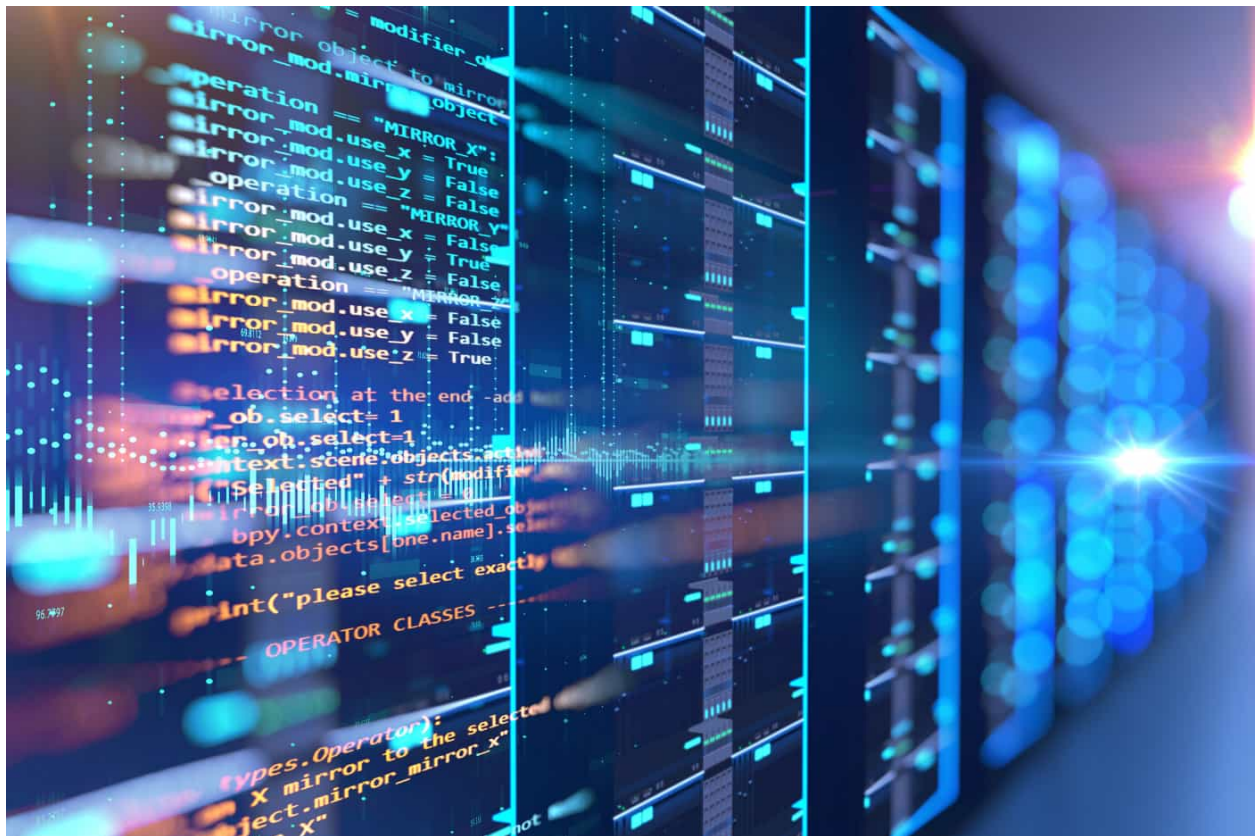


Data Manipulation and Validation

Integrated CA2, Databases, Aldana Louzan



Tolga Baris PINAR

01.12.2022

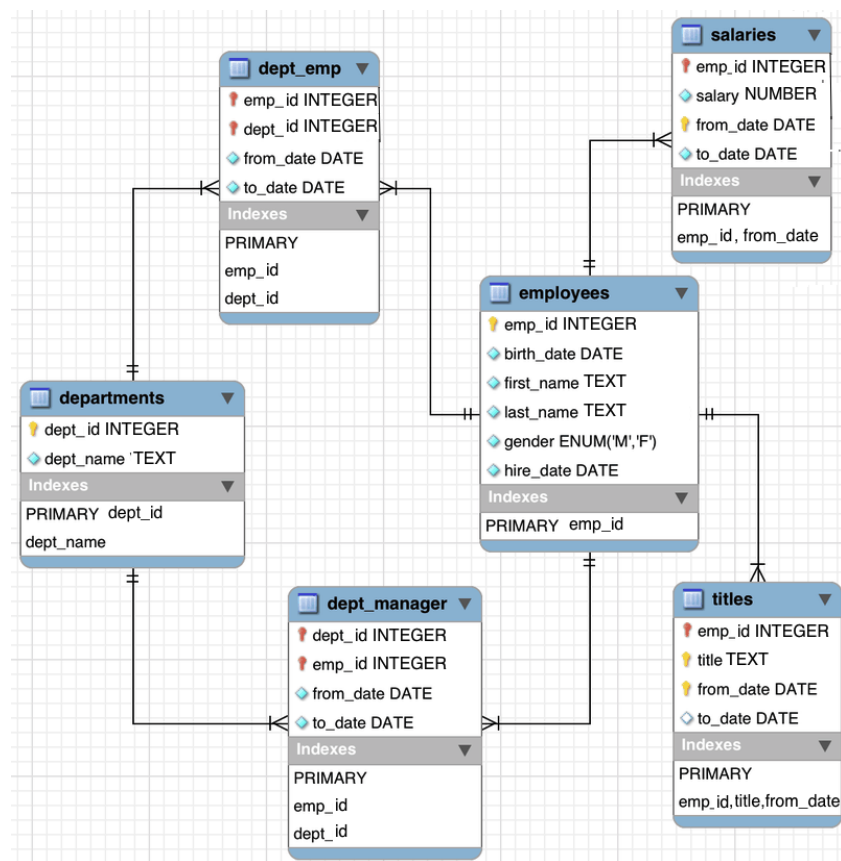
Higher Diploma in Science in Computing

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INTRODUCTION

In this assignment, the employees sample database (created by Fusheng Wang and Carlo Zaniolo at Siemens Corporate Research), a large base of data spread over six separate tables and consisting of 4 million records in total that was created for system testing purposes. The following diagram provides an overview of the structure of the employees.db:



1.1 Databases CA Part 1

1.1.1 List all attributes present in the **departments** TABLE.

CODE: SELECT * FROM departments;

employees.db

