

PROGRAM 5

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. Write each of the following queries in SQL.

The screenshot displays a database management interface for a server at 127.0.0.1, connected to a database named 'airline_flight'. The top toolbar includes buttons for Structure, SQL, Search, Query, Export, Import, Operations, and Privileges. A central panel shows the execution of SQL queries to create and describe tables.

```
1 create table flights(flno int, fromplace varchar(15), toplace varchar(15), distance int,
2   departs datetime, arrives datetime, price int, primary key (flno));
3 desc flights;
4 create table aircraft(aid int, aname varchar(15), cruisingrange int, primary key (aid));
5 desc aircraft;
6 create table employees(eid int, ename varchar(15), salary int, primary key (eid));
7 desc employees;
8 create table certified(eid int, aid int, foreign key (eid) references employees(eid), foreign
9   key (aid) references aircraft(aid));
10 desc certified;
```

Below the query editor, a 'Filters' section contains a search box labeled 'Containing the word:'. At the bottom, a table structure overview is shown with columns for Table, Action, Rows, Type, Collation, Size, and Overhead.

Table	Action	Rows	Type	Collation	Size	Overhead
<input type="checkbox"/> aircraft	★ Browse Structure Search Insert Empty Drop	9	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> certified	★ Browse Structure Search Insert Empty Drop	13	InnoDB	utf8mb4_general_ci	48.0 KiB	-
<input type="checkbox"/> employees	★ Browse Structure Search Insert Empty Drop	7	InnoDB	utf8mb4_general_ci	16.0 KiB	-
<input type="checkbox"/> flights	★ Browse Structure Search Insert Empty Drop	8	InnoDB	utf8mb4_general_ci	16.0 KiB	-
4 tables	Sum	37	InnoDB	utf8mb4_general_ci	96.0 KiB	0 B

'FLIGHTS' table:

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export Import Operations Privileges Routines Events

Run SQL query/queries on database airline_flight: ?

```
1 insert into flights values(101, 'Bangalore', 'Delhi', 2500, '2005-05-13 07:15:31', '2005-05-13 18:15:31', 5000);
2 insert into flights values(102, 'Bangalore', 'Lucknow', 3000, '2013-05-05 07:15:31', '2013-05-05 11:15:31', 6000);
3 insert into flights values(103, 'Lucknow', 'Delhi', 500, '2013-05-05 12:15:31', '2013-05-05 17:15:31', 3000);
4 insert into flights values(107, 'Bangalore', 'Frankfurt', 8000, '2013-05-05 07:15:31', '2013-05-05 22:15:31', 60000);
5 insert into flights values(104, 'Bangalore', 'Frankfurt', 8500, '2013-05-05 07:15:31', '2013-05-05 23:15:31', 75000);
6 insert into flights values(105, 'Kolkata', 'Delhi', 3400, '2013-05-05 07:15:31', '2013-05-05 09:15:31', 7000);
7 insert into flights values(106, 'Bangalore', 'Kolkata', 1000, '2013-05-05 01:15:30', '2013-05-05 09:20:30', 10000);
8 insert into flights values(108, 'Lucknow', 'Kolkata', 1000, '2013-05-05 11:30:30', '2013-05-05 15:20:30', 10000);
9
10 commit;
11
12 select * from flights;
```

Server: 127.0.0.1 » Database: airline_flight » Table: flights

Browse Structure SQL Search Insert Export Import Privileges Operations

✓ Showing rows 0 - 7 (8 total, Query took 0.0007 seconds.)

