```
SET FOREIGN_KEY_CHECKS=0;

DROP TABLE IF EXISTS weeklyfactor CASCADE;
DROP TABLE IF EXISTS profitfactor CASCADE;
DROP TABLE IF EXISTS ticket CASCADE;
DROP TABLE IF EXISTS booking CASCADE;
DROP TABLE IF EXISTS reserved_pass CASCADE;
DROP TABLE IF EXISTS reservation CASCADE;
DROP TABLE IF EXISTS contact CASCADE;
DROP TABLE IF EXISTS passenger CASCADE;

DROP TABLE IF EXISTS weeklyschedule CASCADE;
DROP TABLE IF EXISTS flight CASCADE;
DROP TABLE IF EXISTS route CASCADE;
DROP TABLE IF EXISTS airport CASCADE;

DROP FUNCTION IF EXISTS calculateFreeSeats;
DROP FUNCTION IF EXISTS calculatePrice;

DROP PROCEDURE IF EXISTS addPayment;
DROP PROCEDURE IF EXISTS addContact;
DROP PROCEDURE IF EXISTS addPassenger;
DROP PROCEDURE IF EXISTS addReservation;
DROP PROCEDURE IF EXISTS addFlight;
DROP PROCEDURE IF EXISTS addRoute;
DROP PROCEDURE IF EXISTS addDestination;
DROP PROCEDURE IF EXISTS addDay;
DROP PROCEDURE IF EXISTS addYear;

DROP TRIGGER IF EXISTS rand_ticketno;
```

```
DROP VIEW IF EXISTS allFlights;


SET FOREIGN_KEY_CHECKS=1;


CREATE TABLE airport (
        id VARCHAR(3),
        cityname VARCHAR(30),
        countryname VARCHAR(30),
        CONSTRAINT pk_airport PRIMARY KEY (id)
);

CREATE TABLE route (
        id INT NOT NULL AUTO_INCREMENT,
        routeprice DOUBLE NOT NULL,
    year INT,
    arrival VARCHAR(3),
    departure VARCHAR(3),
        CONSTRAINT pk_route PRIMARY KEY (id)
);



CREATE TABLE weeklyschedule (
        id INT NOT NULL AUTO_INCREMENT,
        year INT NOT NULL,
        day VARCHAR(10),
        time TIME,
```

```
    route INT,
        CONSTRAINT pk_weekly PRIMARY KEY (id)
);



CREATE TABLE flight (
        id INT NOT NULL AUTO_INCREMENT,
        week INT NOT NULL,
--      unpaidseats INT NOT NULL,
        scheduleid INT NOT NULL,
        CONSTRAINT pk_flight PRIMARY KEY (id)
);
-- Ändart till bara fullname
CREATE TABLE passenger (
        passportnumber INT NOT NULL,
    fullname VARCHAR(30),
        -- firstname VARCHAR(30),
        -- lastname VARCHAR(30),
        CONSTRAINT pk_passenger PRIMARY KEY (passportnumber)
);

CREATE TABLE contact (
        contact_passportnumber INT NOT NULL,
        email VARCHAR(30),
        phonenumber BIGINT,
    reservationnumber INT,
        CONSTRAINT pk_contact PRIMARY KEY (contact_passportnumber)
);

CREATE TABLE reservation (
```

```
    reservationnumber INT NOT NULL AUTO_INCREMENT,
    nopassengers INT NOT NULL,
    resflightno INT NOT NULL,
    CONSTRAINT pk_reservation PRIMARY KEY (reservationnumber)
);

CREATE TABLE reserved_pass (
    rp_resno INT NOT NULL,
    rp_passno INT NOT NULL,
    CONSTRAINT pk_reservedpass PRIMARY KEY (rp_resno, rp_passno)
);

CREATE TABLE booking (
    booking_resno INT NOT NULL,
    cardno BIGINT NOT NULL,
    name_cardholder VARCHAR(30),
    price DOUBLE NOT NULL,

    CONSTRAINT pk_bookingresno PRIMARY KEY (booking_resno)
);

CREATE TABLE ticket (
    ticket_resno INT NOT NULL,
    ticket_passportno INT NOT NULL,
    ticketno INT NOT NULL AUTO_INCREMENT,
    CONSTRAINT pk_ticket PRIMARY KEY (ticketno)
);

CREATE TABLE profitfactor (
    year INT NOT NULL,
```

```
    factor DOUBLE NOT NULL,
        CONSTRAINT pk_profitfactor PRIMARY KEY (year)
);

CREATE TABLE weeklyfactor (
        day VARCHAR(10),
    weekly_year INT NOT NULL,
    weekly_factor DOUBLE NOT NULL,
        CONSTRAINT pk_weeklyfactor PRIMARY KEY (day)
);

-- FOREIGN KEYS

ALTER TABLE route ADD CONSTRAINT fk_arrival FOREIGN KEY (arrival)
REFERENCES airport(id);
ALTER TABLE route ADD CONSTRAINT fk_departure FOREIGN KEY (departure)
REFERENCES airport(id);

ALTER TABLE weeklyschedule ADD CONSTRAINT fk_route FOREIGN KEY (route)
REFERENCES route(id);

ALTER TABLE flight ADD CONSTRAINT fk_flightweek FOREIGN KEY (scheduleid)
