

Project Report
Databse Management System

Group_7

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Queries and their Relational algebra expression

Qu-1 List out the total numbers of vacant rooms ?

Q1. $r_1 \leftarrow \sigma_{status_occupied = 'no'} (room)$
 $r_2 \leftarrow F_{count(room_no)} (r_1)$

Figure 1: Relational Algebra Expression

Qu-2 List out the total numbers of filled rooms ?

Q2. $r_1 \leftarrow \text{status_occupied} = \text{'yes'} (\text{room})$
 $r_2 \leftarrow \sum_{\text{count(room_no)}} (r_1)$

Figure 2: Relational Algebra Expression

Qu-3 List the guest id with their room no, tpye of the room ?

Q3. $r_1 \leftarrow \text{room} \bowtie \text{allot}$
 $\text{room}.room_no = \text{allot}.room_no$

$r_2 \leftarrow \sigma_{\text{allot}.guest_id = r_1.guest_id}$
 $\text{allot}.room_no,$
 $\text{room}.type$

Figure 3: Relational Algebra Expression

Qu-4 List the guest id who only had food in hotel ?

$$\begin{aligned} Q4. \quad r_1 &\leftarrow \sigma_{\text{guest_id}} (\text{guest}) \\ r_2 &\leftarrow \sigma_{\text{guest_id}} (\text{allot}) \\ r_3 &\leftarrow r_1 \text{ EXCEPT } r_2 \end{aligned}$$

Figure 4: Relational Algebra Expression

Qu-5 Find out the details of the very first customer of the hotel ?

$$\begin{aligned} Q5. \quad r_1(m) &\leftarrow \varphi(\text{first}) \left(\sigma_{\min(\text{entry-time})} (\text{guest}) \right) \\ r_2 &\leftarrow \varphi(\text{first1}) \left(\text{first} \bowtie \text{guest} \right. \\ &\quad \left. \text{first.m} = \text{guest.entry-time} \right) \\ r_3 &\leftarrow \pi_{\cdot *} (\text{first1} \bowtie \text{family}) \end{aligned}$$

Figure 5: Relational Algebra Expression

Qu-6 List out the number of items in each type of food ?

$$\begin{aligned} Q6. \quad r_1(\text{food.type}, &= \sum_{\text{food.type}} \text{count}(\text{food.product-id}), (\text{food}) \\ \text{food.no.of.items}) &\quad \text{food.type} \\ r_2 &\leftarrow \pi_{\cdot *} (r_1) \end{aligned}$$

Figure 6: Relational Algebra Expression

Qu-7 List out the most ordered food items ate by the customers ?

$$Q7. \quad r_1 (orders.product-id, c) \leftarrow \sigma_{(item_count)} \left(\pi_x (orders) \right)$$

where, $x = orders.prod-id$

$$r_2 (c) \leftarrow \sigma_{(max_item_count)} \left(\pi_{max(c)} (item_count) \right)$$
$$r_3 \leftarrow \sigma_{(max_item)} \left(\pi_{*} (item_count * max_item_count) \right)$$
$$r_4 \leftarrow \pi_{*} (max_item * food)$$

Figure 7: Relational Algebra Expression

Qu-8 List out guest id which uses all types of facilities ?

$$Q8. \quad r_1 \leftarrow \pi_{facility_id} (facility)$$
$$r_2 \leftarrow \pi_{guest_id, facility_id} (uses)$$
$$r_3 \leftarrow r_2 \text{ DIV } r_1$$

Figure 8: Relational Algebra Expression

Qu-9 List guest id that lived in room no = A401 and used facility id = FC001 ?

Q9. $r_1 \leftarrow \text{allot} * \text{uses}$

$r_2 \leftarrow \sigma_{\text{uses.facility-id} = 'FC001' \text{ AND } \text{allot.room-no} = 'A401'} (r_1)$

$r_3 \leftarrow \pi_{\text{allot.room-no}, \text{allot.guest-id}, \text{uses.guest-id}} (r_2)$

Figure 9: Relational Algebra Expression

Qu-10 List out the guest id who were allotted more than or equal to 2 rooms ?

