport('CSMIA');
+-------+------------------+--------------------+-----------+-------------+---------------+-------+-----------+---------+------------+
| FSID  | DepartureAirport | ArrivalAirport     | Status    | ArrivalTime | DepartureTime | crewID | AirportID | PilotID | AircraftID |
+-------+------------------+--------------------+-----------+-------------+---------------+-------+-----------+---------+------------+
| AI001 | CSMIA            | Dubai International | Scheduled | 10:00:00    | 18:00:00      | C102   | BOM       | P102    | A330       |
| AI100 | CSMIA            | Anna International  | Landed    | 16:00:00    | 18:00:00      | C104   | BOM       | P101    | A320N      |
| UK002 | CSMIA            | RGIA               | Scheduled | 05:00:00    | 07:00:00      | C107   | BOM       | P107    | B787-3     |
+-------+------------------+--------------------+-----------+-------------+---------------+-------+-----------+---------+------------+
3 rows in set (0.01 sec)

Query OK, 0 rows affected (0.12 sec)
```

Explanation:

Procedure Name and Parameters: The procedure is named GetFlightsByDepartureAirport, and it accepts one parameter, inputDepartureAirport, which should be the code or name of the departure airport as provided by the user.

Query Execution: Inside the procedure, the SELECT statement is used to fetch all columns from the flight table where the departureAirport column matches the inputDepartureAirport parameter provided.

II. FUNCTIONS

1. Get Flight Count from Departure Airport

```
mysql> CREATE FUNCTION GetFlightCountFromAirport(departureAirportCode VARCHAR(255))
    -> RETURNS INT
    -> DETERMINISTIC
    -> BEGIN
    ->     DECLARE flightCount INT;
    ->     SELECT COUNT(*) INTO flightCount
    ->     FROM flight
    ->     WHERE departureAirport = departureAirportCode;
    ->     RETURN flightCount;
    -> END$$
Query OK, 0 rows affected (0.02 sec)

mysql>
mysql> DELIMITER ;
mysql>
mysql> SELECT GetFlightCountFromAirport('RGIA') AS FlightCountFromRGIA;
+---------------------+
| FlightCountFromRGIA |
+---------------------+
|                   2 |
+---------------------+
1 row in set (0.01 sec)
```

Explanation:

The GetFlightCountFromAirport function retrieves the count of flights available from a specified departure airport. Here's a succinct explanation in 8 lines:

- **Function Purpose:** GetFlightCountFromAirport counts flights departing from a given airport.
- **Input Parameter:** It takes a departure airport code (departureAirportCode) as input.
- **Function Type:** This function is DETERMINISTIC, ensuring consistent results.
- **Query Execution:** It queries the flight table for flights departing from the specified airport.
- **Count Retrieval:** The function retrieves the count of matching flights.
- **Return:** The count is returned as the function result.
- **Example Usage:** It can be used like SELECT GetFlightCountFromAirport('RGIA') AS FlightCountFromRGIA;.
- **Result:** It provides a quick way to obtain flight counts based on departure airports.

2. Baggage Status and Timestamp

```
mysql> CREATE FUNCTION CheckBaggageStatusAndTimestamps(inputWeight FLOAT)
    -> RETURNS VARCHAR(100)
    -> DETERMINISTIC
    -> BEGIN
    ->     DECLARE status VARCHAR(50);
    ->     DECLARE currentTimestamp VARCHAR(50);
    ->     DECLARE result VARCHAR(100);
    ->
    ->     -- Get current timestamp
    ->     SET currentTimestamp = CONCAT('Timestamp: ', NOW());
    ->
    ->     -- Directly check baggage weight and set status
    ->     IF inputWeight > 23 THEN
    ->         SET status = 'Exceeds weight limit';
    ->     ELSE
    ->         SET status = 'Within weight limit';
    ->     END IF;
    ->
    ->     -- Combine status with the current timestamp
    ->     SET result = CONCAT(status, ' at ', currentTimestamp);
    ->
    ->     RETURN result;
    -> END$$
Query OK, 0 rows affected (0.01 sec)
```

Explanation:

Function Declaration:
The function CheckBaggageStatusAndTimestamp is created, taking inputWeight as its parameter and returning a VARCHAR(100) string.

Variable Declarations:

- status to hold the message about the baggage weight.
- currentTimestamp to store the current time and date.
- result to concatenate and store the final message.

Get Current Timestamp:
The NOW() function is used to obtain the current timestamp, which is then concatenated with the text 'Timestamp: ' and stored in currentTimestamp.

Check Baggage Weight:
An IF statement directly checks if inputWeight exceeds 23. Depending on the condition, status is set to either 'Exceeds weight limit' or 'Within weight limit'.

Combine Status and Timestamp:
The status and currentTimestamp are concatenated with additional text ' at ' to form the final message, which is stored in result.

4.1.6 PL/SQL CURSORS AND EXCEPTIONAL HANDLING OF AIRLINE RESERVATION SYSTEM

I.CURSORS

1.Display Passenger Details