REFERENCES weeklyschedule (id);

ALTER TABLE contact ADD        CONSTRAINT fk_passenger FOREIGN KEY
(contact_passportnumber) REFERENCES passenger (passportnumber);

ALTER TABLE reservation ADD   CONSTRAINT fk_flightno FOREIGN KEY
(resflightno) REFERENCES flight (id);

ALTER TABLE reserved_pass ADD CONSTRAINT fk_rpresno FOREIGN KEY
(rp_resno) REFERENCES reservation (reservationnumber);
```

```
ALTER TABLE reserved_pass ADD CONSTRAINT fk_rppassno FOREIGN KEY
(rp_passno) REFERENCES passenger (passportnumber);


ALTER TABLE booking ADD CONSTRAINT fk_reservation FOREIGN KEY
(booking_resno) REFERENCES reservation (reservationnumber);

-- ALTER TABLE booking  ADD CONSTRAINT fk_passno FOREIGN KEY
(bcpassportno) REFERENCES contact (contact_passportnumber);


ALTER TABLE ticket ADD CONSTRAINT fk_booking FOREIGN KEY (ticket_resno)
REFERENCES booking (booking_resno);

ALTER TABLE ticket ADD CONSTRAINT fk_passport FOREIGN KEY
(ticket_passportno) REFERENCES passenger (passportnumber);


ALTER TABLE weeklyfactor ADD CONSTRAINT fk_year FOREIGN KEY
(weekly_year) REFERENCES profitfactor (year);




DELIMITER //


CREATE PROCEDURE addYear(IN new_year INT, IN new_factor DOUBLE)

        BEGIN

    INSERT INTO profitfactor(year, factor)

    VALUES (new_year, new_factor);

END;

//


CREATE PROCEDURE addDay(IN new_year INT, IN new_day VARCHAR(10), IN
new_factor DOUBLE)

        BEGIN

    INSERT INTO weeklyfactor(day, weekly_year, weekly_factor)

    VALUES (new_day, new_year, new_factor);

END;
```

```
//

CREATE PROCEDURE addDestination(IN new_id VARCHAR(3), IN new_cityname
VARCHAR(30), IN new_countryname VARCHAR(30))
        BEGIN
    INSERT INTO airport(id, cityname, countryname)
    VALUES (new_id, new_cityname, new_countryname);
END;
//

CREATE PROCEDURE addRoute(IN new_departure_airport VARCHAR(3), IN
new_arrival_airport VARCHAR(3), IN new_year INT, IN new_routeprice DOUBLE)
        BEGIN
        INSERT INTO route(routeprice, year, arrival, departure)
        VALUES (new_routeprice, new_year, new_arrival_airport,
new_departure_airport);
END;
//

CREATE PROCEDURE addFlight(IN new_departure_airport VARCHAR(3), IN
new_arrival_airport VARCHAR(3), IN new_year INT, IN new_day VARCHAR(10), IN
new_departure_time TIME)
        BEGIN
    DECLARE route_id INT;
    DECLARE schedule_id INT;
    DECLARE new_week INT;

    SET route_id = (SELECT id FROM route WHERE arrival=new_arrival_airport
AND departure=new_departure_airport AND year=new_year);
    INSERT INTO weeklyschedule(year, day, time, route)
        VALUES (new_year, new_day, new_departure_time, route_id);
```

```
    SELECT id INTO schedule_id FROM weeklyschedule WHERE
time=new_departure_time AND day=new_day AND year=new_year;


    SET new_week = 1;
    WHILE new_week <= 52 DO
            INSERT INTO flight(week, scheduleid)
            VALUES (new_week, schedule_id);
            SET new_week = new_week + 1;
       END WHILE;
END;
//

CREATE FUNCTION calculateFreeSeats(flight_number INT)
       RETURNS INT
    BEGIN
    DECLARE tickets INT;
    DECLARE free_seats INT;


    SELECT COUNT(*) INTO tickets FROM reservation, ticket WHERE
reservation.reservationnumber = ticket.ticket_resno AND reservation.resflightno =
flight_number;
    SET free_seats = 40 - tickets;
    RETURN free_seats;
END;
//


CREATE FUNCTION calculatePrice(flight_number INT)
       RETURNS    DOUBLE
    BEGIN
    DECLARE seat_price DOUBLE;
    DECLARE booked_seats INT;
```

```
    DECLARE s_id INT;
        DECLARE r_id INT;
    DECLARE route_price DOUBLE;
    DECLARE route_day VARCHAR(10);
    DECLARE route_year INT;
    DECLARE w_factor DOUBLE;
    DECLARE p_factor DOUBLE;

    SET booked_seats = 40 - calculateFreeSeats(flight_number);