```
1 SELECT * FROM departments;
```

dept_id	dept_name
1	Marketing
2	Finance
3	Human Resources
4	Production
5	Development
6	Quality Management
7	Sales
8	Research
9	Customer Service

1.1.2. List all **employee IDs** of all past/current employees, their **first** and **last names**.

CODE: SELECT emp_id, first_name, last_name FROM employees;

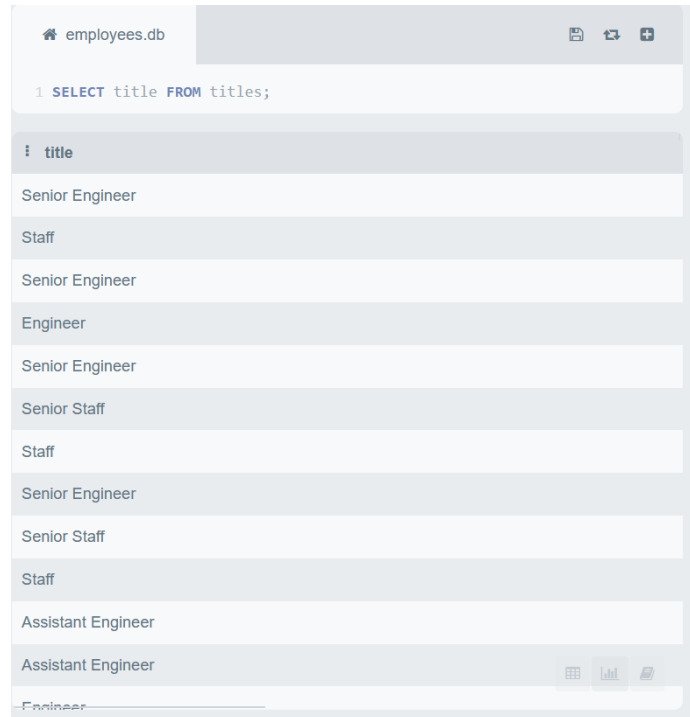
employees.db

```
1 SELECT emp_id, first_name, last_name FROM employees;
```

emp_id	first_name	last_name
10001	Georgi	Facello
10002	Bezalel	Simmel
10003	Parto	Bamford
10004	Chirstian	Koblick
10005	Kyoichi	Maliniak
10006	Anneke	Preusig
10007	Tzvetan	Zielinski
10008	Saniya	Kalloufi
10009	Sumant	Peac
10010	Duangkaew	Piveteau
10011	Mary	Sluis
10012	Patricio	Bridgland
10013	Shamshev	Tarkenton