```
mysql> CREATE PROCEDURE ProcessPassengerDataCorrectly()
    -> BEGIN
    ->     -- Declare variables to hold data fetched from the cursor
    ->     DECLARE v_nationalID VARCHAR(255);
    ->     DECLARE v_fname VARCHAR(255);
    ->     DECLARE v_lname VARCHAR(255);
    ->
    ->     -- Declare a variable to determine the end of the cursor loop
    ->     DECLARE done INT DEFAULT FALSE;
    ->
    ->     -- Declare the cursor for the SELECT statement
    ->     DECLARE passengerCursor CURSOR FOR
    ->         SELECT nationalID, fname, lname FROM passenger;
    ->
    ->     -- Declare continue handler for the cursor
    ->     DECLARE CONTINUE HANDLER FOR NOT FOUND SET done = TRUE;
    ->
    ->     -- Open the cursor
    ->     OPEN passengerCursor;
    ->
    ->     -- Start the loop
    ->     read_loop: LOOP
    ->         -- Fetch data from the cursor into the variables
    ->         FETCH passengerCursor INTO v_nationalID, v_fname, v_lname;
    ->
    ->         -- Check if there are no more rows to fetch
    ->         IF done THEN
    ->             LEAVE read_loop;
    ->         END IF;
    ->
    ->         -- Display the fetched data
    ->         -- Please note, SELECT in a procedure like this might not directly show results in all SQL clients
    ->         SELECT v_nationalID, CONCAT(v_fname, ' ', v_lname) AS FullName;
    ->
    ->     END LOOP;
    ->
    ->     -- Close the cursor
    ->     CLOSE passengerCursor;
    -> END$$
```

Explanation:

- Variables are declared to hold nationalID, fname, and lname.
- An integer variable done is initialized to indicate the end of cursor looping.
- A cursor named passengerCursor is declared to select nationalID, fname, and lname from the passenger table.
- A handler is set to manage the situation when no more rows are found during cursor fetching.
- The cursor is opened to start fetching rows.
- A loop is initiated to iterate through the rows fetched by the cursor.
- Data fetched by the cursor is assigned to respective variables.
- The loop checks if there are more rows to fetch using the done variable.
- If there are more rows, fetched data is displayed using a SELECT statement. (Note: Directly displaying results using SELECT may not work in all environments.)
- The loop continues until all rows are fetched.
- After looping through all rows, the cursor is closed.

Output:

```
mysql> DELIMITER ;
mysql> CALL ProcessPassengerDataCorrectly();
+--------------+------------+
| v_nationalID | FullName   |
+--------------+------------+
| IND01        | Arun Kumar |
+--------------+------------+
1 row in set (0.01 sec)

+--------------+-------------+
| v_nationalID | FullName    |
+--------------+-------------+
| IND02        | Ashok Sinha |
+--------------+-------------+
1 row in set (0.06 sec)

+--------------+-----------+
| v_nationalID | FullName  |
+--------------+-----------+
| IND03        | Dev Singh |
+--------------+-----------+
1 row in set (0.10 sec)

+--------------+----------------+
| v_nationalID | FullName       |
+--------------+----------------+
| IND04        | Vishal Raghavan |
+--------------+----------------+
1 row in set (0.15 sec)

+--------------+-------------+
| v_nationalID | FullName    |
+--------------+-------------+
| IND05        | Viraj Kumar |
+--------------+-------------+
1 row in set (0.20 sec)

+--------------+--------------+
| v_nationalID | FullName     |
+--------------+--------------+
| IND06        | Surya Siraj  |
+--------------+--------------+
1 row in set (0.24 sec)

+--------------+---------------+
| v_nationalID | FullName      |
+--------------+---------------+
| IND07        | Kishore Reddy |
+--------------+---------------+
1 row in set (0.29 sec)

+--------------+----------------+
| v_nationalID | FullName       |
+--------------+----------------+
| IND08        | Nandan Bandaru |
+--------------+----------------+
1 row in set (0.34 sec)

+--------------+--------------+
| v_nationalID | FullName     |
+--------------+--------------+
| IND09        | Rahul Yadav  |
+--------------+--------------+
1 row in set (0.39 sec)