    SELECT scheduleid INTO s_id FROM flight WHERE flight.id = flight_number;
    SELECT route INTO r_id FROM weeklyschedule WHERE weeklyschedule.id =
s_id;
    SELECT routeprice INTO route_price FROM route WHERE route.id = r_id;
    SELECT day INTO route_day FROM weeklyschedule WHERE
weeklyschedule.id = s_id;
        SELECT year INTO route_year FROM weeklyschedule WHERE
weeklyschedule.id = s_id;
    SELECT weekly_factor INTO w_factor FROM weeklyfactor WHERE
weeklyfactor.day = route_day AND weeklyfactor.weekly_year = route_year;
    SELECT factor INTO p_factor FROM profitfactor WHERE profitfactor.year =
route_year;

    SET seat_price = route_price * w_factor * (booked_seats + 1) / 40 * p_factor;
    SET seat_price = ROUND(seat_price, 12);

        RETURN seat_price;
END;
//

 CREATE TRIGGER rand_ticketno BEFORE INSERT ON ticket
        FOR EACH ROW
```

```
        BEGIN


        SET NEW.ticketno = FLOOR(0 + RAND() * 10000);
END;
//


CREATE PROCEDURE addReservation(IN departure_airport_code VARCHAR(3),
IN arrival_airport_code VARCHAR(3), IN res_year INT, IN res_week INT, IN res_day
VARCHAR(10), IN res_time TIME, IN number_of_passengers INT, OUT
output_reservation_nr INT)
        BEGIN
    DECLARE res_route INT DEFAULT 0;
    DECLARE weekly_schedule_id INT DEFAULT 0;
    DECLARE flight_nr INT DEFAULT 0;
    DECLARE free_seats INT DEFAULT 0;
    DECLARE newresno INT DEFAULT 0;



    SELECT id FROM route WHERE route.arrival=arrival_airport_code AND
route.departure=departure_airport_code AND route.year=res_year INTO res_route;
        SELECT id FROM weeklyschedule WHERE weeklyschedule.route =
res_route AND weeklyschedule.day = res_day AND weeklyschedule.year = res_year
AND weeklyschedule.time = res_time INTO weekly_schedule_id;
    SELECT id FROM flight WHERE flight.scheduleid = weekly_schedule_id AND
flight.week = res_week INTO flight_nr;


    SET free_seats = calculateFreeSeats(flight_nr);



    IF res_route != 0 AND weekly_schedule_id != 0 AND flight_nr != 0 THEN
```

```
                IF free_seats >= number_of_passengers THEN
                SET newresno = FLOOR(rand() * 23326);

                    INSERT INTO reservation (reservationnumber, nopassengers,
resflightno) VALUES (newresno, number_of_passengers, flight_nr);

              SET output_reservation_nr = newresno;
              SELECT * from reservation;
              SELECT output_reservation_nr as "lasrt insert";
              SELECT 'OK result' AS 'Message';
                ELSE
          SELECT 'There are not enough seats available on the chosen flight' AS
'Message';
           END IF;
         ELSE
    SELECT 'There exist no flight for the given route, date and time' AS 'Message';
    END IF;
END;
//
CREATE PROCEDURE addPassenger(IN reservation_nr INT, IN passport_number
INT, IN passenger_name VARCHAR(30))
BEGIN

IF EXISTS( SELECT reservationnumber FROM reservation WHERE
reservation.reservationnumber = reservation_nr) THEN


        IF NOT EXISTS ( SELECT booking_resno FROM booking WHERE
booking.booking_resno = reservation_nr) THEN
```

```
        IF NOT EXISTS ( SELECT passportnumber FROM passenger WHERE
passenger.passportnumber = passport_number AND passenger.fullname =
passenger_name) THEN



        INSERT INTO passenger (passportnumber, fullname) VALUES
(passport_number, passenger_name);
        INSERT INTO reserved_pass (rp_resno, rp_passno) values
(reservation_nr, passport_number);


    -- SELECT "OK result" AS "Message";
    ELSE
        INSERT INTO reserved_pass (rp_resno, rp_passno) values
(reservation_nr, passport_number);
        -- SELECT "OK result" AS "Message";
  END IF;


    ELSE
  SELECT "The booking has already been payed and no futher passengers can