1.1.3. List all department **titles** present in the database.

CODE: SELECT title FROM titles;



The screenshot shows a database query interface with the file name 'employees.db'. The SQL query entered is 'SELECT title FROM titles;'. The results are displayed in a table with one column, 'title', containing the following values: Senior Engineer, Staff, Senior Engineer, Engineer, Senior Engineer, Senior Staff, Staff, Senior Engineer, Senior Staff, Staff, Assistant Engineer, Assistant Engineer, and Engineer.

title
Senior Engineer
Staff
Senior Engineer
Engineer
Senior Engineer
Senior Staff
Staff
Senior Engineer
Senior Staff
Staff
Assistant Engineer
Assistant Engineer
Engineer

1.1.4. List all **unique job titles** found in the database, and **order them alphabetically**.

CODE: SELECT DISTINCT title FROM titles ORDER BY title ASC;

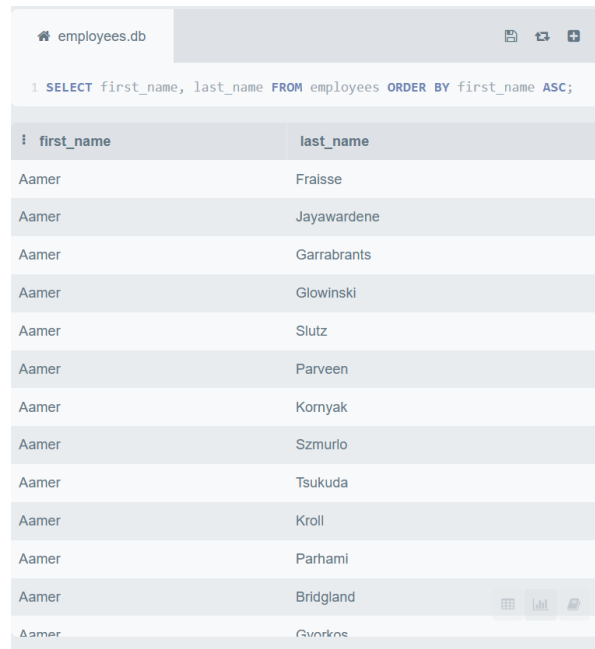


The screenshot shows a database query interface with the file name 'employees.db'. The SQL query entered is 'SELECT DISTINCT title FROM titles ORDER BY title ASC;'. The results are displayed in a table with one column, 'title', containing the following unique values in alphabetical order: Assistant Engineer, Engineer, Manager, Senior Engineer, Senior Staff, Staff, and Technique Leader.

title
Assistant Engineer
Engineer
Manager
Senior Engineer
Senior Staff
Staff
Technique Leader

1.1.5. List all past/current **employees' names ordered alphabetically** in ascending order, i.e. first name and last name in alphabetical order.

CODE: SELECT first_name, last_name FROM employees ORDER BY first_name ASC;



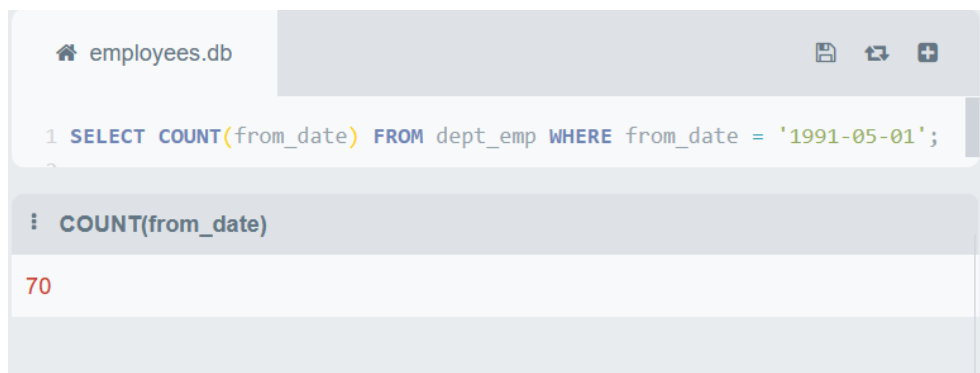
The screenshot shows a database query interface with the following SQL query: `1 SELECT first_name, last_name FROM employees ORDER BY first_name ASC;`