+--------------+-------------------+
| v_nationalID | FullName          |
+--------------+-------------------+
| US003        | Adithya Aggarwal  |
+--------------+-------------------+
1 row in set (0.44 sec)

Query OK, 0 rows affected (0.49 sec)
```

2. Process Flight Details

```
mysql> CREATE PROCEDURE ProcessFlightsData()
    -> BEGIN
    ->     -- Declare variables to hold data fetched from the cursor
    ->     DECLARE v_fsid VARCHAR(255);
    ->     DECLARE v_departureAirport VARCHAR(255);
    ->     DECLARE v_arrivalAirport VARCHAR(255);
    ->     DECLARE v_status VARCHAR(50);
    ->
    ->     -- This variable is needed to determine when the cursor has reached the end of the result set
    ->     DECLARE done INT DEFAULT FALSE;
    ->
    ->     -- Declare the cursor for the SELECT statement
    ->     DECLARE flightCursor CURSOR FOR
    ->         SELECT fsid, departureAirport, ArrivalAirport, Status FROM flight;
    ->
    ->     -- Declare CONTINUE handler for NOT FOUND condition
    ->     DECLARE CONTINUE HANDLER FOR NOT FOUND SET done = TRUE;
    ->
    ->     -- Open the cursor
    ->     OPEN flightCursor;
    ->
    ->     -- Loop through all rows in the cursor
    ->     read_loop: LOOP
    ->         -- Fetch the next row from the cursor
    ->         FETCH flightCursor INTO v_fsid, v_departureAirport, v_arrivalAirport, v_status;
    ->
    ->         IF done THEN
    ->             -- If no more rows, leave the loop
    ->             LEAVE read_loop;
    ->         END IF;
    ->
    ->         -- Output the fetched data
    ->         -- Note: This SELECT statement might not display as expected in all clients, especially in non-interactive environments
    ->         SELECT v_fsid, v_departureAirport, v_arrivalAirport, v_status;
    ->
    ->     END LOOP;
    ->
    ->     -- Close the cursor
```

Output:

```
mysql> DELIMITER ;
mysql> CALL ProcessFlightsData();
+--------+--------------------+------------------+----------+
| v_fsid | v_departureAirport | v_arrivalAirport | v_status |
+--------+--------------------+------------------+----------+
| AA001  | Heathrow           | CSMIA            | InAir    |
+--------+--------------------+------------------+----------+
1 row in set (0.00 sec)

+--------+--------------------+------------------+-----------+
| v_fsid | v_departureAirport | v_arrivalAirport | v_status  |
+--------+--------------------+------------------+-----------+
| AA002  | Kempagowda         | Charles De       | Scheduled |
+--------+--------------------+------------------+-----------+
1 row in set (0.04 sec)

+--------+--------------------+--------------------+-----------+
| v_fsid | v_departureAirport | v_arrivalAirport   | v_status  |
+--------+--------------------+--------------------+-----------+
| AI001  | CSMIA              | Dubai International | Scheduled |
+--------+--------------------+--------------------+-----------+
1 row in set (0.10 sec)

+--------+--------------------+------------------+----------+
| v_fsid | v_departureAirport | v_arrivalAirport | v_status |
+--------+--------------------+------------------+----------+
| AI002  | Anna International | John F Kennedy   | InAir    |
+--------+--------------------+------------------+----------+
1 row in set (0.14 sec)

+--------+--------------------+--------------------+----------+
| v_fsid | v_departureAirport | v_arrivalAirport   | v_status |
+--------+--------------------+--------------------+----------+
| AI100  | CSMIA              | Anna International | Landed   |
+--------+--------------------+--------------------+----------+
1 row in set (0.19 sec)
```

3. Change Scheduled Flight Status to Delayed