be added" AS "Message";
  END IF;


ELSE
    SELECT 'The given reservation number does not exist' AS 'Message';
END IF;
END;
//


CREATE PROCEDURE addContact( IN reservation_nr INT, IN passport_number
INT, IN email VARCHAR(30), IN phone INT)
BEGIN
```

```
IF EXISTS( SELECT reservationnumber, passportnumber FROM reservation, passenger WHERE reservation.reservationnumber = reservation_nr) THEN


    IF EXISTS (SELECT rp_resno FROM reserved_pass WHERE rp_resno = reservation_nr AND rp_passno = passport_number) THEN

            INSERT INTO contact (contact_passportnumber, email, phonenumber, reservationnumber) VALUES (passport_number, email, phone, reservation_nr);

            SELECT "OK result addContact" AS "Message";

    ELSE

            SELECT "The person is not a passenger of the reservation" AS "Message";

        END IF;


ELSE

        SELECT "The given reservation number does not exist" AS "Message";



END IF;

END;

//



CREATE PROCEDURE addPayment (IN reservation_nr INT, IN cardholder_name VARCHAR(30), IN credit_card_number BIGINT)

BEGIN


DECLARE flightno INT DEFAULT 0;

DECLARE price DOUBLE DEFAULT 0;

DECLARE no_of_pass INT DEFAULT 0;

DECLARE ticket_number INT;
```

```
        IF EXISTS( SELECT reservationnumber from reservation where
reservation.reservationnumber = reservation_nr ) THEN

                IF EXISTS ( SELECT contact_passportnumber FROM contact WHERE
contact.reservationnumber = reservation_nr) THEN

                        SELECT resflightno FROM reservation WHERE
reservation.reservationnumber = reservation_nr INTO flightno;

                        SELECT count(*) FROM reserved_pass WHERE
reserved_pass.rp_resno = reservation_nr INTO no_of_pass;




            IF no_of_pass <= calculateFreeSeats(flightno) THEN

                        SELECT SLEEP(15);

                        SET price = no_of_pass*calculatePrice(flightno);

                            INSERT INTO booking (booking_resno, cardno,
name_cardholder, price) VALUES (reservation_nr, credit_card_number,
cardholder_name, price);

                    INSERT INTO ticket(ticket_resno, ticket_passportno) SELECT *
FROM reserved_pass WHERE reserved_pass.rp_resno = reservation_nr;


                        SELECT "OK Result addPayment" AS "Message";

            ELSE

                        SELECT "There are not enough seats available on the
flight anymore, deleting reservation" AS "Message";

                        DELETE FROM reserved_pass WHERE
reserved_pass.rp_resno = reservation_nr;

                SELECT * from booking;

                SELECT * from reservation;

                SELECT "efter respass" AS "kuken";

                        DELETE FROM reservation WHERE
reservation.reservationnumber = reservation_nr;

                SELECT "efter respass och reservation" AS "blablavla";

            END IF;

              ELSE
```

```
                SELECT "The reservation has no contact yet" AS "Message";


            END IF;
        ELSE
            SELECT "The given reservation number does not exist" AS "Message";
        END IF;


 END;
//


CREATE VIEW allFlights AS
        SELECT depart.cityname as departure_city_name, arrive.cityname as
destination_city_name, ws.time as departure_time, ws.day as departure_day,
fl.week as departure_week, ws.year as departure_year, calculateFreeSeats(fl.id) AS
nr_of_free_seats, calculatePrice(fl.id) AS current_price_per_seat
        FROM flight AS fl INNER JOIN weeklyschedule AS ws INNER JOIN route as
ro INNER JOIN airport as depart INNER JOIN airport as arrive
     WHERE fl.scheduleid = ws.id AND ws.route = ro.id AND ro.arrival = arrive.id
AND ro.departure = depart.id;
//
SELECT * from route;
SELECT * from allFlights;
```

