

Consider the following database that keeps 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 as well; Every pilot is certified for some aircraft, and only pilots are certified to fly.

create database airline_flight;

```
CREATE TABLE FLIGHTS (  
    FLNO INTEGER PRIMARY KEY,  
    FFROM VARCHAR(15) NOT NULL,  
    TTO VARCHAR(15) NOT NULL,  
    DISTANCE INTEGER,  
    DEPARTS TIMESTAMP,  
    ARRIVES TIMESTAMP,  
    PRICE REAL);
```

```
CREATE TABLE AIRCRAFT (  
    AID INTEGER PRIMARY KEY,  
    ANAME VARCHAR(10),  
    CRUISINGRANGE INTEGER);
```

```
CREATE TABLE EMPLOYEES (  
    EID INTEGER PRIMARY KEY,  
    ENAME VARCHAR(15),  
    SALARY REAL(10,2));
```

```
CREATE TABLE CERTIFIED (  
    EID INTEGER NOT NULL,  
    AID INTEGER NOT NULL,  
    PRIMARY KEY (EID, AID),  
    FOREIGN KEY (EID) REFERENCES EMPLOYEES(EID),  
    FOREIGN KEY (AID) REFERENCES AIRCRAFT(AID));
```

```
insert into aircraft values(101,'747',3000);
insert into aircraft values(102,'Boeing',900);
insert into aircraft values(103,'647',800);
insert into aircraft values(104,'Dreamliner',10000);
insert into aircraft values(105,'Boeing',3500);
insert into aircraft values(106,'707',1500);
insert into aircraft values(107,'Dream', 120000);
```

```
insert into employees values(701,'A',50000);
insert into employees values(702,'B',100000);
insert into employees values(703,'C',150000);
insert into employees values(704,'D',90000);
insert into employees values(705,'E',40000);
insert into employees values(706,'F',60000);
insert into employees values(707,'G',90000);
```





```
insert into certified values(701,101);
insert into certified values(701,102);
insert into certified values(701,106);
insert into certified values(701,105);
insert into certified values(702,104);
insert into certified values(703,104);
insert into certified values(704,104);
insert into certified values(702,107);
insert into certified values(703,107);
insert into certified values(704,107);
insert into certified values(702,101);
insert into certified values(703,105);
insert into certified values(704,105);
insert into certified values(705,103);
```

```
insert into flights values(101,'Bangalore','Delhi',2500,TIMESTAMP '2005-05-13 07:15:31',TIMESTAMP
'2005-05-13 17:15:31',5000);
insert into flights values(102,'Bangalore','Lucknow',3000,TIMESTAMP '2005-05-13 07:15:31',TIMESTAMP
'2005-05-13 11:15:31',6000);
insert into flights values(103,'Lucknow','Delhi',500,TIMESTAMP '2005-05-13 12:15:31',TIMESTAMP '
2005-05-13 17:15:31',3000);
insert into flights values(107,'Bangalore','Frankfurt',8000,TIMESTAMP '2005-05-13 07:15:31',TIMESTAMP
'2005-05-13 22:15:31',60000);
insert into flights values(104,'Bangalore','Frankfurt',8500,TIMESTAMP '2005-05-13 07:15:31',TIMESTAMP
'2005-05-13 23:15:31',75000);
insert into flights values(105,'Kolkata','Delhi',3400,TIMESTAMP '2005-05-13 07:15:31',TIMESTAMP
'2005-05-13 09:15:31',7000);
```

Write each of the following queries in SQL.



i. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.

```
SELECT DISTINCT A.aname FROM Aircraft A
WHERE A.Aid IN (SELECT C.aid FROM Certified C, Employees E
               WHERE C.aid = E.aid AND NOT EXISTS ( SELECT * FROM Employees E1
               WHERE E1.aid = E.aid AND E1.salary < 80000 ));
```

