

(i) Find the agency names for agencies located in the same city as passenger id 256.

Steps:

1. First, find the city of the passenger with pid = 256.
2. Then, find the agency names located in that city.

### Relational Algebra:

1. Get the city of the passenger:

$$pcity256 = \pi_{city} ( \sigma_{pid = 256} ( passenger ) )$$

2. Find the agencies in the same city:

$$\pi_{aname} ( \sigma_{acity = pcity256} ( agency ) )$$
$$\pi_{aname} ( \sigma_{acity = pcity} ( agency \times ( \pi_{city} ( \sigma_{pid = 256} ( passenger ) ) ) ) )$$

(ii) Get the details of flights that are scheduled on either of the dates 01/12/2024 or 02/12/2024 or both at 14:00 hours.

Steps:

1. Select flights scheduled on either 01/12/2024 or 02/12/2024.
2. Ensure the flight time is 14:00.

**Relational Algebra:**

$$\sigma ( fdate = '01/12/2024' \vee fdate = '02/12/2024' ) \wedge time = '14:00' ( flight )$$

(iii) Find the details of all male passengers who are associated with the Jet agency.

Steps:

1. Find the aid of the agency named "Jet".
2. Find all passengers who booked flights through this agency and are male.

**Relational Algebra:**

1. Get the aid for the Jet agency:

$$\text{aid}_{\text{jet}} = \pi \text{ aid } ( \sigma \text{ aname} = \text{'Jet'} ( \text{agency} ) )$$

2. Join the booking and passenger tables, and filter male passengers:

$$\pi \text{ pid, pname, pgender, pcity } ( \sigma \text{ pgender} = \text{'Male'} ( \text{passenger} \bowtie \sigma \text{ aid} = \text{aid}_{\text{jet}} ( \text{booking} ) )$$

(iv) Find the passenger names who do not have any bookings in any flights.

Steps:

1. Find all passengers who are **not** in the booking relation.

**Relational Algebra:**

1. Find the passengers who do have bookings:

$\text{booked\_pids} = \pi \text{ pid} ( \text{booking} )$

2. Subtract those from all passengers:

$\pi \text{ pname} ( \text{passenger} ) - \pi \text{ pname} ( \sigma \text{ pid} \in \text{booked\_pids} ( \text{passenger} ) )$

(v) Find the passenger names of passengers who have bookings on at least one flight.

Steps:

1. Find passengers who are in the booking relation (i.e., have at least one flight booked).

**Relational Algebra:**

1. Get the passengers who have bookings:

$\pi \text{ pname } ( \text{passenger} \bowtie \pi \text{ pid } ( \text{booking} ) )$

(vi) Find the details of all male passengers who are associated with Jet agency.

To solve this, we need to:

- Find the aid of the "Jet" agency.
- Find all male passengers who have bookings with that agency.

### Relational Algebra:

1. Find the aid of the Jet agency:

$$\pi \text{ aid } ( \sigma \text{ aname} = \text{'Jet'} ( \text{agency} ) )$$

2. Join this with the booking relation to get pid of the passengers associated with this agency:

$$\pi \text{ pid } ( \sigma \text{ aid} = \text{Jet.aid} ( \text{booking} ) )$$

3. Now, join the result with the passenger relation to get the details of male passengers:

$$\pi \text{ pid, pname, pgender, pcity } ( \sigma \text{ pgender} = \text{'Male'} ( \text{passenger} \bowtie \pi \text{ pid } ( \sigma \text{ aid} = \text{Jet.aid} ( \text{booking} ) ) ) )$$

vii. Find the flight numbers for passengers with pid 256 for flights to Mumbai before the date 19/06/2024.

Select the bookings for passenger with pid 256:

$$B1 \leftarrow \sigma \text{ pid} = 256 ( \text{Booking} )$$

Select the flights that are heading to Mumbai and are scheduled before 19/06/2024:

$$F1 \leftarrow \sigma \text{ dest} = 'Mumbai' \wedge \text{ fdate} < '2024-06-19' ( \text{Flight} )$$

Join the filtered bookings with the filtered flights on the flight ID (fid):

$$\text{Result} \leftarrow \pi \text{ fid} ( B1 \bowtie \text{ fid} = \text{fid} F1 )$$

viii. Find the agency names for agencies who do not have any bookings for passenger with id 256.

Select agencies that have bookings for passenger pid = 256:

$A1 \leftarrow \pi \text{ aid } ( \sigma \text{ pid} = 256 ( \text{Booking} ) )$

Select all agencies:  $A2 \leftarrow \pi \text{ aid}, \text{ aname } ( \text{Agency} )$

Find agencies that do not have any bookings for passenger pid = 256 by performing set difference:  $\text{Result} \leftarrow A2 - \pi \text{ aid } ( A1 )$

Project the agency names:  $\text{Result} \leftarrow \pi \text{ aname } ( \text{Result} )$



ix. Get the details of flights that are scheduled on either of the dates 01/12/2024 or 02/12/2024 or both at 18:00 hours.

Select flights that are scheduled on either 01/12/2023 or 02/12/2023 and have the time 18:00 hours:

$$F1 \leftarrow \sigma ( fdate = '2024-12-01' \vee fdate = '202412-02' ) \wedge time = '18:00' ( Flight )$$

Project all flight details:

$$Result \leftarrow \pi fid, fdate, time, src, dest ( F1 )$$

x. Find the passenger names for those who do not have any bookings in any flights.

Select all passengers:  $P1 \leftarrow \pi_{pid, pname} ( Passenger )$

Select passengers who have bookings:  $P2 \leftarrow \pi_{pid} ( Booking )$

Find passengers who do not have any bookings (set difference):

$Result \leftarrow P1 - \pi_{pid} ( P2 )$

Project the passenger names:  $Result \leftarrow \pi_{pname} ( Result )$