Martin Forsberg
Emilia Bylund Månsson

Assignment 4

Task 2 – 7 as seen in code above

Task 8

a) *How can you protect the credit card information in the database from hackers?*

You can encrypt the credit card information or separate the credit card numbers in different files two make it harder for hackers to access all information necessary.

b) *Give three advantages of using stored procedures in the database (and thereby execute them on the server) instead of writing the same functions in the frontend of the system (in for example java-script on a web-page)?*

1. The performance is better compared to writing it in the front end, due to the quick response and the storage in executable form.
2. You can group the stored procedures and execute them all at once, this isn't possible to the same extent with for instance java-script. Instead of writing the same query over and over again the user can call the procedure. This can reduce code complexity, epecially if the same query is used in many parts of the code.
3. If the query has to be changed as the development evolves, the query only has to be changed in one place, which is more OOP.

Task 9

b) No, this is not visible in section B because we haven't written a commit yet. This means that the two transactions are isolated from each other.

c) Since the transactions are executed in isolation due to the lack of commit-statement, B can't see what happens in A and can't modify it. After A has committed, B will be able to see the transaction.

Task 10

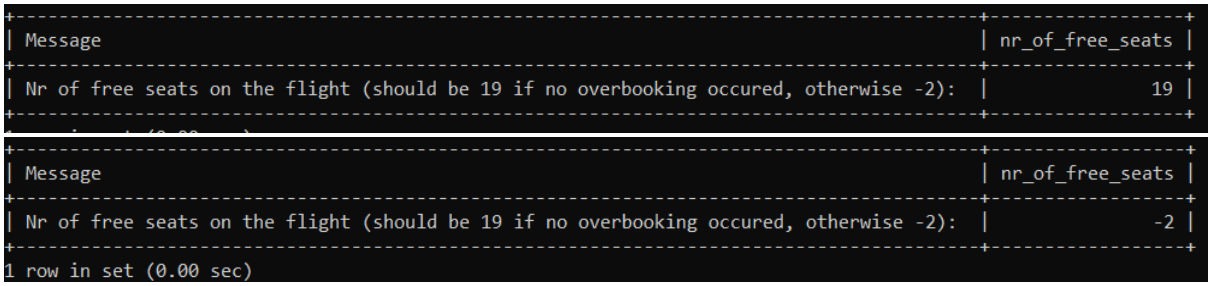
a) No, overbooking did not occur due to the fact that we got an IF-statement that controls the number of passengers that the reservation is trying to book. The first transaction is then preventing the second from booking too many passengers.