SELECT * FROM `flights`

☐ Show all | Number of rows: 25 | Filter rows: Search this table | Sort by key: None

+ Options

<div><div><div>↔</div><div>⌵</div><div>↔</div></div></div>				fno	fromplace	toplace	distance	departs	arrives	price
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	101	Bangalore	Delhi	2500	2005-05-13 07:15:31	2005-05-13 18:15:31	5000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	102	Bangalore	Lucknow	3000	2013-05-05 07:15:31	2013-05-05 11:15:31	6000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	103	Lucknow	Delhi	500	2013-05-05 12:15:31	2013-05-05 17:15:31	3000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	104	Bangalore	Frankfurt	8500	2013-05-05 07:15:31	2013-05-05 23:15:31	75000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	105	Kolkata	Delhi	3400	2013-05-05 07:15:31	2013-05-05 09:15:31	7000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	106	Bangalore	Kolkata	1000	2013-05-05 01:15:30	2013-05-05 09:20:30	10000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	107	Bangalore	Frankfurt	8000	2013-05-05 07:15:31	2013-05-05 22:15:31	60000
<div><div><div></div></div></div>	<div><div><div></div></div></div> Edit	<div><div><div></div></div></div> Copy	<div><div><div></div></div></div> Delete	108	Lucknow	Kolkata	1000	2013-05-05 11:30:30	2013-05-05 15:20:30	10000

'AIRCRAFT' table:

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export Import

Run SQL query/queries on database airline_flight: ⓘ

```
1 insert into aircraft values(101, '747', 3000);
2 insert into aircraft values(102, 'Boeing', 900);
3 insert into aircraft values(103, '647', 800);
4 insert into aircraft values(104, 'Dreamliner', 10000);
5 insert into aircraft values(105, 'Boeing', 3500);
6 insert into aircraft values(106, '707', 1500);
7 insert into aircraft values(107, 'Dream', 120000);
8 insert into aircraft values(108, '707', 760);
9 insert into aircraft values(109, '747', 1000);
10
11 commit;
12
13 select * from aircraft;
```

Server: 127.0.0.1 » Database: airline_flight » Table: aircraft

Browse Structure SQL Search Insert Ex

✓ Showing rows 0 - 8 (9 total, Query took 0.0006 seconds.)

SELECT * FROM `aircraft`

☐ Show all | Number of rows: 25 ▼ Filter rows:

+ Options

				aid	aname	cruisingrange
<input type="checkbox"/>		Edit	Copy Delete	101	747	3000
<input type="checkbox"/>		Edit	Copy Delete	102	Boeing	900
<input type="checkbox"/>		Edit	Copy Delete	103	647	800
<input type="checkbox"/>		Edit	Copy Delete	104	Dreamliner	10000
<input type="checkbox"/>		Edit	Copy Delete	105	Boeing	3500
<input type="checkbox"/>		Edit	Copy Delete	106	707	1500
<input type="checkbox"/>		Edit	Copy Delete	107	Dream	120000
<input type="checkbox"/>		Edit	Copy Delete	108	707	760
<input type="checkbox"/>		Edit	Copy Delete	109	747	1000

'EMPLOYEES' table:

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export Import

Run SQL query/queries on database airline_flight: ?

```
1 insert into employees values(701, 'A', 50000);
2 insert into employees values(702, 'B', 100000);
3 insert into employees values(703, 'C', 150000);
4 insert into employees values(704, 'D', 90000);
5 insert into employees values(705, 'E', 40000);
6 insert into employees values(706, 'F', 60000);
7 insert into employees values(707, 'G', 90000);
8
9 commit;
10
11 select * from employees;
```

Server: 127.0.0.1 » Database: airline_flight » Table: employees

Browse Structure SQL Search Insert

✓ Showing rows 0 - 6 (7 total, Query took 0.0006 seconds.)

SELECT * FROM `employees`

☐ Show all | Number of rows: 25 ▼ Filter rows: Search

+ Options

			eid	ename	salary
<input type="checkbox"/>	Edit	Copy	Delete	701	A 50000
<input type="checkbox"/>	Edit	Copy	Delete	702	B 100000
<input type="checkbox"/>	Edit	Copy	Delete	703	C 150000
<input type="checkbox"/>	Edit	Copy	Delete	704	D 90000
<input type="checkbox"/>	Edit	Copy	Delete	705	E 40000
<input type="checkbox"/>	Edit	Copy	Delete	706	F 60000
<input type="checkbox"/>	Edit	Copy	Delete	707	G 90000

'CERTIFIED' table:

