Database for SQL Database Analysis

CREATE DATABASE AirlineDB

```
CREATE TABLE Airports (
   airport_code CHAR(3) PRIMARY KEY,
   airport_name VARCHAR(100) NOT NULL,
   city VARCHAR(50),
   country VARCHAR(50)
);
```

```
CREATE TABLE Aircrafts (
   aircraft_code CHAR(3) PRIMARY KEY,
   model VARCHAR(100) NOT NULL,
   range_km INT NOT NULL
);
```

```
CREATE TABLE Seats (
   aircraft_code CHAR(3),
   seat_no VARCHAR(5),
   fare_conditions ENUM('Economy','Comfort','Business'),
   PRIMARY KEY (aircraft_code, seat_no),
   FOREIGN KEY (aircraft_code) REFERENCES Aircrafts(aircraft_code)
);
```

```
CREATE TABLE Flights (
   flight_id INT AUTO_INCREMENT PRIMARY KEY,
   flight_no VARCHAR(10) NOT NULL,
   scheduled_departure DATETIME NOT NULL,
   scheduled_arrival DATETIME NOT NULL,
```

```
    departure_airport CHAR(3),
    arrival_airport CHAR(3),
    status ENUM('Scheduled','On Time','Delayed','Departed','Arrived','Cancelled') DEFAULT
'Scheduled',
    aircraft_code CHAR(3),
    actual_departure DATETIME,
    actual_arrival DATETIME,
    FOREIGN KEY (departure_airport) REFERENCES Airports(airport_code),
    FOREIGN KEY (arrival_airport) REFERENCES Airports(airport_code),
    FOREIGN KEY (aircraft_code) REFERENCES Aircrafts(aircraft_code)
);
-----------------------------------------------------------------------------------------------------------------------------------
CREATE TABLE Bookings (
    book_ref CHAR(6) PRIMARY KEY,
    book_date DATETIME NOT NULL,
    total_amount DECIMAL(10,2) NOT NULL
);
-----------------------------------------------------------------------------------------------------------------------------------
CREATE TABLE Tickets (
    ticket_no CHAR(13) PRIMARY KEY,
    book_ref CHAR(6),
    passenger_name VARCHAR(100) NOT NULL,
    passenger_id VARCHAR(20),
    contact_data JSON,
    FOREIGN KEY (book_ref) REFERENCES Bookings(book_ref)
);
-----------------------------------------------------------------------------------------------------------------------------------
CREATE TABLE Ticket_Flights (
    ticket_no CHAR(13),
    flight_id INT,
    fare_conditions ENUM('Economy','Comfort','Business'),
```

```
    amount DECIMAL(10,2) NOT NULL,
    PRIMARY KEY (ticket_no, flight_id),
    FOREIGN KEY (ticket_no) REFERENCES Tickets(ticket_no),
    FOREIGN KEY (flight_id) REFERENCES Flights(flight_id)
);
```

```
CREATE TABLE Boarding_Passes (
    ticket_no CHAR(13),
    flight_id INT,
    boarding_no INT,
    seat_no VARCHAR(5),
    PRIMARY KEY (ticket_no, flight_id),
    FOREIGN KEY (ticket_no, flight_id) REFERENCES Ticket_Flights(ticket_no, flight_id),
    FOREIGN KEY (flight_id) REFERENCES Flights(flight_id)
);
```

Inserting Values into Database

```
INSERT INTO Airports (airport_code, airport_name, city, country) VALUES
('DEL', 'Indira Gandhi International Airport', 'Delhi', 'India'),
('DXB', 'Dubai International Airport', 'Dubai', 'UAE'),
('JFK', 'John F Kennedy International Airport', 'New York', 'USA'),
('LHR', 'Heathrow Airport', 'London', 'UK'),
('BOM', 'Chhatrapati Shivaji Maharaj International Airport', 'Mumbai', 'India'),
('SIN', 'Changi Airport', 'Singapore', 'Singapore'),
('SYD', 'Sydney Kingsford Smith Airport', 'Sydney', 'Australia'),
('CDG', 'Charles de Gaulle Airport', 'Paris', 'France'),
('FCO', 'Leonardo da Vinci Airport', 'Rome', 'Italy'),
('YYZ', 'Toronto Pearson International Airport', 'Toronto', 'Canada');
```

```
INSERT INTO Aircrafts (aircraft_code, model, range_km) VALUES
```

