# Directions & Deliverable

Complete the following exercises in a single document. Label each question and/or letter clearly. This assignment requires the use of relational symbols. You may either do the assignment electronically or handwritten on paper. Regardless, please submit your work electronically to Blackboard by the due date specified.

#### Exercises

*The following tables form part of a database held in a relational DBMS:*

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

*where* Hotel *contains hotel details and* hotelNo *is the primary key;*

Room contains room details for each hotel and (roomNo, hoteINo) forms the primary key;

Booking contains details of bookings and (hoteINo, guestNo, dateFrom) forms the primary key;

Guest contains guest details and guestNo is the primary key.

1. (10 pts.) Identify the foreign keys in this schema. Explain how the entity and referential integrity rules apply to these relations.
2. (10 pts.) Produce some sample tables for these relations that observe the relational integrity rules. Suggest some general constraints that would be appropriate for this schema.
3. (10 pts.) Analyze the RDBMSs that you are currently using. Determine the support the system provides for primary keys, alternate keys, foreign keys, relational integrity, and views.
4. (10 pts.) Implement the above schema in one of the RDBMSs you currently use. Generate two user-views that are accessible and updatable as well as two other user-views that cannot be updated.

***For the following exercises, use the Hotel schema defined at the start of the exercises.***

1. (10 pts.) Describe the relations that would be produced by the following relational algebra operations:
2. ΠhotelNo (price  50 (Room) )
3. Hotel.hotelNo  Room.hotelNo(Hotel  Room)
4. ΠhotelName (Hotel Hotel.hotelNo  Room.hotelNo (price  50 (Room)) )
5. Guest (dateTo ≥ ‘1-Jan-2007’ (Booking))
6. Hotel Hotel.hotelNo  Room.hotelNo (price  50 (Room)) )
7. ΠguestName, hotelNo (Booking Booking.guestNo  Guest.guestNo Guest) ÷ ΠhotelNo (city ’London’(Hotel))
8. (10 pts.) Provide the equivalent tuple relational calculus and domain relational calculus expressions for each of the relational algebra queries below.
9. ΠhotelNo (price  50 (Room) )
10. Hotel.hotelNo  Room.hotelNo(Hotel  Room)
11. ΠhotelName (Hotel Hotel.hotelNo  Room.hotelNo (price  50 (Room)) )
12. Guest (dateTo ≥ ‘1-Jan-2007’ (Booking))
13. Hotel Hotel.hotelNo  Room.hotelNo (price  50 (Room)) )
14. ΠguestName, hotelNo (Booking Booking.guestNo  Guest.guestNo Guest) ÷ ΠhotelNo (city ’London’(Hotel))
15. (10 pts.) Describe the relations that would be produced by the following tuple relational calculus expressions:
16. {H.hotelName | Hotel(H)  H.city = ‘London’}
17. {H.hotelName | Hotel(H)  (R) (Room(R)  H.hotelNo  R.hotelNo R.price > 50)}
18. {H.hotelName | Hotel(H)  (B) (G) (Booking(B)  Guest(G)  H.hotelNo  B.hotelNo B.guestNo = G.guestNo  G.guestName = ‘John Smith’)}
19. {H.hotelName, G.guestName, B1.dateFrom, B2.dateFrom | Hotel(H)  Guest(G)  Booking(B1)  Booking(B2)  H.hotelNo  B1.hotelNo G.guestNo = B1.guestNo  B2.hotelNo = B1.hotelNo  B2.guestNo = B1.guestNo  B2.dateFrom ≠ B1.dateFrom}
20. (10 pts.) Provide the equivalent domain relational calculus and relational algebra expressions for each of the tuple relational calculus expressions.
21. {H.hotelName | Hotel(H)  H.city = ‘London’}
22. {H.hotelName | Hotel(H)  (R) (Room(R)  H.hotelNo  R.hotelNo R.price > 50)}
23. {H.hotelName | Hotel(H)  (B) (G) (Booking(B)  Guest(G)  H.hotelNo  B.hotelNo B.guestNo = G.guestNo  G.guestName = ‘John Smith’)}
24. {H.hotelName, G.guestName, B1.dateFrom, B2.dateFrom | Hotel(H)  Guest(G) 

Booking(B1)  Booking(B2)  H.hotelNo  B1.hotelNo

G.guestNo = B1.guestNo  B2.hotelNo = B1.hotelNo 

B2.guestNo = B1.guestNo  B2.dateFrom ≠ B1.dateFrom}

1. (10 pts.) Generate the relational algebra, tuple relational calculus, and domain relational calculus expressions for the following queries:
2. *List all hotels.*
3. *List all single rooms with a price below $20 per night.*
4. *List the names and cities of all guests.*
5. *List the price and type of all rooms at the Grosvenor Hotel.*
6. *List all guests currently staying at the Grosvenor Hotel.*
7. *List the details of all rooms at the Grosvenor Hotel, including the name of the guest staying in the room, if the room is occupied.*
8. *List the guest details (guestNo, guestName, and guestAddress) of all guests staying at the Grosvenor Hotel.*
9. (10 pts.) Using relational algebra, create a view of all rooms in the Grosvenor Hotel, excluding price details. What would be the advantages of this view?