Q10. $r_1 (\text{allot.guest-id}, \text{allot.no-of-rooms}) \leftarrow \sigma_{\text{allot.guest-id}} \sqsubset_{\text{count(allot.room-no)}} (\text{allot})$

$r_2 \leftarrow \sigma_{\text{no-of-rooms} \geq 2} (r_1)$

$r_3 \leftarrow \pi_{*, *} (r_2)$

Figure 10: Relational Algebra Expression

Qu-11 Total Amount paid by the family type customers ?

Q11. $r_1 \leftarrow \text{bill} * \text{family}$

$r_2 \leftarrow \sum_{\text{bill.amount}} (r_1) (r_1)$

Figure 11: Relational Algebra Expression

Qu-12 Total Amount paid by the company type customers ?

$$\begin{aligned}
 Q12. \quad & r_1 \leftarrow \text{bill} * \text{company} \\
 & r_2 \leftarrow \int \text{sum(bill.amount)} \quad (r_1)
 \end{aligned}$$

Figure 12: Relational Algebra Expression

Qu-13 Find out the name of that company that came with maximum number of employee ?

$$\begin{aligned}
 Q13. \quad & r_1 \leftarrow \text{company} \quad \bowtie \quad \text{company-members} \\
 & \text{company.guest-id} = \text{company-members.guest-id} \\
 & \text{company.name} = \text{company-members.name} \\
 & r_2 (\text{company.name}, \text{no-of-employees}) \leftarrow \wp(\text{company-count}) \quad (p) \\
 & \text{where, } p = \text{company.name} \int \text{company.name,} \\
 & \quad \quad \quad \text{count(company-members,} \\
 & \quad \quad \quad \text{name)} \\
 & r_3 (\text{no-of-employees}) \leftarrow \wp(\text{max-count}) \left(\int_{\text{max(no-of-employees)}} \text{company-count} \right) \\
 & r_4 \leftarrow \text{max-count} * \text{company-count} \\
 & r_5 \leftarrow \pi_{*} (r_4)
 \end{aligned}$$

Figure 13: Relational Algebra Expression

Qu-14 Most Profitable guest id that is of family type customer ?

Q14. $\begin{aligned} r_1 &\leftarrow \text{bill} * \text{family} \\ r_2(\text{amount}) &\leftarrow \wp(\text{family-amount}) \left(\overline{F}_{\max(\text{bill.amount})}(r_1) \right) \\ r_3 &\leftarrow \text{bill} * \text{family-amount} \\ r_4 &\leftarrow \pi_{*}(r_3) \end{aligned}$

Figure 14: Relational Algebra Expression

Qu-15 Most Profitable guest id that is of company type customer ?

Q15. $\begin{aligned} r_1 &\leftarrow \text{bill} * \text{company} \\ r_2(\text{amount}) &\leftarrow \wp(\text{company-amount}) \left(\overline{F}_{\max(\text{bill.amount})}(r_1) \right) \\ r_3 &\leftarrow \text{bill} * \text{company-amount} \\ r_4 &\leftarrow \pi_{*}(r_3) \end{aligned}$

Figure 15: Relational Algebra Expression

Qu-16 List out the Head SSN with Head Name who came twice to the hotel ?

$$\begin{aligned}
 & Q16. \quad f1 \leftarrow \text{family} \quad f2 \leftarrow \text{family} \\
 & r_1 \leftarrow \sigma_{f1.\text{family-Head-SSN} = f2.\text{family-Head-SSN} \text{ AND } f1.\text{guest-id} \neq f2.\text{guest.id}} (f1 \times f2) \\
 & r_2 \leftarrow (\pi_{f1.\text{family-Head-SSN}, f1.\text{family-Head-Name}}, \sigma_{\text{count}(f1.\text{guest-id})=2}) (r_1) \\
 & r_3 \leftarrow \pi_{*} (\sigma_{\text{count}(f1.\text{guest-id})=2}) (r_2)
 \end{aligned}$$

