

Database Management System 13

Query Using Relational Algebra

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Employee Database

Emp(empNo,name)

Project(projectNo,pName,manager)

Assigned_To(projectNo,empNo)

Query: Find empNo of employees working on project 'comp01'

$$\pi_{empNo} (\sigma_{projectNo='comp01'}(Assigned_To))$$

Query: Find details of employees working on project 'comp01'

$$\pi_{empNo,name} (\sigma_{projectNo='comp01'}(Emp \bowtie Assigned_To))$$

Query: Obtain the details of employees working on the database project

$$\pi_{empNo,name} (\sigma_{pName='database'}(Emp \bowtie Assigned_To \bowtie Project))$$

Query: Find the details of employees working on the 'comp01' and 'comp02' projects

$$\pi_{empNo, name} (\sigma_{projectNo='comp01' \wedge projectNo='comp02'} (Emp \bowtie Assigned_To))$$

Query: Find the empNo who don't work on project 'comp01'

$$\pi_{empNo} (Assigned_To) - \pi_{empNo} (\sigma_{projectNo='comp01'} (Assigned_To))$$

This query can be solved as:

$$\pi_{empNo} (\sigma_{projectNo \neq 'comp01'} (Assigned_To))$$

Sailor Database

Sailors(sid, sname, rating, age)

Boats(bid, bname, color)

Reserves(sid, bid, day)

Query: Find the names of sailors who've reserved boat 105

$$\pi_{sname} (\sigma_{bid=105}(\text{Reserves} \bowtie \text{Sailors}))$$

This query can also be written as:

$$\pi_{sname} (\sigma_{bid=105}(\text{Reserves}) \bowtie \text{Sailors})$$

Query: Find the names of sailors who've reserved a green boat

$$\pi_{sname} (\sigma_{color='green'}(\text{Boats} \bowtie \text{Reserves} \bowtie \text{Sailors}))$$

This query can also be written as:

$$\pi_{sname} ((\sigma_{color='green'}(\text{Boats})) \bowtie \text{Reserves} \bowtie \text{Sailors})$$

Query: Find the sailor ids of the sailors who've reserved all boats

$$\pi_{sid, bid} (\text{Reserves}) \div \pi_{bid} (\text{Boats})$$

Query: Find the names of sailors who've reserved all boats

1. $\rho_{Temp} (\pi_{sid, bid} (\text{Reserves}) \div \pi_{bid} (\text{Boats}))$
2. $\pi_{sname} (\text{Temp} \bowtie \text{Sailors})$

This query can also be written as:

$$\pi_{sname, bid} (\text{Sailors} \bowtie \text{Reserves}) \div \pi_{bid} (\text{Boats})$$

Query Using Relational Algebra...

Query: Find the colors of boats reserved by Akash

$$\pi_{color} ((\sigma_{sname='Akash'}(\text{Sailors})) \bowtie \text{Reserves} \bowtie \text{Boats})$$

Query: Find all sailor id's of sailors who have a rating of at least 10 or reserved boat 105

$$\pi_{sid} (\sigma_{rating \geq 10}(\text{Sailors})) \cup \pi_{sid} (\sigma_{bid=105}(\text{Reserves}))$$

Query: Find the names of sailors who have not reserved a green boat

$$\pi_{sname} ((\pi_{sid}(\text{Sailors}) - \pi_{sid}(\sigma_{color='green'}(\text{Boats}) \bowtie \text{Reserves})) \bowtie \text{Sailors})$$

Query: Find the sailor id's of sailors with age over 20 who have not reserved a green boat

$$\pi_{sid} (\sigma_{age > 20}(\text{Sailors})) - \pi_{sid} (\sigma_{color='green'}(\text{Boats}) \bowtie \text{Reserves})$$

Query Using Relational Algebra...

