

## Exercises

For the following exercises, use the Hotel schema defined at the start of the Exercises at the end of Chapter 3.

4.8 Describe the relations that would be produced by the following relational algebra operations:

- (a)  $\Pi_{\text{hotelNo}}(\sigma_{\text{price} > 50}(\text{Room}))$
- (b)  $\sigma_{\text{Hotel.hotelNo} = \text{Room.hotelNo}}(\text{Hotel} \times \text{Room})$
- (c)  $\Pi_{\text{hotelName}}(\text{Hotel} \bowtie_{\text{Hotel.hotelNo} = \text{Room.hotelNo}}(\sigma_{\text{price} > 50}(\text{Room})))$
- (d)  $\text{Guest} \bowtie (\sigma_{\text{dateTo} \geq '1-Jan-2002'}(\text{Booking}))$
- (e)  $\text{Hotel} \bowtie_{\text{Hotel.hotelNo} = \text{Room.hotelNo}}(\sigma_{\text{price} > 50}(\text{Room}))$
- (f)  $\Pi_{\text{guestName, hotelNo}}(\text{Booking} \bowtie_{\text{Booking.guestNo} = \text{Guest.guestNo}} \text{Guest}) \div \Pi_{\text{hotelNo}}(\sigma_{\text{city} = 'London'}(\text{Hotel}))$

4.9 Provide the equivalent tuple relational calculus and domain relational calculus expressions for each of the relational algebra queries given in Exercise 4.8.

4.10 Describe the relations that would be produced by the following tuple relational calculus expressions:

- (a)  $\{H.\text{hotelName} \mid \text{Hotel}(H) \wedge H.\text{city} = 'London'\}$
- (b)  $\{H.\text{hotelName} \mid \text{Hotel}(H) \wedge (\exists R) (\text{Room}(R) \wedge H.\text{hotelNo} = R.\text{hotelNo} \wedge R.\text{price} > 50)\}$
- (c)  $\{H.\text{hotelName} \mid \text{Hotel}(H) \wedge (\exists B) (\exists G) (\text{Booking}(B) \wedge \text{Guest}(G) \wedge H.\text{hotelNo} = B.\text{hotelNo} \wedge B.\text{guestNo} = G.\text{guestNo} \wedge G.\text{guestName} = 'John Smith')\}$
- (d)  $\{H.\text{hotelName}, G.\text{guestName}, B1.\text{dateFrom}, B2.\text{dateFrom} \mid \text{Hotel}(H) \wedge \text{Guest}(G) \wedge \text{Booking}(B1) \wedge \text{Booking}(B2) \wedge H.\text{hotelNo} = B1.\text{hotelNo} \wedge G.\text{guestNo} = B1.\text{guestNo} \wedge B2.\text{hotelNo} = B1.\text{hotelNo} \wedge B2.\text{guestNo} = B1.\text{guestNo} \wedge B2.\text{dateFrom} \neq B1.\text{dateFrom}\}$

4.11 Provide the equivalent domain relational calculus and relational algebra expressions for each of the tuple relational calculus expressions given in Exercise 4.10.

4.12 Generate the relational algebra, tuple relational calculus, and domain relational calculus expressions for the following queries:

- (a) List all hotels.
- (b) List all single rooms with a price below £20 per night.
- (c) List the names and cities of all guests.
- (d) List the price and type of all rooms at the Grosvenor Hotel.
- (e) List all guests currently staying at the Grosvenor Hotel.
- (f) 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.
- (g) List the guest details (guestNo, guestName, and guestAddress) of all guests staying at the Grosvenor Hotel.

4.13 Using relational algebra, create a view of all rooms in the Grosvenor Hotel, excluding price details. What are the advantages of this view?

4.14 Analyze the RDBMSs that you are currently using. What types of relational language does the system provide? For each of the languages provided, what are the equivalent operations for the eight relational algebra operations defined in Section 4.1?