Server: 127.0.0.1 » Database: airline_flight » Table: certified

BrowseStructureSQLSearchInsert

Run SQL query/queries on table airline_flight.certified: ?

```
1 insert into certified values(701, 101);
2 insert into certified values(701, 102);
3 insert into certified values(701, 106);
4 insert into certified values(701, 105);
5 insert into certified values(702, 104);
6 insert into certified values(703, 104);
7 insert into certified values(704, 104);
8 insert into certified values(702, 107);
9 insert into certified values(703, 107);
10 insert into certified values(704, 107);
11 insert into certified values(702, 101);
12 insert into certified values(702, 108);
13 insert into certified values(701, 109);
14
15 commit;
16
17 select * from certified;
```

Server: 127.0.0.1 » Database: airline_flight » Table: certified

BrowseStructureSQLSearchInsert

⚠ Current selection does not contain a unique column. Grid edit, checkbox

✔ Showing rows 0 - 12 (13 total, Query took 0.0005 seconds.)

SELECT * FROM `certified`

☐ Show all | Number of rows: 25 ▾ | Filter rows: Search

+ Options

eid	aid
701	101
701	102
701	106
701	105
702	104
703	104
704	104
702	107
703	107
704	107
702	101
702	108
701	109

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

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export Import Operations Privileges

Run SQL query/queries on database airline_flight:

```
1 select distinct a.aname
2 from aircraft a
3 where a.aid in (select c.aid
4                 from certified c, employees e
5                 where c.eid = e.eid and not exists (select *
6                                                       from employees e1
7                                                       where e1.eid=e.eid and e1.salary<80000));
```

Server: 127.0.0.1 » Database: airline_flight » Table: aircraft

Browse Structure SQL Search Insert

Show query box

✓ Showing rows 0 - 3 (4 total, Query took 0.1342 seconds.)

```
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))
```

☐ Show all | Number of rows: 25 Filter rows: Search

+ Options

	aname
<input type="checkbox"/> Edit Copy Delete	747
<input type="checkbox"/> Edit Copy Delete	Dreamliner
<input type="checkbox"/> Edit Copy Delete	Dream
<input type="checkbox"/> Edit Copy Delete	707

2) For each pilot who is certified for more than three aircraft, find the eid and the maximum cruising range of the aircraft for which she or he is certified.

← Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export

Run SQL query/queries on database airline_flight: ?

```
1 select max(a.cruisingrange), c.eid
2 from certified c, aircraft a
3 where c.aid = a.aid
4 group by c.eid
5 having count(c.aid)>3;
```

← Server: 127.0.0.1 » Database: airline_flight » Table: certified

Browse Structure SQL Search Insert

Show query box

⚠ Current selection does not contain a unique column. Grid edit, checkbox

✓ Showing rows 0 - 1 (2 total, Query took 0.0024 seconds.)

```
select max(a.cruisingrange), c.eid from certified c, aircraft
```

☐ Show all | Number of rows: 25 ▾ | Filter rows: Search

+ Options

max(a.cruisingrange)	eid
3500	701
120000	702

3) Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export Import Operations

Run SQL query/queries on database airline_flight: ?

```
1 select ename
2 from employees
3 where salary < (select min(price)
4                 from flights
5                 where fromplace='Bangalore' and toplace='Frankfurt');
```

Server: 127.0.0.1 » Database: airline_flight » Table: employees

Browse Structure SQL Search Insert

Show query box

✓ Showing rows 0 - 1 (2 total, Query took 0.1026 seconds.)

```
select ename from employees where salary < (select min(price
```

☐ Show all | Number of rows: 25 ▼ Filter rows: Search

+ Options

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

4) For all aircraft with cruising range over 1000 Kms, find the name of the aircraft and the average salary of all pilots certified for this aircraft.

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export

Run SQL query/queries on database airline_flight: ?

```
1 select avg(e.salary), c.aid
2 from certified c, employees e
3 where c.aid in (select aid
4                 from aircraft
5                 where cruisingrange>1000)
6                 and e.eid = c.eid
7 group by c.aid;
```

Server: 127.0.0.1 » Database: airline_flight » Table: certified

Browse Structure SQL Search Insert

Show query box

⚠ Current selection does not contain a unique column. Grid edit, checkbox

✓ Showing rows 0 - 4 (5 total, Query took 0.0441 seconds.)

