CPSC 304 Midterm 2
May, 2009
Time: 75 minutes
Total: 15 points

Consider the following relations for a hotel:

roomInfo(roomNum, roomType, serverNum)
categories(roomType,weekdayRate,weekendRate)
occupancy(roomNum, customerNum, arrivalDate,departureDate)

For the last relation, if a customer checks in any time, say, on May 1, 2009 and checks out before noon, say, on May 3, 2009, the arrivalDate and the departureDate would be "01/05/2009" and "03/05/2009" respectively. If a customer does not check out before noon, the customer is considered staying for that day. For simplicity, the departureDate cannot be null (i.e., if a customer is staying for today, the departureDate is set to tomorrow's date).

Question 1 (5 points)
For each of the following SQL queries, determine if there exists an equivalent ***relational algebra*** statement. If you answer is positive, give such a statement (i.e., a single RA expression); otherwise, just state that no such statement exists.

a) (1 point) select distinct roomNum from occupancy where customerNum = 999

\Pi roomNum (\Sigma customerNum = 999 (occupancy))

b) (2 points) select max(departureDate) from occupancy where customerNum = 999

(\Rho A (|Pi departureDate \Sigma customerNum = 999 (occupancy)) -
[\Pi A.departureDate \Sigma A.departureDate < B.departureDate
[A \Times(\Rho B (|Pi departureDate \Sigma customerNum = 999 (occupancy)))]]

c) (1 point) select distinct roomNum from occupancy A where not exists
(select * from occupancy B where B.roomNum = A.roomNum and
customerNum = 999)

\Pi roomNum (occupancy) - \Pi roomNum(\Sigma customerNum = 999 (occupancy))

d) (1 point) select distinct A.roomNum from occupancy A, occupancy B where
A.customerNum = 999 and A.roomNum = B.roomNum and
B. customerNum = 100 and B.departureDate = A.arrivalDate

\Pi A.roomNum [\Sigma A.customerNum= 999 and A.roomNum = B.roomNum and
B.customerNum = 100 and B.departureDate =A.arrivalDate (\Rho A (occupancy)
\Times \Rho B (occupancy))]

Question 2 (10 points)
For each of the following queries, determine if there exists an equivalent SQL statement. If you answer is positive, give such a statement (i.e., a single SQL statement); otherwise, just state that no such statement exists.

a) (1 point) Find all the room types (i.e., roomType) served by server numbered 101.

select roomType from roomInfo where serverNum = 101

b) (1 point) Find the number of room types served by server numbered 101 (i.e., unlike the previous part, this question asks for a number, not the list).

select count(distinct roomType) from roomInfo where serverNum = 101

c) (2 points) Find the highest number of room types served by a single server.

With Temp(typeTotal) as
select count(distinct roomType) as typeTotal from roomInfo group by serverNum
select max(typeTotal) from Temp

d) (1 point) Find all the rooms (i.e., roomNum) that were ***not*** occupied in the evening of May 15, 2009.

select roomNum from roomInfo where roomNum not in
(select roomNum from occupancy where arrivalDate <= "15/05/2009" and departureDate >= "16/05/2009")

e) (1 point) May 15, 2009 is a weekday. Find all the occupied rooms in the evening of May 15, 2009 which has a daily room rate exceeding $400.

select occupancy.roomNum from occupancy, categories, roomInfo where
arrivalDate <= "15/05/2009" and departureDate >= "16/05/2009" and
occupancy.roomNum = roomInfo.roomNum and weekdayRate >= $400
and roomInfo.roomType = categories.roomType

f) (1 point) Find the most expensive occupied room in the evening of May 15, 2009.

The following query finds the most expensive room rate among the occupied rooms:

select max(weekdayRate) from occupancy, categorie, roomInfo where
arrivalDate <= "15/05/2009" and departureDate >= "16/05/2009" and
occupancy.roomNum = categories.roomNum and
roomInfo.roomType = categories.roomType

The following query finds the rooms with the most expensive room rate among the occupied rooms:

```
With Temp(roomNum,roomRate) as
        select occupancy.roomNum, weekdayRate
        from occupancy, categories, roomInfo  where
        arrivalDate <= "15/05/2009" and departureDate >= "16/05/2009" and
       occupancy.roomNum = roomInfo.roomNum
       and roomInfo.roomType = categories.roomType

select roomNum from Temp where roomRate =
        (select max(roomRate) from Temp)
```

g) (1 point) Find all the rooms that have not been occupied since May 1, 2009.

```
select roomNum from roomInfo where roomNum not in
      (select roomNum from occupancy where departureDate >= "01/05/2009")
```

h) (2 points) Within the month of April 2009, find all the rooms that have been occupied by at least 2 different customers.

```
 select roomNum from occupancy where
     ( (departureDate >= "01/04/2009" and departureDate <= "30/04/2009")
or
      (arrivalDate >= "01/04/2009" and arrivalDate <= "30/04/2009") )
     groupby roomNum having count (distinct customerNum) >= 2
```

----- The End -----