('777', 'Boeing 777', 14300),

('320', 'Airbus A320', 6100),

('737', 'Boeing 737', 5865),

('388', 'Airbus A380', 15700),

('787', 'Boeing 787', 14140);

INSERT INTO Seats (aircraft_code, seat_no, fare_conditions) VALUES

('777', '1A', 'Business'),

('777', '1B', 'Business'),

('777', '1C', 'Business'),

('777', '1D', 'Business'),

('777', '10A', 'Economy'),

('777', '10B', 'Economy'),

('777', '10C', 'Economy'),

('777', '10D', 'Economy'),

('320', '1A', 'Business'),

('320', '1B', 'Business'),

('320', '2A', 'Business'),

('320', '2B', 'Business'),

('320', '10A', 'Economy'),

('320', '10B', 'Economy'),

('320', '10C', 'Economy'),

('320', '10D', 'Economy'),

('737', '1A', 'Business'),

('737', '1B', 'Business'),

('737', '2A', 'Business'),

('737', '2B', 'Business'),

('737', '10A', 'Economy'),

('737', '10B', 'Economy'),

('737', '10C', 'Economy'),

('737', '10D', 'Economy');

INSERT INTO Bookings (book_ref, book_date, total_amount) VALUES

('AB1234', '2025-06-15 10:30:00', 182000.00),

('CD5678', '2025-07-20 14:45:00', 95500.00),

('EF9012', '2025-08-10 09:15:00', 78750.00),

('GH3456', '2025-09-05 16:20:00', 120000.00),

('IJ7890', '2025-06-25 11:30:00', 85000.00);

INSERT INTO Flights (flight_no, scheduled_departure, scheduled_arrival, departure_airport, arrival_airport, status, aircraft_code, actual_departure, actual_arrival) VALUES

('EK512', '2025-06-01 08:00:00', '2025-06-01 10:30:00', 'DEL', 'DXB', 'Arrived', '777', '2025-06-01 08:15:00', '2025-06-01 10:45:00'),

('EK515', '2025-06-02 14:00:00', '2025-06-02 16:30:00', 'DEL', 'DXB', 'Arrived', '777', '2025-06-02 14:00:00', '2025-06-02 16:30:00'),

('BA115', '2025-06-01 18:00:00', '2025-06-02 06:00:00', 'JFK', 'LHR', 'Arrived', '388', '2025-06-01 18:30:00', '2025-06-02 06:30:00'),

('SQ421', '2025-06-01 22:00:00', '2025-06-02 06:30:00', 'BOM', 'SIN', 'Arrived', '787', '2025-06-01 22:45:00', '2025-06-02 07:15:00'),

('EK414', '2025-06-01 10:00:00', '2025-06-02 05:00:00', 'DXB', 'SYD', 'Arrived', '388', '2025-06-01 10:00:00', '2025-06-02 05:00:00'),

('AF1234', '2025-06-01 12:00:00', '2025-06-01 14:00:00', 'CDG', 'FCO', 'Arrived', '320', '2025-06-01 12:00:00', '2025-06-01 14:00:00'),

('AI131', '2025-06-01 13:00:00', '2025-06-01 17:30:00', 'BOM', 'LHR', 'Arrived', '777', '2025-06-01 14:18:00', '2025-06-01 18:48:00'),

('AI101', '2025-06-01 15:00:00', '2025-06-02 02:00:00', 'DEL', 'JFK', 'Arrived', '777', '2025-06-01 16:05:00', '2025-06-02 03:05:00'),

('AI201', '2025-06-03 08:00:00', '2025-06-03 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI202', '2025-06-04 08:00:00', '2025-06-04 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI301', '2025-07-01 08:00:00', '2025-07-01 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI302', '2025-07-02 08:00:00', '2025-07-02 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI401', '2025-08-01 08:00:00', '2025-08-01 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI402', '2025-08-02 08:00:00', '2025-08-02 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI501', '2025-09-01 08:00:00', '2025-09-01 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL),