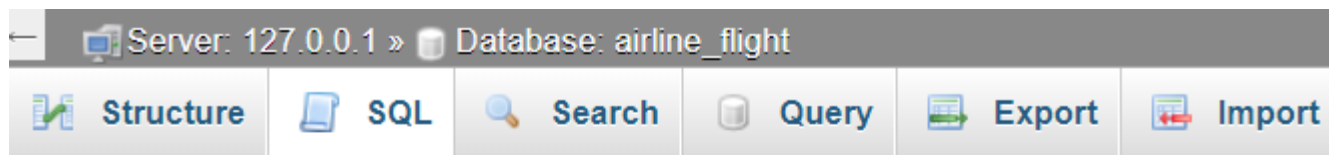
```
select avg(e.salary), c.aid from certified c, employees e w
```

☐ Show all | Number of rows: 25 ▼ | Filter rows: Search

+ Options

avg(e.salary)	aid
75000.0000	101
113333.3333	104
50000.0000	105
50000.0000	106
113333.3333	107

5) Find the names of pilots certified for some Boeing aircraft.



Run SQL query/queries on database airline_flight: ?

```
1 select ename
2 from employees
3 where eid in (select eid
4               from certified
5               where aid in (select aid
6                             from aircraft
7                             where aname = 'Boeing'));
```



Show query box

✓ Showing rows 0 - 0 (1 total, Query took 0.0017 seconds.)

select ename from employees where eid in (select eid from ce

☐ Show all | Number of rows: 25 ▼ Filter rows: Search

+ Options

← T → **ename**

☐ Edit Copy Delete A

6) Find the aids of all aircraft that can be used on routes from Bengaluru to Delhi.

Server: 127.0.0.1 » Database: airline_flight

Structure SQL Search Query Export Import Operations

Run SQL query/queries on database airline_flight: ?

```
1 select aname
2 from aircraft
3 where cruisingrange > any (select distance
4                             from flights
5                             where fromplace='Bangalore' and toplace='Delhi');
```

Server: 127.0.0.1 » Database: airline_flight » Table: aircraft

Browse Structure SQL Search Insert

Show query box

✓ Showing rows 0 - 3 (4 total, Query took 0.1056 seconds.)

```
select aname from aircraft where cruisingrange > any (select
```

☐ Show all | Number of rows: 25 ▼ Filter rows: Search

+ 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

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

Server: 127.0.0.1 » Database: airline_flight

Structure

SQL

Search

Query

Export

Import

Operations

Run SQL query/queries on database airline_flight:

```

1 select F.flno, F.departs
2 from flights F
3 where F.flno in ( (select F0.flno
4                   from flights F0
5                   where F0.fromplace = 'Bangalore' and F0.toplace = 'Kolkata'
6                   and extract(hour from F0.arrives) < 18)
7                 UNION
8                 (select F0.flno
9                   from flights F0, flights F1
10                  where F0.fromplace = 'Bangalore' and F0.toplace <> 'Kolkata'
11                    and F0.toplace = F1.fromplace and F1.toplace = 'Kolkata'
12                    and F1.departs > F0.arrives
13                    and extract(hour from F1.arrives) < 18)
14                  UNION
15                  (select F0.flno
16                    from flights F0, flights F1, flights F2
17                    where F0.fromplace = 'Bangalore'
18                      and F0.toplace = F1.fromplace
19                      and F1.toplace = F2.fromplace
20                      and F2.toplace = 'Kolkata'
21                      and F0.toplace <> 'Kolkata'
22                      and F1.toplace <> 'Kolkata'
23                      and F1.departs > F0.arrives
24                      and F2.departs > F1.arrives
25                      and extract(hour from F2.arrives) < 18));

```

+ Options

		flno	departs
<input type="checkbox"/>	Edit Copy Delete	102	2013-05-05 07:15:31
<input type="checkbox"/>	Edit Copy Delete	106	2013-05-05 01:15:30