b) Overbooking is theoretically possible if both transactions are going through the IF-statement in addPayment before the trigger that generates the ticket number starts. If the code inside the IF-statement is too slow and B is going through the condition before the execution of the ticket then an overbooking is possible.

   i) IF-statement starts for transaction A
   ii) IF-statement starts for transaction B and B is "inside" the IF-statement
   iii) Ticket-number is generated by the trigger for A
   iv) Ticket-number is generated by the trigger for B

   → Overbooking occurs

c) By adding SELECT SLEEP (15) the second call to addPayment is able to enter the if-statement before the first one is getting the ticket and actually booking, this will thereby create an overbooked flight.



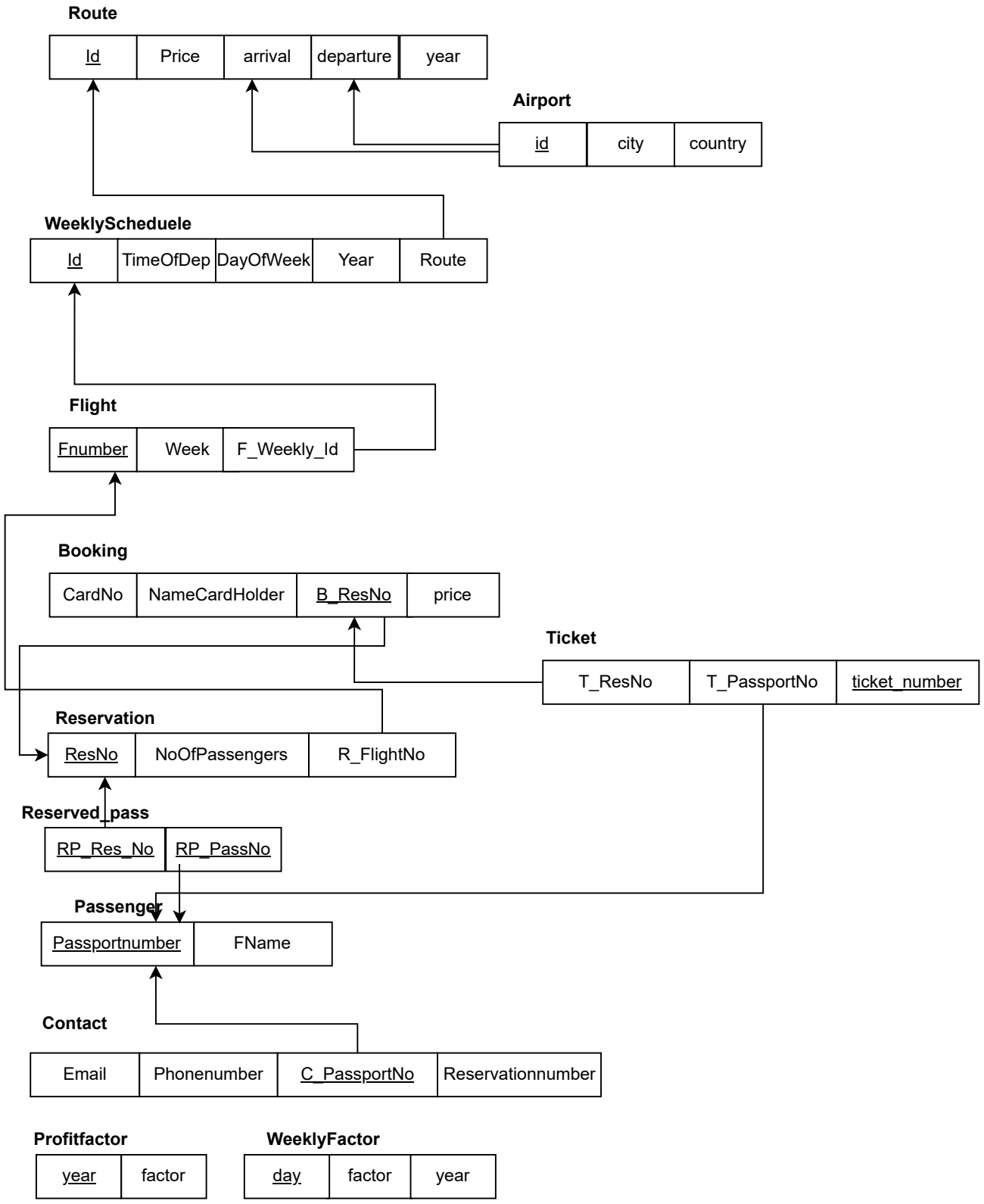
```
+-----------------------------------------------------------------------------------------+------------------+
| Message                                                                                 | nr_of_free_seats |
+-----------------------------------------------------------------------------------------+------------------+
| Nr of free seats on the flight (should be 19 if no overbooking occured, otherwise -2):  |               19 |
+-----------------------------------------------------------------------------------------+------------------+
+-----------------------------------------------------------------------------------------+------------------+
| Message                                                                                 | nr_of_free_seats |
+-----------------------------------------------------------------------------------------+------------------+
| Nr of free seats on the flight (should be 19 if no overbooking occured, otherwise -2):  |               -2 |
+-----------------------------------------------------------------------------------------+------------------+
1 row in set (0.00 sec)
```