Figure 16: Relational Algebra Expression

Qu-17 List the facility used by more than 10 customers ?

$$\begin{aligned}
 & Q17. \quad r_1 \leftarrow \text{family} * \text{uses} \\
 & r_2 \leftarrow \pi_{\text{uses.facility-id}, \text{facility.facility-type}} (\sigma_{\text{count}(\text{uses.guest-id}) \geq 10}) (r_1) \\
 & r_3 \leftarrow \pi_{*} (\sigma_{\text{count} \geq 10}) (r_2)
 \end{aligned}$$

Figure 17: Relational Algebra Expression

Qu-18 List out the different company names with their number of employees ?

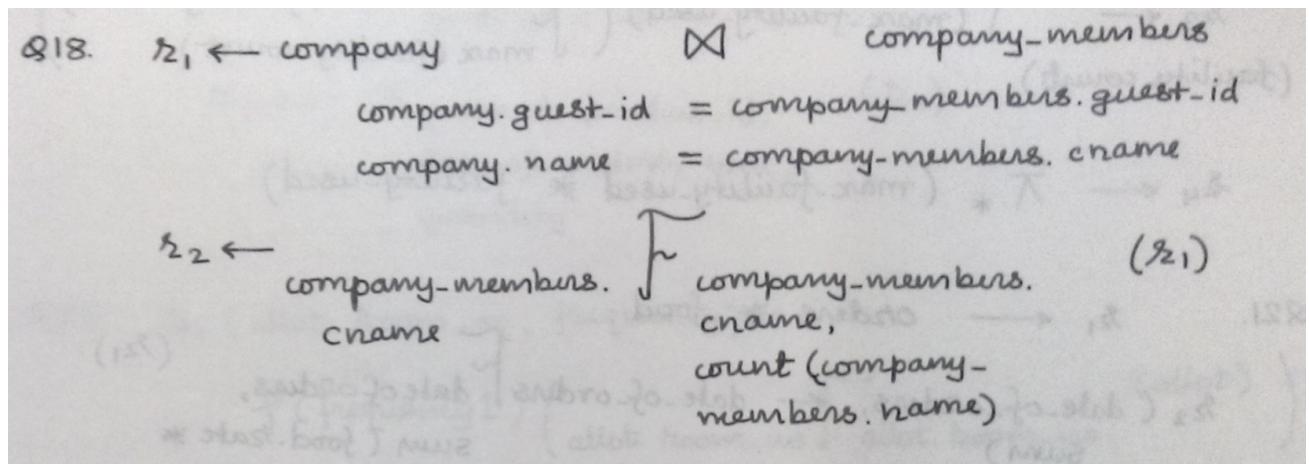


Figure 18: Relational Algebra Expression

Qu-19 List out the guest id of the family type with the maximum number of members with them ?

