# Database Systems

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# Assignment 3: SQL Queries

**Questions**

1. The following relations keep track of airline flight information:

Flights(*flno:* **integer**, *from:* **string**, *to:* **string**, *distance:* **integer**, *departs:*

**time**,

*arrives:* **time**, *price:* **integer**)

Aircraft(*aid:* **integer**, *aname:* **string**, *cruisingrange:* **integer**) Certified(eid: **integer**, aid: **integer**)

Employees(*eid:* **integer**, *ename:* **string**, *salary:* **integer**)

Note that the Employees relation describes pilots and other kinds of employees aswell; every pilot is certified for some aircraft, and only pilots are certified to fly.Write each of the following queries in SQL.

* 1. Find the names of aircraft such that all pilots certified to operate them earn more than $80,000.
  2. For each pilot who is certified for more than three aircraft, find the *eid* and the maximum *cruisingrange* of the aircraft for which she or he is certified.
  3. Find the names of pilots whose *salary* is less than the price of the cheapest route from Los Angeles to Honolulu.
  4. For all aircraft with *cruisingrange* over 1000 miles, find the name of the aircraft and the average salary of all pilots certified for this aircraft.
  5. Find the names of pilots certified for some Boeing aircraft.
  6. Find the *aids* of all aircraft that can be used on routes from Los Angeles to Chicago.
  7. Identify the routes that can be piloted by every pilot who makes more than

$100,000.

* 1. Print the *enames* of pilots who can operate planes with *cruisingrange* greater than 3000 miles but are not certified on any Boeing aircraft.
  2. A customer wants to travel from Madison to New York with no more than two changes of flight. List the choice of departure times from Madison if the customer wants to arrive in New York by 6 p.m.
  3. Compute the difference between the average salary of a pilot and the average salary of all employees (including pilots).
  4. Print the name and salary of every nonpilot whose salary is more than the average salary for pilots.
  5. Print the names of employees who are certified only on aircrafts with cruising range longer than 1000 miles.
  6. Print the names of employees who are certified only on aircrafts with cruising range longer than 1000 miles, but on at least two such aircrafts.
  7. Print the names of employees who are certified only on aircrafts with cruising range longer than 1000 miles and who are certified on some Boeing aircraft.

Ans:

1. SELECT DISTINCT A.aname

FROM Aircraft A

WHERE A.Aid IN (SELECT C.aid

FROM Certified C, Employees E WHERE C.eid = E.eid AND NOT EXISTS ( SELECT \*

FROM Employees E1

WHERE E1.eid = E.eid AND E1.salary < 80000 ))

1. SELECT C.eid, MAX (A.cruisingrange)

FROM Certified C, Aircraft A

WHERE C.aid = A.aid

GROUP BY C.eid

HAVING COUNT (\*) > 3

1. SELECT DISTINCT E.ename

FROM Employees E

WHERE E.salary < ( SELECT MIN (F.price)

FROM Flights F

WHERE F.from = ‘Los Angeles’ AND F.to = ‘Honolulu’ )

1. Observe that aid is the key for Aircraft, but the question asks for aircraft names; we deal with this complication by using an intermediate relation Temp:

SELECT Temp.name, Temp.AvgSalary

FROM ( SELECT A.aid, A.aname AS name, AVG (E.salary) AS AvgSalary

FROM Aircraft A, Certified C, Employees E

WHERE A.aid = C.aid AND C.eid = E.eid AND A.cruisingrange > 1000

GROUP BY A.aid, A.aname ) AS Temp

1. SELECT DISTINCT E.ename

FROM Employees E, Certified C, Aircraft A

WHERE E.eid = C.eid AND C.aid = A.aid AND A.aname LIKE ‘Boeing%’

1. SELECT A.aid

FROM Aircraft A

WHERE A.cruisingrange > ( SELECT MIN (F.distance)

FROM Flights F

WHERE F.from = ‘Los Angeles’ AND F.to = ‘Chicago’ )

1. SELECT DISTINCT F.from, F.to

FROM Flights F

WHERE NOT EXISTS ( SELECT \*

FROM Employees E WHERE E.salary > 100000 AND

NOT EXISTS (SELECT \*

FROM Aircraft A, Certified C

WHERE A.cruisingrange > F.distance AND E.eid = C.eid AND A.aid = C.aid) )

1. SELECT DISTINCT E.ename

FROM Employees E

WHERE E.eid IN ( ( SELECT C.eid

FROM Certified C

WHERE EXISTS ( SELECT A.aid

FROM Aircraft A

WHERE A.aid = C.aid

AND A.cruisingrange > 3000 )

AND

NOT EXISTS ( SELECT A1.aid

FROM Aircraft A1

WHERE A1.aid = C.aid

AND A1.aname LIKE ‘Boeing%’ ))

1. SELECT F.departs

FROM Flights F

WHERE F.flno IN ( ( SELECT F0.flno

|  |  |  |  |
| --- | --- | --- | --- |
|  | | FROM WHERE  UNION | Flights F0  F0.from = ‘Madison’ AND F0.to = ‘New York’  AND F0.arrives < ‘18:00’ ) |
|  |  | ( SELECT | F0.flno |
|  |  | FROM | Flights F0, Flights F1 |
|  |  | WHERE | F0.from = ‘Madison’ AND F0.to <> ‘New York’ |
|  |  |  | AND F0.to = F1.from AND F1.to = ‘New York’ |
|  |  |  | AND F1.departs > F0.arrives |
|  |  | UNION | AND F1.arrives < ‘18:00’ ) |
|  |  | ( SELECT | F0.flno |
|  |  | FROM | Flights F0, Flights F1, Flights F2 |
|  |  | WHERE | F0.from = ‘Madison’ |
|  | | | AND F0.to = F1.from |
| AND F1.to = F2.from |
| AND F2.to = ‘New York’ |
| AND F0.to <> ‘New York’ |
| AND F1.to <> ‘New York’ |
| AND F1.departs > F0.arrives |
| AND F2.departs > F1.arrives |
| AND F2.arrives < ‘18:00’ )) |