Query: Find the names of sailors who have reserved at least two boats

$$\pi_{Reserves.bid} (\sigma_{Reserves.bid=Reserves2.bid \wedge Reserves.sid \neq Reserves2.sid} (Reserves \bowtie \rho_{Reserves2} (Reserves)))$$

Query: Find the sailor id's of sailors whose rating is better than some sailor called Bobby

$$\pi_{Sailors2.sid} (\sigma_{Sailors2.rating > Sailors.rating} (\rho_{Sailors2} (Sailors) \bowtie \sigma_{sname='Bobby'} (Sailors)))$$

Query: Find the sailor id's of sailors whose rating is better than every sailor called Bobby

$$\pi_{sid}(Sailors) - \pi_{Sailors2.sid} (\sigma_{Sailors2.rating \leq Sailors.rating} (\rho_{Sailors2} (Sailors) \bowtie \sigma_{sname='Bobby'} (Sailors)))$$

Query: Find the sailor id's of sailors with the highest rating

$$\pi_{sid}(Sailors) - \pi_{Sailors2.sid} (\sigma_{Sailors2.rating < Sailors.rating} (\rho_{Sailors2} (Sailors) \bowtie (Sailors)))$$

Shipment Database

Customer(cust_id, cust_name, annual_revenue)

Truck(truckno, driver_name)

City(city_name, population)

Shipment(shipment_no, cust_id, weight, truckno,
destination_city)

Query: Find the list of shipment numbers for shipments weighing over 20 pounds

$\pi_{shipment_no} (\sigma_{weight > 20pound}(Shipment))$

Query: Find the names of customers with more than \$10 million in annual revenue

$\pi_{cust_name} (\sigma_{annual_revenue > \$10million}(Customer))$

Query Using Relational Algebra...

Query: Find the driver of truck 45

$\pi_{driver_name} (\sigma_{truckno=45}(Truck))$

Query: Find the names of cities which have received shipments weighing over 100 pounds

$\pi_{destination_city} (\sigma_{weight>100pounds}(Shipment))$

Query: Find the name and annual revenue of customers who have sent shipments weighing over 100 pounds

$\pi_{cust_name,annual_revenue} (\sigma_{weight>100pounds}(Customer \bowtie Shipment))$

Query: Find the truck numbers of trucks which have carried shipments weighing over 100 pounds

$\pi_{truckno} (\sigma_{weight>100pounds}(Shipment))$

Query Using Relational Algebra...

Query: Find the names of drivers who have delivered shipments weighing over 100 pounds

$\pi_{driver_name} (\sigma_{weight > 100 pounds} (Shipment \bowtie Truck))$

Query: List the cities which have received shipments from customers having over \$15 million in annual revenue

$\pi_{destination_city} (\sigma_{annual_revenue > \$15 million} (Customer \bowtie Shipment))$

Query: List the customers having over \$5 million in annual revenue who have sent shipments weighing greater than 1 pound

$\pi_{cust_name} (\sigma_{annual_revenue > \$5 million} (Customer) \bowtie \sigma_{weight > 1 pound} (Shipment))$

This query can also be written as:

$\pi_{cust_name} (\sigma_{annual_revenue > \$5 million \wedge weight > 1 pound} (Customer \bowtie Shipment))$

Query Using Relational Algebra...

Query: List the customers whose shipments have been delivered by truck driver Ramesh

$\pi_{cust_name} (\sigma_{driver_name='Ramesh'} (Customer \bowtie Shipment \bowtie Truck))$

Query: Find the customers having over \$5 million in annual revenue who have sent shipments weighing less than 1 pound or have sent a shipment to Bhubaneswar

$\pi_{cust_name} (\sigma_{annual_revenue > \$5million} (Customer) \bowtie \sigma_{weight > 1pound \vee destination_city='Bhubaneswar'} (Shipment))$

Query: Find the customers who have sent shipments to every city with population over 500000

$\pi_{cust_name, destination_city} (Customer \bowtie Shipment) \div \pi_{city} (\sigma_{population > 500000} (City))$

Query Using Relational Algebra...

Query: List the drivers who have delivered shipments for customers with annual revenue over \$20 million to cities with population over 1 million

$$\pi_{driver_name} (\sigma_{annual_revenue > 20 million} (Customer) \bowtie Shipment \bowtie Truck \bowtie (\sigma_{population > 1 million} (City)))$$

This query can also be written as:

$$\pi_{driver_name} (\sigma_{annual_revenue > 20 million \wedge population > 1 million} (Customer \bowtie Shipment \bowtie Truck \bowtie City))$$

Query: Find the cities which have received shipments from every customer

$$\pi_{destination_city, cust_id} (Shipment) \div \pi_{cust_id} (Customer)$$

Query: Find the drivers who have delivered shipments to every city

$$\pi_{driver_name, destination_city} (Truck \bowtie Shipment) \div \pi_{city_name} (City)$$