('AI502', '2025-09-02 08:00:00', '2025-09-02 10:00:00', 'DEL', 'BOM', 'Scheduled', '320', NULL, NULL);

INSERT INTO Tickets (ticket_no, book_ref, passenger_name, passenger_id, contact_data) VALUES

('TKT0010001001', 'AB1234', 'Rahul Sharma', 'PASS001', '{"email": "rahul@email.com", "phone": "+911234567890"}'),

('TKT0010001002', 'CD5678', 'Aisha Khan', 'PASS002', '{"email": "aisha@email.com", "phone": "+911234567891"}'),

('TKT0010001003', 'EF9012', 'John Doe', 'PASS003', '{"email": "john@email.com", "phone": "+11234567890"}'),

('TKT0010001004', 'GH3456', 'Ramesh Kumar', 'PASS004', '{"email": "ramesh@email.com", "phone": "+911234567892"}'),

('TKT0010001005', 'IJ7890', 'Sarah Wilson', 'PASS005', '{"email": "sarah@email.com", "phone": "+11234567891"}'),

('TKT0010001006', 'AB1234', 'Priya Singh', 'PASS006', '{"email": "priya@email.com", "phone": "+911234567893"}'),

('TKT0010001007', 'CD5678', 'Mike Johnson', 'PASS007', '{"email": "mike@email.com", "phone": "+11234567892"}');

INSERT INTO Ticket_Flights (ticket_no, flight_id, fare_conditions, amount) VALUES

('TKT0010001001', 1, 'Business', 45000.00),

('TKT0010001001', 2, 'Business', 42000.00),

('TKT0010001001', 3, 'Business', 38800.00),

('TKT0010001002', 1, 'Business', 45000.00),

('TKT0010001002', 4, 'Comfort', 35000.00),

('TKT0010001002', 5, 'Business', 38500.00),

('TKT0010001003', 3, 'Business', 38800.00),

('TKT0010001003', 6, 'Comfort', 32400.00),

('TKT0010001003', 2, 'Comfort', 30000.00),

('TKT0010001004', 1, 'Economy', 25000.00),

('TKT0010001004', 3, 'Economy', 32000.00),

('TKT0010001004', 5, 'Economy', 28400.00),

('TKT0010001005', 2, 'Economy', 22000.00),

('TKT0010001005', 4, 'Economy', 28000.00),

('TKT0010001006', 1, 'Economy', 25000.00),

('TKT0010001007', 1, 'Comfort', 32000.00);

INSERT INTO Boarding_Passes (ticket_no, flight_id, boarding_no, seat_no) VALUES

('TKT0010001001', 1, 1, '1A'),

('TKT0010001002', 1, 2, '1B'),

('TKT0010001003', 1, 3, '1C'),

('TKT0010001004', 1, 4, '10A'),

('TKT0010001005', 1, 5, '10B'),

('TKT0010001006', 1, 6, '10C'),

('TKT0010001007', 1, 7, '2A'),

('TKT0010001001', 2, 1, '1A'),

('TKT0010001002', 4, 1, '1A'),

('TKT0010001003', 3, 1, '1A');

SQL Queries to Extract Key Insights

1)Top 5 busiest routes (by passenger bookings)

```
SELECT a1.city AS source_city,
    a2.city AS destination_city,
    COUNT(tf.ticket_no) AS total_passengers
FROM Ticket_Flights tf
JOIN Flights f ON tf.flight_id = f.flight_id
JOIN Airports a1 ON f.departure_airport = a1.airport_code
JOIN Airports a2 ON f.arrival_airport = a2.airport_code
GROUP BY a1.city, a2.city
ORDER BY total_passengers DESC
LIMIT 5;
```

source_city	destination_city	total_passengers
Delhi	Dubai	8
New York	London	3
Dubai	Sydney	2
Mumbai	Singapore	2
Paris	Rome	1