```
mysql> CREATE PROCEDURE DisplayScheduledAsDelayed()
    -> BEGIN
    ->     -- Declare variables to hold flight details
    ->     DECLARE v_fsid VARCHAR(255);
    ->     DECLARE v_departureAirport VARCHAR(255);
    ->     DECLARE v_ArrivalAirport VARCHAR(255);
    ->     DECLARE done INT DEFAULT FALSE;
    ->
    ->     -- Cursor to select scheduled flights
    ->     DECLARE scheduledFlightsCursor CURSOR FOR
    ->         SELECT fsid, departureAirport, ArrivalAirport
    ->         FROM flight
    ->         WHERE Status = 'Scheduled';
    ->
    ->     -- Handler for no more rows
    ->     DECLARE CONTINUE HANDLER FOR NOT FOUND SET done = TRUE;
    ->
    ->     OPEN scheduledFlightsCursor; -- Open the cursor
    ->
    ->     read_loop: LOOP
    ->         FETCH scheduledFlightsCursor INTO v_fsid, v_departureAirport, v_ArrivalAirport;
    ->         IF done THEN
    ->             LEAVE read_loop;
    ->         END IF;
    ->
    ->         -- Display flight details with Status artificially set to 'Delayed'
    ->         SELECT v_fsid AS FlightID,
    ->                v_departureAirport AS DepartureAirport,
    ->                v_ArrivalAirport AS ArrivalAirport,
    ->                'Delayed' AS Status;
    ->     END LOOP;
    ->
    ->     CLOSE scheduledFlightsCursor; -- Close the cursor
    -> END$$
Query OK, 0 rows affected (0.02 sec)
```

Output:

```
mysql> DELIMITER ;
mysql> CALL DisplayScheduledAsDelayed();
+----------+------------------+----------------+---------+
| FlightID | DepartureAirport | ArrivalAirport | Status  |
+----------+------------------+----------------+---------+
| AA002    | Kempagowda       | Charles De     | Delayed |
+----------+------------------+----------------+---------+
1 row in set (0.00 sec)

+----------+------------------+---------------------+---------+
| FlightID | DepartureAirport | ArrivalAirport      | Status  |
+----------+------------------+---------------------+---------+
| AI001    | CSMIA            | Dubai International | Delayed |
+----------+------------------+---------------------+---------+
1 row in set (0.04 sec)

+----------+------------------+----------------+---------+
| FlightID | DepartureAirport | ArrivalAirport | Status  |
+----------+------------------+----------------+---------+
| IN003    | Kempegowda       | IGI            | Delayed |
+----------+------------------+----------------+---------+
1 row in set (0.09 sec)

+----------+------------------+---------------------+---------+
| FlightID | DepartureAirport | ArrivalAirport      | Status  |
+----------+------------------+---------------------+---------+
| UK001    | RGIA             | Dubai International | Delayed |
+----------+------------------+---------------------+---------+
1 row in set (0.13 sec)

+----------+------------------+----------------+---------+
| FlightID | DepartureAirport | ArrivalAirport | Status  |
+----------+------------------+----------------+---------+
| UK002    | CSMIA            | RGIA           | Delayed |
+----------+------------------+----------------+---------+
1 row in set (0.18 sec)
```

II. EXCEPTIONAL HANDLING

1.Check Baggage Weight

```
mysql> CREATE PROCEDURE CheckBaggageWeight(IN inputWeight FLOAT)
    -> BEGIN
    ->     DECLARE weightStatus VARCHAR(100);
    ->     DECLARE exc_negative_weight CONDITION FOR SQLSTATE '45000';
    ->
    ->     -- Check for negative weight and raise a custom exception if found
    ->     IF inputWeight < 0 THEN
    ->         SIGNAL exc_negative_weight SET MESSAGE_TEXT = 'Negative weight is not allowed.';
    ->     ELSE
    ->         IF inputWeight > 23 THEN
    ->             SET weightStatus = 'Exceeds weight limit';
    ->         ELSE
    ->             SET weightStatus = 'Within weight limit';
    ->         END IF;
    ->
    ->         -- Output the status
    ->         SELECT weightStatus AS 'Baggage Weight Status';
    ->     END IF;
    -> END$$
Query OK, 0 rows affected (0.01 sec)
```

Output:

```
mysql>
mysql> DELIMITER ;
mysql> CALL CheckBaggageWeight(20);
+-----------------------+
| Baggage Weight Status |
+-----------------------+
| Within weight limit   |
+-----------------------+
1 row in set (0.00 sec)

Query OK, 0 rows affected (0.03 sec)

mysql> CALL CheckBaggageWeight(24);
+-----------------------+
| Baggage Weight Status |
+-----------------------+
| Exceeds weight limit  |
+-----------------------+
1 row in set (0.00 sec)

Query OK, 0 rows affected (0.03 sec)

mysql> CALL CheckBaggageWeight(-5);
ERROR 1644 (45000): Negative weight is not allowed.
mysql>
```

Explanation:

- Input: Accepts weight as input
- Error Handling: Raises a custom exception if weight exeeds>23
- Output: Returns Baggage Weight Status

2. Check Passenger Details