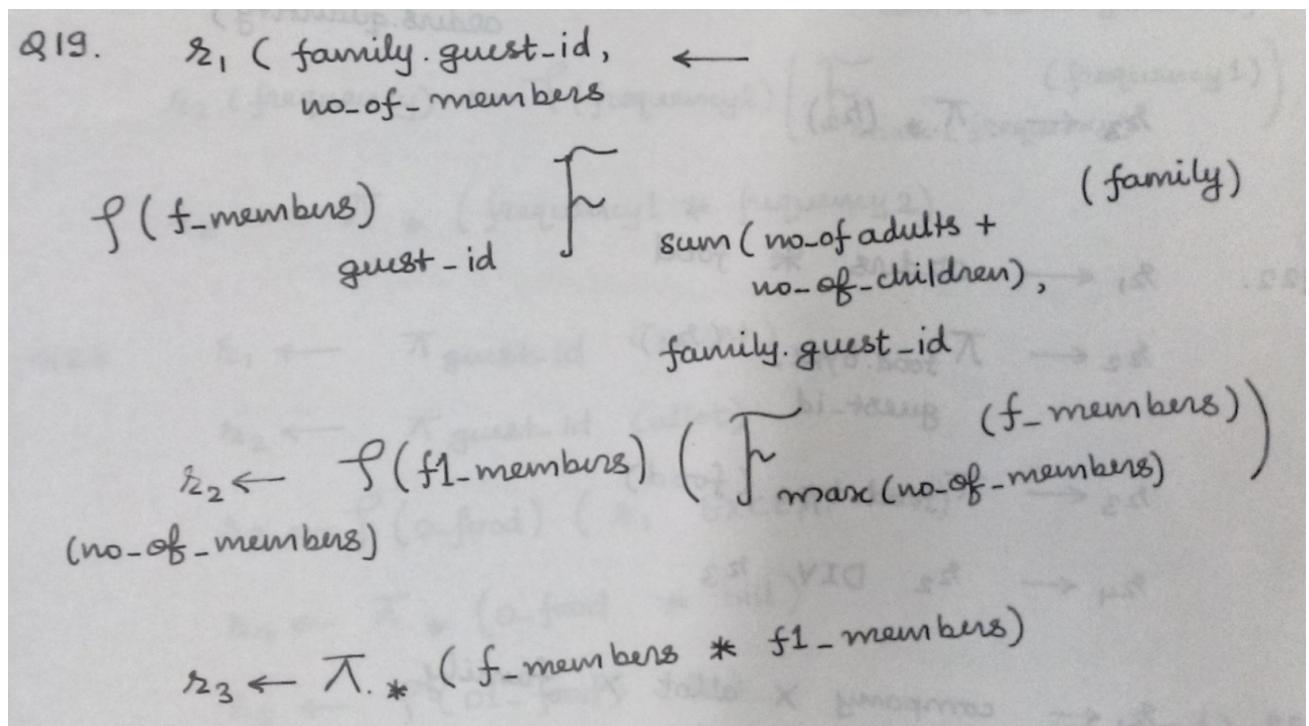


Figure 19: Relational Algebra Expression

Qu-20 List out the facility used by the most number of customers ?

Q20. $\Sigma_1 \leftarrow \text{facility} * \text{uses}$

$\Sigma_2 (\text{facility-type}, \text{facility-id}, \text{facility-count}) \leftarrow \wp(\text{facility-used}) (p)$ where,

$p \equiv (\text{facility-id}, \text{facility-type}) \sum \text{facility-id, facility-type, count (uses.guest-id)}$

Figure 20:

$\Sigma_3 \leftarrow \wp(\text{max-facility-used}) \left(\sum_{\text{max(facility-count)}} (\text{facility-used}) \right)$

$\Sigma_4 \leftarrow \pi_{\cdot *} (\text{max-facility-used} * \text{facility-used})$

Figure 21: **Relational Algebra Expression**

Qu-21 Find out the total food amount on a particular date given by the customers ?

Q21. $\Sigma_1 \leftarrow \text{orders} * \text{food}$

$\Sigma_2 (\text{date-of-orders}, \text{sum}) \leftarrow \text{date-of-orders} \sum \text{date-of-orders, sum (food.rate * orders.quantity)}$

$\Sigma_3 \leftarrow \pi_{\cdot *} (\Sigma_2)$

Figure 22: **Relational Algebra Expression**

Qu-22 List out the guest id that orders all types of foods ?

Q22. $r_{21} \leftarrow \text{orders} * \text{food}$
 $r_{22} \leftarrow \pi_{\text{food.type}, \text{guest-id}} (r_{21})$
 $r_{23} \leftarrow \pi_{\text{food.type}} (\text{food})$
 $r_{24} \leftarrow r_{22} \text{ DIV } r_{23}$

Figure 23: Relational Algebra Expression

Qu-23 List out the total number of people who checked out on 11-01-2015 ?