2) Percentage of flights delayed beyond 30 minutes

```
SELECT
ROUND(100.0 * SUM(CASE
WHEN TIMESTAMPDIFF(MINUTE, f.scheduled_departure, f.actual_departure) > 30
THEN 1 ELSE 0 END) / COUNT(*), 2)
AS delayed_percentage
FROM Flights f
WHERE f.actual_departure IS NOT NULL;
```

delayed_percentage
50

3) High-value frequent flyers (spent > 100,000 total)

```
SELECT t.passenger_name,
    SUM(tf.amount) AS total_spent,
    COUNT(DISTINCT tf.flight_id) AS flights_taken
FROM Tickets t
JOIN Ticket_Flights tf ON t.ticket_no = tf.ticket_no
GROUP BY t.passenger_name
HAVING SUM(tf.amount) > 100000
ORDER BY total_spent DESC;
```

passenger_name	total_spent	flights_taken
Rahul Sharma	125800	3
Aisha Khan	118500	3
John Doe	101200	3

4) Average ticket price by class

```
SELECT tf.fare_conditions,
ROUND(AVG(tf.amount), 2) AS avg_price
FROM Ticket_Flights tf
GROUP BY tf.fare_conditions;
```

fare_conditions	avg_price
Business	41350
Comfort	32350
Economy	26733.33

5) Monthly flight volume

```
SELECT DATE_FORMAT(scheduled_departure, '%Y-%m') AS month,
 COUNT(*) AS total_flights
FROM Flights
GROUP BY DATE_FORMAT(scheduled_departure, '%Y-%m')
ORDER BY month;
```

month	total_flights
2025-06	10
2025-07	2
2025-08	2
2025-09	2

6) Load factor (per flight)

```
SELECT f.flight_id,
    f.flight_no,
    COUNT(bp.seat_no) AS booked_seats,
    (SELECT COUNT(*) FROM Seats s WHERE s.aircraft_code = f.aircraft_code) AS total_seats,
    ROUND(100.0 * COUNT(bp.seat_no) /
        (SELECT COUNT(*) FROM Seats s WHERE s.aircraft_code = f.aircraft_code), 2) AS load_factor_percentage
FROM Flights f
LEFT JOIN Boarding_Passes bp ON f.flight_id = bp.flight_id
GROUP BY f.flight_id, f.flight_no;
```

flight_id	flight_no	booked_seats	total_seats	load_factor_percentage
1	EK512	7	8	87.5
2	EK515	1	8	12.5
3	BA115	1	0	NULL
4	SQ421	1	0	NULL
5	EK414	0	0	NULL
6	AF1234	0	8	0
7	AI131	0	8	0
8	AI101	0	8	0
9	AI201	0	8	0
10	AI202	0	8	0

flight_id	flight_no	booked_seats	total_seats	load_factor_percentage
9	AI201	0	8	0
10	AI202	0	8	0
11	AI301	0	8	0
12	AI302	0	8	0
13	AI401	0	8	0
14	AI402	0	8	0
15	AI501	0	8	0
16	AI502	0	8	0

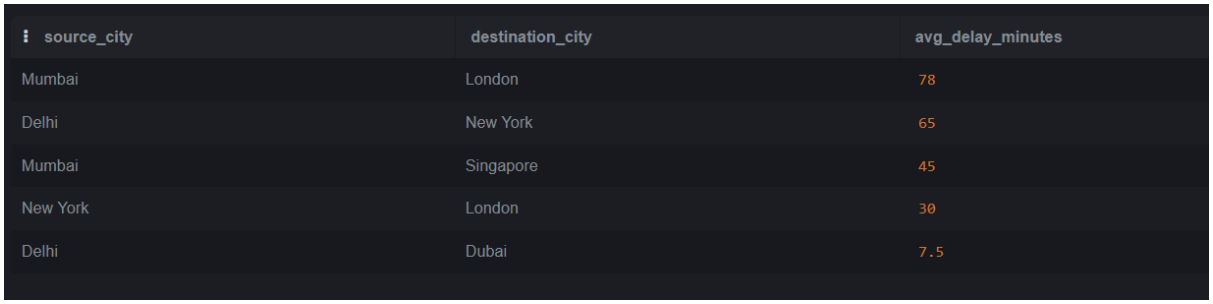
7) Top 5 most frequently used aircraft models

```
SELECT ac.model,
    COUNT(f.flight_id) AS total_flights
FROM Flights f
JOIN Aircrafts ac ON f.aircraft_code = ac.aircraft_code
GROUP BY ac.model
ORDER BY total_flights DESC
LIMIT 5;
```