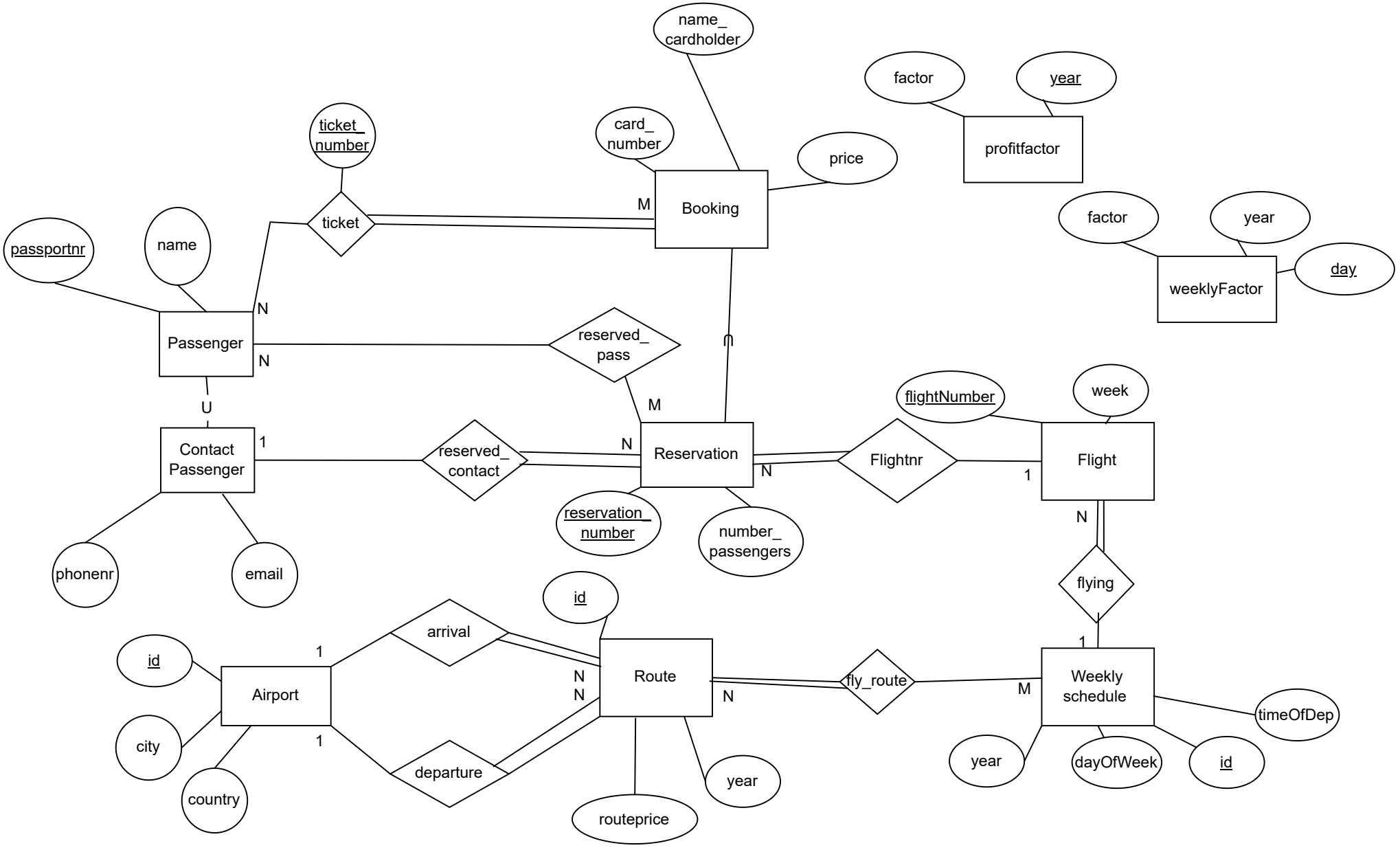
d) When doing a *LOCK TABLES ticket READ* the other transaction is not able to read and use the ticket table and therefore a booking can't get through. The second transaction then needs to wait until the table has been UNLOCKED again and then it tries to book, but this time we already have a booking and not enough seats which will cancel the booking.

