W228/302C, W282/302C

DUBLIN INSTITUTE OF TECHNOLOGY

DT228 BSc. (Honours) Degree in Computer Science

DT282 BSc. (Honours) Degree in Computer Science (International)

Year 3

WINTER EXAMINATIONS 2016/2017

DATABASES 2 [CMPU3010]

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DR. DEIRDRE LILLIS
MR. PAUL COLLINS

THURSDAY 5TH JANUARY 1.00 P.M. – 3.00 P.M.

TWO HOURS

Read the case study on page 2 before attempting Question 1.

Answer Question 1 (40%) and TWO others (30% each).

There is a syntax sheet at the end of the exam to assist you.

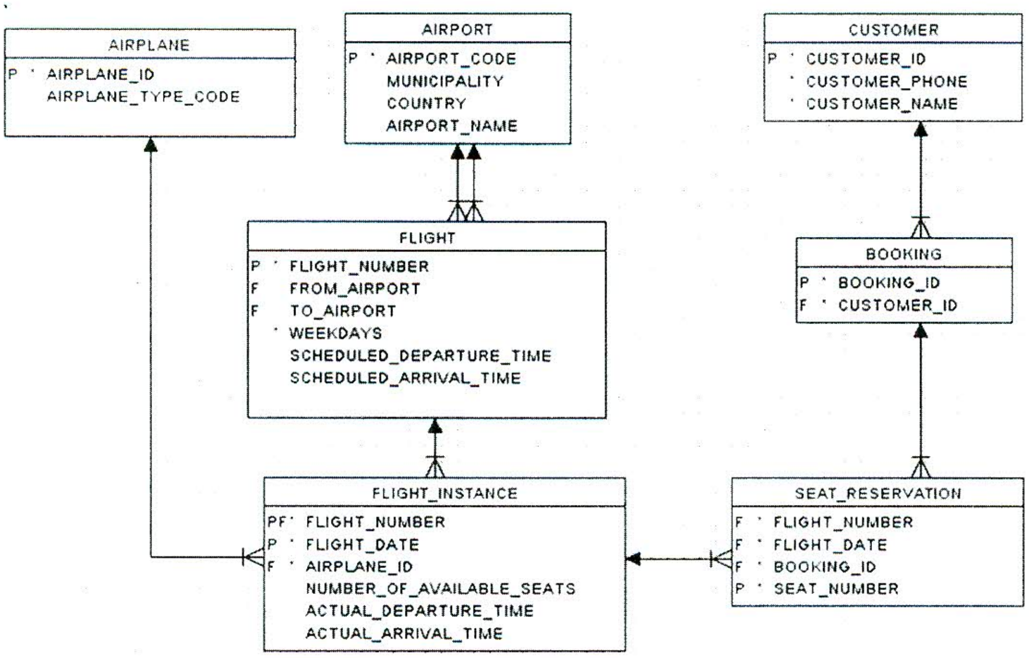


Figure 1 Airline flight planning and reservation system

FlyWithMe is an airline that runs scheduled flights throughout Europe. At the start of each season, the flight planner schedules flights that will run throughout the season. In the context of this system, the airport_code is an IATA three character code that uniquely identifies an airport. Each flight is planned to fly from one airport_code (from_airport) to another (to_airport). All instances of a planned flight follow the same route.

The ***planner*** adds flights every season, giving a seven character string of Y's and N's to show the weekdays on which the flight operates. When the planner decides on a range of dates for a flight, she implements the flight by running a program to generate a flight instance for every flight that is scheduled to take place. The planner provides the seating capacity that will be available on each flight.

The ***scheduler*** records information regarding the flight instance that took place, so adds actual departure and arrival times. If a flight is delayed or cancelled, the scheduler amends details or reschedules cancelled seat reservations.

Customers can make bookings, based on available seats. A customer can add bookings and seat reservations for flight instances that already exist. When a customer books a seat, the booking id is recorded for the seat.

1. (a) List the tables to which each user role (planner, scheduler and customer) should have access, and the type of access the role should have. (6 marks)

(b) Write SQL to do the following:

(i) List the number of seats reservations made for flights from Dublin (Airport code DUB) to London Gatwick (Airport code LGW) in the month of March 2016. (6 marks)

(ii) List the names of airports (airport_name) that no scheduled flight comes from (from_airport). (6 marks)

(iii) List each flight number and the number of flight instance for all flights, even those where there are no instances. (6 marks)

(c) The airline have decided to expand its business by selling extras such as hotel reservations and car rental during the booking process and would like to use a MongoDB document to contain this booking. Design the way in which you would store this information, and Write a BSON snippet to add the following information to the collection(s) you have specified.