first_name	last_name
Aamer	Fraisse
Aamer	Jayawardene
Aamer	Garrabrants
Aamer	Glowinski
Aamer	Slutz
Aamer	Parveen
Aamer	Kornyak
Aamer	Szmurlo
Aamer	Tsukuda
Aamer	Kroll
Aamer	Parhami
Aamer	Bridgland
Aamer	Gundke

1.2 Database CA Part 2

1.2.1 The number of all employees that started on **1991-05-01**.

CODE: SELECT COUNT(from_date) FROM dept_emp WHERE from_date = '1991-05-01';

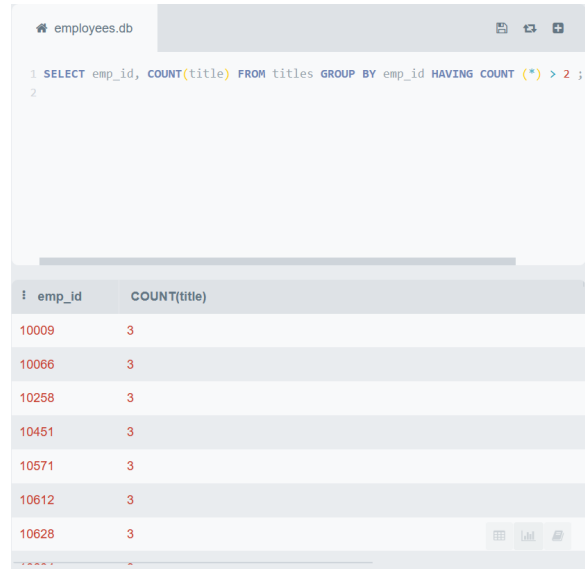


The screenshot shows a database query interface with the following SQL query: `1 SELECT COUNT(from_date) FROM dept_emp WHERE from_date = '1991-05-01';`

COUNT(from_date)
70

1.2.2 List all **emp_no** who have had strictly **more than 2 titles** and display **the total number of the titles** they have had.

CODE: SELECT emp_id, COUNT(title) FROM titles GROUP BY emp_id HAVING COUNT (*) > 2;



The screenshot shows a database query interface with the following SQL query:

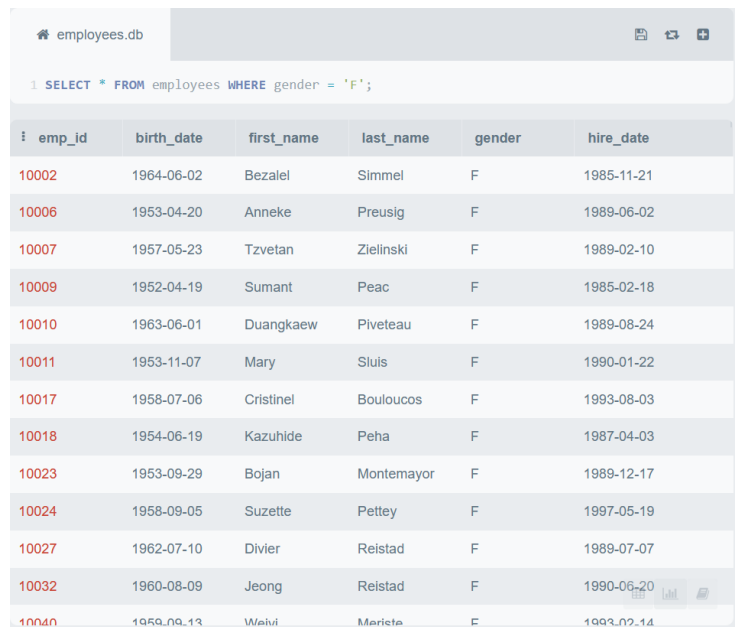
```
1 SELECT emp_id, COUNT(title) FROM titles GROUP BY emp_id HAVING COUNT (*) > 2 ;
```

