COMP3278 Introduction to Database Management Systems

Assignment 2 – Relational Algebra

Due: April 17, 2025, 23:59

Consider the following relational tables:
• Customers (cID, name)

• Hotels (hID, name, location, category)
location: The city where the hotel is located (e.g., London, Paris, Tokyo, etc.)
category is a number in the star rating system used by international hotel standards. The value can be 3, 4, or 5.

• Reservation (cID, hID, rdate)
Foreign keys: cID referencing Customers (cID), hID referencing Hotels (hID)
rdate is the date of the reservation in the format DD-MM-YYYY. We can assume that no reservation will span across two days.

• Feedback (feedbackID, cID, hID, score, comment)
Foreign keys: cID referencing Customers (cID), hID referencing Hotels (hID)
score: Integer. The rating given by the customer, on a scale from 1 to 5.
comment: The textual feedback provided by the customer.

Answer the below queries using relational algebra. You need to show your steps and clearly state the assumptions if any.

Example: Find the names of hotels in "Paris" that have been reserved by customers named "Emma".

Step 1: Select customers named "Emma"
$C1 \leftarrow \sigma_{name='Emma'}(Customers)$
Step 2: Get reservations made by Emma
$R1 \leftarrow C1 \bowtie Reservation$
Step 3: Join reservations with Paris hotels and project hotel names
$Result \leftarrow \pi_{Hotels.name}(R1 \bowtie \sigma_{location='Paris'}(Hotels))$

Q1 [20%] Find the cID of the customers(s) who reserved a hotel in "London" on '04-04-2025'.

Q2 [20%] Find the hID of the hotel(s) that satisfy both of the following conditions:
(1) The hotel has been reserved at least once by the customer with name "Jack", and
(2) The hotel has been reserved more than 100 times in total by all customers combined.

Q3 [20%] Find the cID, name of the customer(s) who have reserved all 5-star "Tokyo" location hotels.

Q4 [20%] Find the names of customers who have reserved a 5-star hotel in "Dubai" and submitted feedback with a score higher than 4 for that same hotel.

Q5 [20%] Provide the optimized expression tree for Q4. If your relational algebra expression for Q4 is not yet optimized, please optimize it first. If your Q4 solution is already optimized, please write down the expression tree directly.