Both James and John Shannon would like to book the 10:50 flight FM1234 from Dublin to London Gatwick on 23rd December, returning on flight FM4321 on 3rd January at 14:30. For the duration of his stay John would like to rent a car of class 'Small' from the CarCompany 'Hertz'. James would like to book accommodation; he would like to stay in a single bedroom in Oak House from 23rd to 27th December and then stay in a single bedroom in the Waldorf House from 27th December to 3rd January. (10 marks)

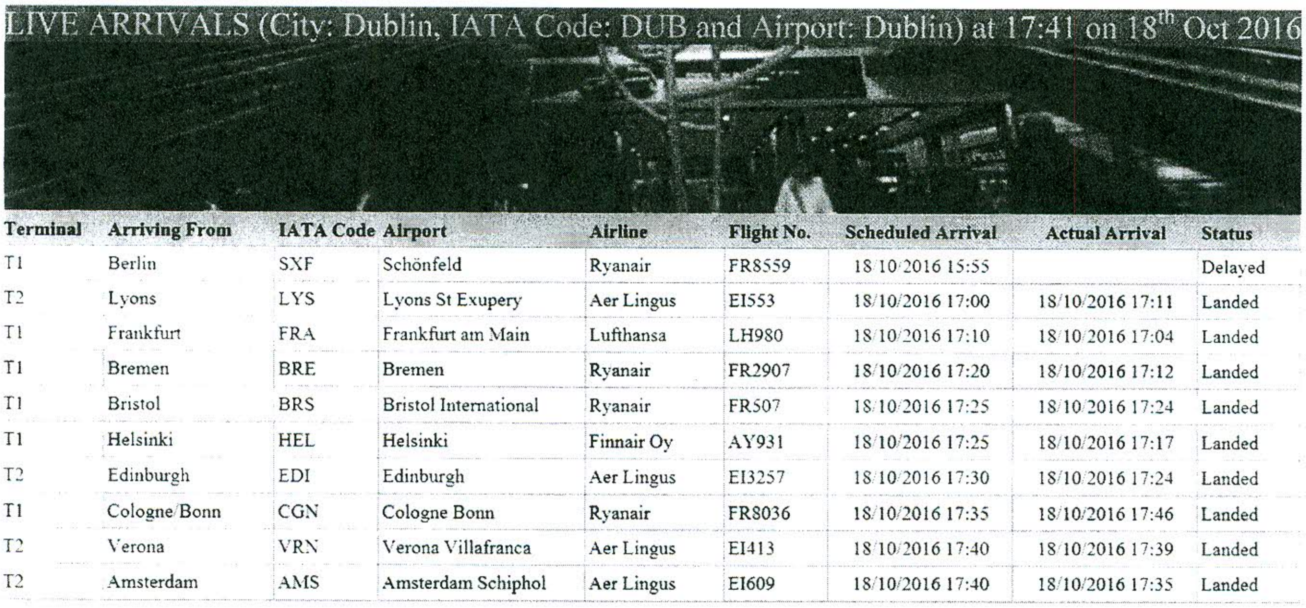
(d) Justify the choices you have made in your answer to 1(c). (6 marks)

2. Using the Case Study described by Figure 1 above, write SQL queries to satisfy the following:

(a) Write query to return the flight number, country from where the flight is arriving, the scheduled arrival time, the actual arrival time (null if it has not yet arrived) that are arriving in the airport with airport code 'SXF' today, in scheduled arrival time order. (10 marks)

(b) Write a query to return the number of seats reserved on flights that departed from an airport in the country 'Ireland' and arrived in an airport in the country 'United Kingdom' that have arrived (actual_arrival_time is not null). (10 marks)

(c) List the names of customers who have booked seats on flights to Paris (airport code CDG) and also to London Gatwick (Airport code LGW) (10 marks)



LIVE ARRIVALS (City: Dublin, IATA Code: DUB and Airport: Dublin) at 17:41 on 18th Oct 2016

Terminal	Arriving From	IATA Code	Airport	Airline	Flight No.	Scheduled Arrival	Actual Arrival	Status
T1	Berlin	SXF	Schönfeld	Ryanair	FR8559	18/10/2016 15:55		Delayed
T2	Lyons	LYS	Lyons St Exupery	Aer Lingus	EI553	18/10/2016 17:00	18/10/2016 17:11	Landed
T1	Frankfurt	FRA	Frankfurt am Main	Lufthansa	LH980	18/10/2016 17:10	18/10/2016 17:04	Landed
T1	Bremen	BRE	Bremen	Ryanair	FR2907	18/10/2016 17:20	18/10/2016 17:12	Landed
T1	Bristol	BRS	Bristol International	Ryanair	FR507	18/10/2016 17:25	18/10/2016 17:24	Landed
T1	Helsinki	HEL	Helsinki	Finnair Oy	AY931	18/10/2016 17:25	18/10/2016 17:17	Landed
T2	Edinburgh	EDI	Edinburgh	Aer Lingus	EI3257	18/10/2016 17:30	18/10/2016 17:24	Landed
T1	Cologne/Bonn	CGN	Cologne Bonn	Ryanair	FR8036	18/10/2016 17:35	18/10/2016 17:46	Landed
T2	Verona	VRN	Verona Villafranca	Aer Lingus	EI413	18/10/2016 17:40	18/10/2016 17:39	Landed
T2	Amsterdam	AMS	Amsterdam Schiphol	Aer Lingus	EI609	18/10/2016 17:40	18/10/2016 17:35	Landed