Q23. $r_{21} \leftarrow \text{company} \times \text{allot} \times \text{family}$
 $r_{22} \leftarrow \sigma_{(\text{company.guest-id} = \text{allot.guest-id} \text{ OR } \text{allot.guest-id} = \text{family.guest-id}) \text{ AND } \text{allot.check-out-date} = '2015-01-15'} (r_{21})$
 $r_{23} \leftarrow \pi_{\text{allot.check-out-date}, \text{allot.guest-id}} (r_{22})$

Figure 24: Relational Algebra Expression

Qu-24 List out the orders for the guest id - C1004 during his period of living ?

Q24. $\begin{aligned} r_1 &\leftarrow \sigma_{\text{guest_id} = 'C1004'}(\text{orders}) \\ r_2 &\leftarrow \pi_{\text{guest_id}, \text{product_id}, \text{date_of_order}, \text{time}, \text{quantity}}(r_1) \end{aligned}$

Figure 25: Relational Algebra Expression

Qu-25 List out the most frequently allotted room ?

Q25. $\begin{aligned} r_1(\text{allot_room_no}, \text{frequency}) &\leftarrow \text{f}(\text{frequency}_1) \left(\text{allot_room_no} \sum_{\text{allot_room_no}} \text{count}(\text{allot_guest_id}) \right) \\ r_2(\text{frequency}) &\leftarrow \text{f}(\text{frequency}_2) \left(\sum_{\text{max}(\text{frequency})} (\text{frequency}_1) \right) \\ r_3 &\leftarrow \pi_{*}(\text{frequency}_1 * \text{frequency}_2) \end{aligned}$

Figure 26: Relational Algebra Expression

Qu-26 Find out the average amount of bill paid by guests visting only for food ?

$$\begin{aligned}
 Q26. \quad & r_1 \leftarrow \pi_{\text{guest_id}} (\text{guest}) \\
 & r_2 \leftarrow \pi_{\text{guest_id}} (\text{allot}) \\
 & r_3 \leftarrow \delta(\text{o-food}) (r_1 \text{ EXCEPT } r_2) \\
 & r_4 \leftarrow \pi_{*} (\text{o-food} * \text{bill}) \\
 & r_5 \leftarrow \delta(\text{o1-food}) (r_4) \\
 & r_6 (\text{average}) \leftarrow \sum_{\text{o1-food.guest-id}} \frac{\text{sum(o1-food.amount)}}{\text{count(o1-food.guest-id)}}
 \end{aligned}$$

Figure 27: Relational Algebra Expression

Qu-27 Find out the date on which the maximum number customers came to hotel ?

$$\begin{aligned}
 27. \quad & r_1 (\text{no-of-cust}, \text{date(entry-time)}) \leftarrow \\
 & \quad \delta(\text{new}) \left(\text{date(entry-time)} \sum_{\text{count(guest-id)}} \text{date(entry-time), (guest)} \right) \\
 & r_2 (\text{no-of-cust}) \leftarrow \delta(\text{new1}) \left(\sum_{\text{max(no-of-cust)}} (\text{new}) \right) \\
 & r_3 \leftarrow \pi_{*} (\text{new} * \text{new1})
 \end{aligned}$$

Figure 28: Relational Algebra Expression

Qu-28 List out the guest id that paid there bills by Cheque?

Q28. $r_1 \leftarrow \sigma_{\text{paying-method} = \text{'By-cheque'}}(\text{bill})$
 $r_2 \leftarrow \pi_{\text{guest-id}, \text{bill-no}, \text{paying-method}}(r_1)$

Figure 29: Relational Algebra Expression

Qu-29 List out the guest id that paid there bills by Cash?