model	total_flights
Airbus A320	9
Boeing 777	4
Airbus A380	2
Boeing 787	1

8) Longest average delay per route

```
SELECT a1.city AS source_city,
    a2.city AS destination_city,
    ROUND(AVG(TIMESTAMPDIFF(MINUTE, f.scheduled_departure, f.actual_departure)), 2) AS avg_delay_minutes
FROM Flights f
JOIN Airports a1 ON f.departure_airport = a1.airport_code
JOIN Airports a2 ON f.arrival_airport = a2.airport_code
WHERE f.actual_departure IS NOT NULL
GROUP BY a1.city, a2.city
ORDER BY avg_delay_minutes DESC
LIMIT 5;
```



source_city	destination_city	avg_delay_minutes
Mumbai	London	78
Delhi	New York	65
Mumbai	Singapore	45
New York	London	30
Delhi	Dubai	7.5

9) Revenue Per Booking

```
SELECT b.book_ref,
    COUNT(t.ticket_no) AS num_tickets,
    SUM(tf.amount) AS total_revenue
FROM Bookings b
JOIN Tickets t ON b.book_ref = t.book_ref
JOIN Ticket_Flights tf ON t.ticket_no = tf.ticket_no
GROUP BY b.book_ref
ORDER BY total_revenue DESC;
```

book_ref	num_tickets	total_revenue
AB1234	4	150800
CD5678	4	150500
EF9012	3	101200
GH3456	3	85400
IJ7890	2	50000

10) Passengers with connecting flights (multi-segment tickets)

```
SELECT t.passenger_name,
COUNT(tf.flight_id) AS num_segments
FROM Tickets t
JOIN Ticket_Flights tf ON t.ticket_no = tf.ticket_no
GROUP BY t.passenger_name
HAVING COUNT(tf.flight_id) > 1
ORDER BY num_segments DESC;
```

passenger_name	num_segments
Ramesh Kumar	3
Rahul Sharma	3
John Doe	3
Aisha Khan	3
Sarah Wilson	2

11) Rank routes by total passengers (using RANK())

```
SELECT a1.city AS source_city,
    a2.city AS destination_city,
    COUNT(tf.ticket_no) AS total_passengers,
    RANK() OVER (ORDER BY COUNT(tf.ticket_no) DESC) AS route_rank
FROM Ticket_Flights tf
```

JOIN Flights f ON tf.flight_id = f.flight_id

JOIN Airports a1 ON f.departure_airport = a1.airport_code

JOIN Airports a2 ON f.arrival_airport = a2.airport_code

GROUP BY a1.city, a2.city;

source_city	destination_city	total_passengers	route_rank
Delhi	Dubai	8	1
New York	London	3	2
Dubai	Sydney	2	3
Mumbai	Singapore	2	3
Paris	Rome	1	5

12) Passenger spending vs. average (using AVG() OVER)

SELECT t.passenger_name,

SUM(tf.amount) AS total_spent,

ROUND(AVG(SUM(tf.amount)) OVER (), 2) AS avg_spent_across_all,

SUM(tf.amount) - AVG(SUM(tf.amount)) OVER () AS difference_from_avg

FROM Tickets t

JOIN Ticket_Flights tf ON t.ticket_no = tf.ticket_no

GROUP BY t.passenger_name

ORDER BY 2 DESC, 4 DESC;

passenger_name	total_spent	avg_spent_across_all	difference_from_avg
Rahul Sharma	125800	76842.86	48957.142857142855
Aisha Khan	118500	76842.86	41657.142857142855
John Doe	101200	76842.86	24357.142857142855
Ramesh Kumar	85400	76842.86	8557.142857142855
Sarah Wilson	50000	76842.86	-26842.857142857145
Mike Johnson	32000	76842.86	-44842.857142857145
Priya Singh	25000	76842.86	-51842.857142857145