+ Options					aname
<input type="checkbox"/>	 Edit	 Copy	 Delete		747
<input type="checkbox"/>	 Edit	 Copy	 Delete		Dreamliner
<input type="checkbox"/>	 Edit	 Copy	 Delete		Boeing
<input type="checkbox"/>	 Edit	 Copy	 Delete		Dream

ii. For each pilot who is certified for more than three aircrafts, find the eid and the maximum cruisingrange of the aircraft for which she or he is certified.

```
SELECT C.aid, MAX(A.cruisingrange) FROM Certified C, Aircraft A
WHERE C.aid = A.aid
GROUP BY C.aid HAVING COUNT(*) > 3 ;
```

					eid	MAX(A.cruisingrange)
<input type="checkbox"/>	 Edit	 Copy	 Delete		701	3500

iii. Find the names of pilots whose salary is less than the price of the cheapest route from Bangalore to Frankfurt.

```
SELECT DISTINCT E.ename FROM Employees E
WHERE E.salary < ( SELECT MIN(F.price) FROM Flights F
                  WHERE F.ffrom = 'Bangalore' AND F.tto = 'Frankfurt' );
```

+ Options					ename
<input type="checkbox"/>	 Edit	 Copy	 Delete		A
<input type="checkbox"/>	 Edit	 Copy	 Delete		E

iv. For all aircraft with cruisingrange over 1000 Kms, find the name of the aircraft and the average salary of all pilots certified for this aircraft.

```
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.aid = E.aid AND A.cruisingrange > 1000
      GROUP BY A.aid, A.aname ) AS Temp
```

name	AvgSalary
747	75000.000000
Dreamliner	113333.333333
Boeing	96666.666667
707	50000.000000
Dream	113333.333333

v. Find the names of pilots certified for some Boeing aircraft.

```
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%';
```

				ename
<input type="checkbox"/>	Edit	Copy	Delete	A
<input type="checkbox"/>	Edit	Copy	Delete	C
<input type="checkbox"/>	Edit	Copy	Delete	D

vi. Find the aids of all aircraft that can be used on routes from Bangalore to Delhi.

```
SELECT A.aid FROM Aircraft A
WHERE A.cruisingrange > ( SELECT MIN(F.distance) FROM Flights F
WHERE F.ffrom = 'Bangalore' AND F.tto = 'Delhi');
```







				aid
<input type="checkbox"/>	Edit	Copy	Delete	101
<input type="checkbox"/>	Edit	Copy	Delete	104
<input type="checkbox"/>	Edit	Copy	Delete	105
<input type="checkbox"/>	Edit	Copy	Delete	107

vii. A customer wants to travel from Bangalore to Delhi with no more than two changes of flight. List the choice of departure times from Bangalore if the customer wants to arrive in Delhi by 6 p.m.

```
SELECT F.departs, F.flno FROM Flights F
WHERE F.flno IN (( SELECT F0.flno FROM Flights F0
WHERE F0.ffrom = 'Bangalore' AND F0.tto = 'Delhi' AND extract(hour from F0.arrives) < 18)
UNION
(SELECT F0.flno FROM Flights F0, Flights F1
WHERE F0.ffrom = 'Bangalore' AND F0.tto <> 'Delhi'
AND F0.tto = F1.ffrom AND F1.tto = 'Delhi'
AND F1.departs > F0.arrives AND extract(hour from F1.arrives) < 18 )
UNION
(SELECT F0.flno FROM Flights F0, Flights F1, Flights F2
WHERE F0.ffrom = 'Bangalore' AND F0.tto = F1.ffrom
AND F1.tto = F2.ffrom AND F2.tto = 'Delhi')
```

AND F0.tto <> 'Delhi' AND F1.tto <> 'Delhi'

AND F1.departs > F0.arrives AND F2.departs > F1.arrives AND extract(hour from F2.arrives) < 18));

				departs	filno
<input type="checkbox"/>	 Edit	 Copy	 Delete	2005-05-13 07:15:31	101
<input type="checkbox"/>	 Edit	 Copy	 Delete	2005-05-13 07:15:31	102