Q29. $r_1 \leftarrow \sigma_{\text{paying-method} = \text{'By-Cash'}}(\text{bill})$
 $r_2 \leftarrow \pi_{\text{guest-id}, \text{bill-no}, \text{paying-method}}(r_1)$

Figure 30: Relational Algebra Expression

Qu-30 List out the guest id that paid there bills by Debit-Card ?

Q30. $r_1 \leftarrow \sigma_{\text{paying-method} = \text{'By-Debit-Card'}}(\text{bill})$
 $r_2 \leftarrow \pi_{\text{guest-id}, \text{bill-no}, \text{paying-method}}(r_1)$

Figure 31: Relational Algebra Expression

Qu-31 List name, guest id of families and company check in on 12-01-2015 ?

Q31. $r_1 \leftarrow \text{allot * family}$
 $r_2 \leftarrow \sigma_{\text{check-in-date} = '2015-01-12'} (r_1)$
 $r_3 (\text{guest-id}, \text{check-in-date}, \text{Head-SSN/cname}) \leftarrow$
 $\pi_{\text{guest-id}, \text{check-in-date}, \text{family-head-SSN}} (r_1)$
 $r_4 \leftarrow \text{allot * company}$
 $r_5 \leftarrow \sigma_{\text{check-in-date} = '2015-01-12'} (r_4)$
 $r_6 \leftarrow \pi_{\text{guest-id}, \text{check-in-date}, \text{company.name}} (r_5)$
 $r_7 \leftarrow r_3 \text{ UNION } r_6$

Figure 32: Relational Algebra Expression

Qu-32 List out guest id with their room-no. that are of family type ?

Q32. $r_1 \leftarrow \text{allot * family}$
 $r_2 \leftarrow \pi_{r_1.\text{guest-id}, r_1.\text{room-no}} (r_1)$

Figure 33: Relational Algebra Expression

Qu-33 List out guest id with their room-no. that are of company type ?

Q33. $r_1 \leftarrow \text{allot} * \text{company}$
 $r_2 \leftarrow \pi_{r_1.\text{guest-id}, r_1.\text{room-no}}(r_1)$

Figure 34: Relational Algebra Expression

Qu-34 List out the facility id used by guest that lived in room-no = A101 ?

Q34. $r_1 \leftarrow \sigma_{\text{allot. room-no} = 'A101'}(\text{allot})$
 $r_2 \leftarrow r_1 * \text{uses}$
 $r_3 \leftarrow r_2 * \text{facility}$

Figure 35: Relational Algebra Expression

Qu-35 List out the date on which maximum number of customer of family tpye came to hotel ?

Q35. $r_1 \leftarrow \text{guest} * \text{family}$
 $r_2 \leftarrow \text{count, date(entry-time)} \leftarrow$
 $\quad f(\text{new}) \left(\text{date(entry-time)} \overbrace{\quad}^{\text{date(entry-time),}} \text{count(guest-id)}, (r_1) \right)$
 $r_3 \leftarrow f(\text{new}) \overbrace{\quad}^{\text{max(count)}} (\text{new})$
 $r_4 \leftarrow \pi_{*}(\text{new} * \text{new1})$

Figure 36: Relational Algebra Expression

Qu-36 List out the date on which maximum number of customer of company type came to hotel ?

$$\begin{aligned} Q36. \quad & r_1 \leftarrow \text{guest} * \text{company} \\ & r_2 (\text{count}, \text{date(entry-time)}) \leftarrow \\ & \quad \wp(\text{new}) \left(\text{date(entry-time)} \overbrace{\text{F}}^{\text{count(guest-id)}} \text{date(entry-time)}, (r_1) \right) \\ & r_3 \leftarrow \wp(\text{new1}) \overbrace{\text{F}}^{\text{max(count)}} \text{new1} \\ & (\text{count}) \\ & r_4 \leftarrow \pi_{\cdot * } (\text{new} * \text{new1}) \end{aligned}$$

Figure 37: Relational Algebra Expression