```
mysql> CREATE FUNCTION GetPassengerDetails(
    ->     p_nationalID VARCHAR(255)
    -> )
    -> RETURNS VARCHAR(255)
    -> DETERMINISTIC
    -> BEGIN
    ->     DECLARE passengerInfo VARCHAR(255);
    ->
    ->     -- Check if the provided nationalID exists
    ->     SELECT CONCAT_WS(', ', nationalID, fname, lname)
    ->     INTO passengerInfo
    ->     FROM passenger
    ->     WHERE nationalID = p_nationalID;
    ->
    ->     -- Check if passengerInfo is NULL, indicating no record found
    ->     IF passengerInfo IS NULL THEN
    ->         SIGNAL SQLSTATE '45000'
    ->             SET MESSAGE_TEXT = 'User-defined exception: Passenger not found.';
    ->     ELSE
    ->         RETURN passengerInfo;
    ->     END IF;
    -> END$$
Query OK, 0 rows affected (0.03 sec)
```

Output:

```
mysql> SELECT GetPassengerDetails('IND01') AS PassengerDetails;
+--------------------+
| PassengerDetails   |
+--------------------+
| IND01, Arun, Kumar |
+--------------------+
1 row in set (0.02 sec)

mysql>
mysql> SELECT GetPassengerDetails('US031') AS PassengerDetails;
ERROR 1644 (45000): User-defined exception: Passenger not found.
mysql>
```

Explanation:

- Input: Accepts a national ID as input.
- Query: Retrieves passenger details based on the national ID.
- Error Handling: Raises a custom exception if no record is found.
- Output: Returns passenger details as a concatenated string.
- Usage: Call with a national ID to retrieve passenger details or handle exceptions.

CHAPTER V

APPLICATIONS

An airline reservation system (ARS) is a vital component of the aviation industry, facilitating the efficient management of flight bookings, seat availability, and passenger information. First and foremost, an ARS serves as a centralized database where airlines can store and manage information regarding flight schedules, routes, and seat availability. By providing real-time updates on seat availability, an ARS empowers airlines to maximize their revenue potential by effectively managing overbooking situations and implementing dynamic pricing strategies based on demand.

Moreover, an ARS plays a crucial role in facilitating the booking process for travelers. Through user-friendly interfaces, such as airline websites or mobile applications, passengers can easily search for flights, compare prices, and make reservations in a matter of minutes. Additionally, an ARS can integrate with payment gateways to enable secure online transactions, further enhancing the booking experience for passengers.

In addition to flight reservations, an ARS also manages passenger information and itinerary details, ensuring a smooth travel experience from booking to boarding. The system stores passenger profiles, including personal information and travel preferences, which allows airlines to personalize services and tailor offerings to individual travelers. Overall, the application of an airline reservation system is instrumental in modernizing and optimizing the airline industry's booking and operations processes.

Furthermore, an ARS enhances operational efficiency by automating various tasks such as ticket issuance and seat allocation. This automation reduces manual errors and speeds up processes, allowing airlines to handle a larger volume of bookings with ease. Additionally, ARS generates comprehensive reports and analytics, providing airlines with valuable insights into booking trends, revenue performance, and customer behavior. By leveraging this data-driven approach, airlines can make informed decisions to improve service quality, optimize pricing strategies, and enhance overall competitiveness in the dynamic aviation market.

CHAPTER VI

CONCLUSION

During the development stage of the airline reservation system's back end, the adoption of PL/SQL procedures, functions, cursors, and exceptional handling mechanisms significantly bolstered the system's functionality and reliability.

Procedures were utilized to handle tasks such as updating flight information, processing reservation requests, and managing payment transactions. By organizing functionality into procedures, developers could efficiently manage the complexity of the system and promote code reusability across different modules.

Functions were employed to calculate total fares based on flight details and passenger preferences, ensuring accurate pricing for reservations. By integrating functions into SQL queries, developers could streamline data manipulation tasks and enhance the efficiency of the system's operations.

Cursors were utilized to retrieve passenger information for a particular flight or iterate through reservation records. By leveraging cursors, developers could implement complex data processing logic and efficiently manage large datasets within the system.

Exception handling mechanisms were essential for managing errors and exceptions that could arise during the execution of PL/SQL code. Exception blocks were employed to catch and handle errors gracefully, ensuring that the system could recover from unexpected situations without compromising data integrity or system stability.

In conclusion, the incorporation of PL/SQL procedures, functions, cursors, and exceptional handling mechanisms played a crucial role in the development of a robust and reliable back-end system for the airline reservation system. These features empowered developers to build a scalable, efficient, and fault-tolerant system capable of delivering a seamless and user-friendly experience for both airlines and passengers.

CHAPTER VII

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