Figure 2 Arrivals in Dublin Airport

The image in Figure 2 shows flights arrival status into Dublin Airport (City: Dublin, IATA Code: DUB and Airport: Dublin) at 17:41 on 18th October 2016. The box to the left of each row shows the terminal into which the flight will arrive (T1 = Terminal 1, T2 = Terminal 2). The details shown are the city of origin, the Airport IATA code and name, the airline, the incoming flight number, the day and time on which the flight was scheduled to arrive, the time at which the flight landed (if it landed) or blank (if it has not landed). The flight status will be shown as delayed if the flight is overdue and has not landed. Flights that are not due to have landed are not shown. The same system is used throughout the world.

For normalization you may assume the following information holds. Other airports could have arrivals recorded in the same database. The IATA is unique for the airports that are recorded (i.e. no two airports in the database have the same IATA code. A flight number uniquely identifies the departure and arrival airports (e.g. FR2907 always flies from Bremen to Dublin) and the arrival terminal. The flight instance is uniquely determined by the flight number and scheduled arrival time. The list is generated depending on the current local time, which is not stored in the database, but is generated at run time. You need not take into account the fact that the flight prefix determines the airline.

3. (a) Represent the data shown in Figure 2 in unnormalized form. (5 marks)

(b) Represent the form(s) derived in part (a) in first normal form. (5 marks)

(c) Represent the form(s) resulting from part (b) in second normal form. (5 marks)

(d) Represent the form(s) resulting from part (c) in second normal form. (5 marks)

(e) Represent the form(s) resulting from part (d) as an ERD. (10 marks)

4. Write a PL/SQL program to do the following:

Accept a pre-existing booking id, a flight number and a flight date from the user. If there are enough seats left (number_of_available_seats) add the number of seat reservations required to the seat_reservation table, ensuring that the seat_number has not yet been filled for that flight. Assume that the seats are numbered from 1 to the maximum available on the plane and that previous allocations have been made starting at seat number 1 (i.e. if 20 seats have been sold, seats 1 to 20 are allocated). Adjust the number_of_available_seats accordingly. Ensure that your transaction is atomic and the system is left in a consistent state and that users are made aware of any errors that have occurred. (30 marks)

SQL

```
SELECT column-list FROM tablename
[WHERE condition]
[ORDER BY column-list]
[GROUP BY column-name]
[HAVING condition];
SELECT  column-list FROM join-
            expression
Join-expression =
      table1 JOIN table2 ON condition |
            USING (column-list)
      table1  LEFT JOIN table2 ON
            condition | USING (column-
            list)
Conditions :  =,>,<,>=,<=,<>,
            BETWEEN .. AND.., IN (list),
            IS NULL, LIKE
Logical operators:  AND, OR, NOT
Set operations:  UNION, INTERSECT,
            MINUS

INSERT INTO tablename [{column-
            name,}] VALUES (data-value-
            list)
UPDATE tablename
[SET column-name= <data-value>]
            [WHERE condition]
```

PL/SQL_BLOCK

```
DECLARE
  [constant/variable declarations]
BEGIN
  Executable statements
RETURN Return value
[EXCEPTION
 exception handlers
END;
```

Exceptions:
DUP_VAL_ON_INDEX
NO_DATA_FOUND
TOO_MANY_ROWS

Error variables:
SQLCODE – gives error code
SQLERRM – gives error message.

MONGODB EXAMPLES

Create a products collection:

```
db.createCollection("products")
```

Insert a document with _id value 11 into products collection:

```
db.products.insert(
  [
   { _id: 11, item: "pencil", qty: 50, type:
"no.2" },
   { item: "pen", qty: 20 },
   { item: "eraser", qty: 25 }
  ])
```

Attributes may contain embedded documents or arrays.

<Embed_attrib_name>:[{set of embedded attributes}]

1) 1310
2) 1330

COLLEGE EXAMINATIONS

AMENDMENTS TO EXAMINATION QUESTION PAPER

COURSE REF: W211C/302C VENUE: B1, B2, G33, K104, K106
W228/W282/302C

SUBJECT: Databases 2

DATE: 5/1/17

TIME: 0100 - 0300

SIGNED: Patricia O'Byrne.

INSTRUCTIONS:

Q2. (b) (iii)

"List each flight number and the number of flight instance ..."

should read

"List each flight number and the number of flight instances .."

Q 3 (d) should read

Represent the form(s) resulting from part(c) in third normal form.