Index

A secondary index is used to get access to specific data faster. By having a table's id:s in a separate, already sorted table, that points to the original tuple, the user does not have to search through a random array of indexes to find the data they are looking for. This will increase the efficiency of querying the database.

In this project we could have used a secondary index for the passengers fo example. We would create another table only consisting of the p-number och all passengers in the passenger table. The new table would be sorted by size and be a fk of the p-number in passenger. If we assume MySQL uses an algorithm to search for a tuple and not just try at random, this method should be faster.


Route
Id
Price
arrival
departure
year
Airport
id
city
country
WeeklyScheduele
Id
TimeOfDep
DayOfWeek
Year
Route
Flight
Fnumber
Week
F_Weekly_Id
Booking
CardNo
NameCardHolder
B_ResNo
price
Ticket
T_ResNo
T_PassportNo
ticket_number
Reservation
ResNo
NoOfPassengers
R_FlightNo
Reserved_pass
RP_Res_No
RP_PassNo
Passenger
Passportnumber
FName
Contact
Email
Phonenumber
C_PassportNo
Reservationnumber
Profitfactor
year
factor
WeeklyFactor
day
factor
year


name_
cardholder
factor
year
profitfactor
ticket_
number
card_
number
price
Booking
M
ticket
passportnr
name
factor
year
weeklyFactor
day
N
Passenger
N
reserved_
pass
n
M
U
flightNumber
week
Contact
Passenger
1
reserved_
contact
N
Reservation
N
Flightnr
1
Flight
reservation_
number
number_
passengers
phonenr
email
N
flying
id
arrival
1
id
Airport
N
N
Route
N
fly_route
M
Weekly
schedule
timeOfDep
city
1
departure
year
dayOfWeek
id
country
routeprice
year