1. SELECT Temp1.avg - Temp2.avg

FROM (SELECT AVG (E.salary) AS avg

FROM Employees E

WHERE E.eid IN (SELECT DISTINCT C.eid

FROM Certified C )) AS Temp1,

(SELECT AVG (E1.salary) AS avg

FROM Employees E1 ) AS Temp2

1. SELECT E.ename, E.salary

FROM Employees E

WHERE E.eid NOT IN ( SELECT DISTINCT C.eid

FROM Certified C )

AND E.salary > ( SELECT AVG (E1.salary)

|  |  |  |
| --- | --- | --- |
|  | FROM | Employees E1 |
|  | WHERE | E1.eid IN  ( SELECT DISTINCT C1.eid  FROM Certified C1 ) ) |

1. SELECT E.ename

FROM Employees E, Certified C, Aircraft A WHERE C.aid = A.aid AND E.eid = C.eid GROUP BY E.eid, E.ename

HAVING EVERY (A.cruisingrange > 1000)

1. SELECT E.ename

FROM Employees E, Certified C, Aircraft A WHERE C.aid = A.aid AND E.eid = C.eid GROUP BY E.eid, E.ename

HAVING EVERY (A.cruisingrange > 1000) AND COUNT (\*) > 1

1. SELECT E.ename

FROM Employees E, Certified C, Aircraft A WHERE C.aid = A.aid AND E.eid = C.eid GROUP BY E.eid, E.ename

HAVING EVERY (A.cruisingrange > 1000) AND ANY (A.aname = ’Boeing’)

1. Consider the following relational schema. An employee can work in more than one department; the *pct\_time* filed of the Works relation shows the percentage of time that a given employee works in a given department.

Emp(*eid:* **integer**, *ename:* **string**, *age:* **integer**, *salary:* **real**) Works(*eid:* **integer**, *did:* **integer**, *pct\_time:* **integer**)

Dept(*did:* **integer**, dname: **string**, *budget:* **real**, *managerid:* **integer**) Write the following queries in SQL:

* 1. Print the names and ages of each employee who works in both the Hardware department and the Software department.
  2. For each department with more than 20 full-time-equivalent employees (i.e., where the part-time and full-time employees add up to at least that many full- time employees), print the *did* together with the number of employees that work in that department.
  3. Print the name of each employee whose salary exceeds the budget of all of the departments that he or she works in.
  4. Find the *managerids* of managers who manage only departments with budgets greater than $1 million.
  5. Find the *enames* of managers who manage the departments with the largest budgets.
  6. If a manager manages more than one department, he or she *controls* the sum of all the budgets for those departments. Find the *managerids* of managers who control more than $5 million.
  7. Find the *managerids* of managers who control the largest amounts.
  8. Find the *enames* of managers who manage only departments with budgets larger than $1 million, but at least one department with budget less than $5 million.

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| --- | --- | --- | --- |
| Ans:  a. | SELECT | E.ename, E.age | |
|  | FROM | Emp E, Works W1, Works W2, Dept D1, Dept D2 | |
|  | WHERE | E.eid = W1.eid AND W1.did = D1.did AND D1.dname = ‘Hardware’ AND E.eid = W2.eid AND W2.did = D2.did AND D2.dname = ‘Software’ | |
| b. | SELECT FROM | W.did, COUNT (W.eid) Works W | |
| GROUP BY W.did | | | |
| HAVING | | 2000 < ( SELECT | SUM (W1.pct time) |
|  | | FROM | Works W1 |
|  | | WHERE | W1.did = W.did ) |
|  | |  |  |

1. SELECT E.ename

FROM Emp E

WHERE E.salary > ALL (SELECT D.budget

FROM Dept D, Works W

WHERE E.eid = W.eid AND D.did = W.did)

1. SELECT DISTINCT D.managerid

FROM Dept D

WHERE 1000000 < ALL (SELECT D2.budget

FROM Dept D2

WHERE D2.managerid = D.managerid )

1. SELECT E.ename

FROM Emp E

WHERE E.eid IN (SELECT D.managerid

FROM Dept D

WHERE D.budget = (SELECT MAX (D2.budget)

FROM Dept D2))

1. SELECT D.managerid

FROM Dept D

WHERE 5000000 < (SELECT SUM (D2.budget)

FROM Dept D2

WHERE D2.managerid = D.managerid )

1. SELECT DISTINCT tempD.managerid

FROM (SELECT DISTINCT D.managerid, SUM (D.budget) AS tempBudget

FROM Dept D

GROUP BY D.managerid ) AS tempD

WHERE tempD.tempBudget = (SELECT MAX (tempD.tempBudget)

FROM tempD)

1. SELECT E.ename

FROM Emp E, Dept D

WHERE E.eid = D.managerid GROUP BY E.Eid, E.ename

HAVING EVERY (D.budget > 1000000) AND ANY (D.budget < 5000000)