The results are displayed in a table with the following data:

emp_id	COUNT(title)
10009	3
10066	3
10258	3
10451	3
10571	3
10612	3
10628	3

1.2.3 List **female employees** (past/current) together with all other relation attributes.

CODE: SELECT * FROM employees WHERE gender = 'F';



The screenshot shows a database query interface with the following SQL query:

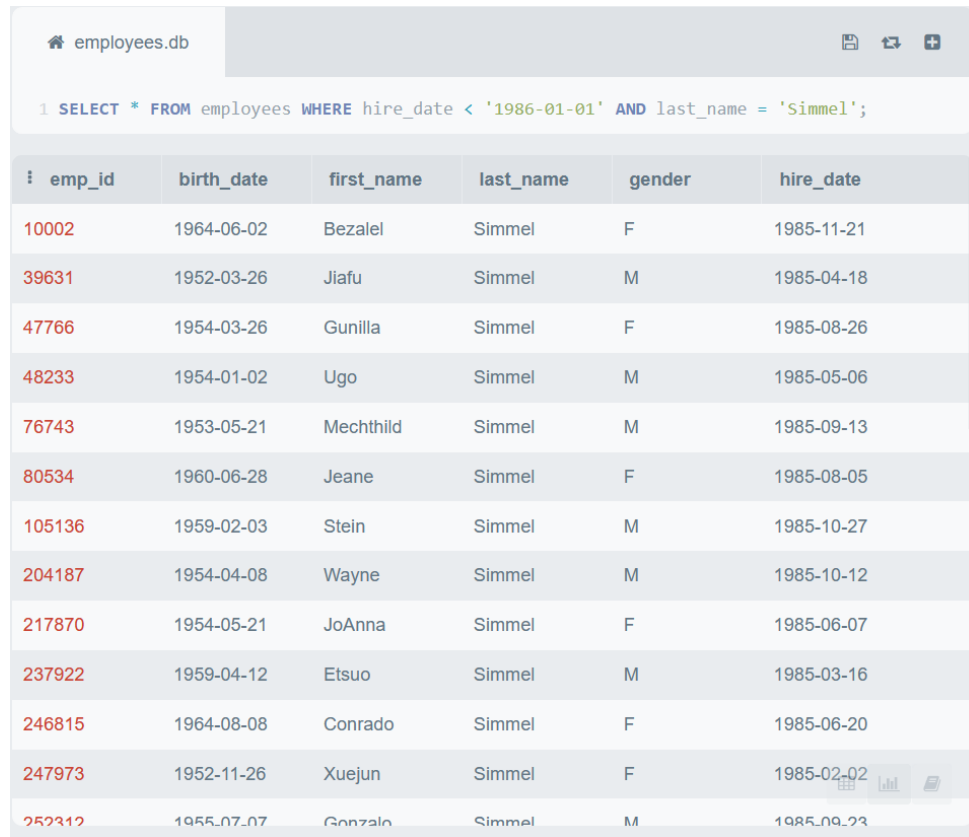
```
1 SELECT * FROM employees WHERE gender = 'F';
```

The results are displayed in a table with the following data:

emp_id	birth_date	first_name	last_name	gender	hire_date
10002	1964-06-02	Bezalel	Simmel	F	1985-11-21
10006	1953-04-20	Anneke	Preusig	F	1989-06-02
10007	1957-05-23	Tzvetan	Zielinski	F	1989-02-10
10009	1952-04-19	Sumant	Peac	F	1985-02-18
10010	1963-06-01	Duangkaew	Piveteau	F	1989-08-24
10011	1953-11-07	Mary	Sluis	F	1990-01-22
10017	1958-07-06	Cristinel	Bouloucos	F	1993-08-03
10018	1954-06-19	Kazuhide	Peha	F	1987-04-03
10023	1953-09-29	Bojan	Montemayor	F	1989-12-17
10024	1958-09-05	Suzette	Pettey	F	1997-05-19
10027	1962-07-10	Divier	Reistad	F	1989-07-07
10032	1960-08-09	Jeong	Reistad	F	1990-06-20
10040	1959-09-13	Welvi	Meriete	F	1993-02-14

1.2.4 List past/current **employees** hired prior to **1986-01-01** with the surname **Simmel**.

CODE: SELECT * FROM employees WHERE hire_date < '1986-01-01' AND last_name = 'Simmel';

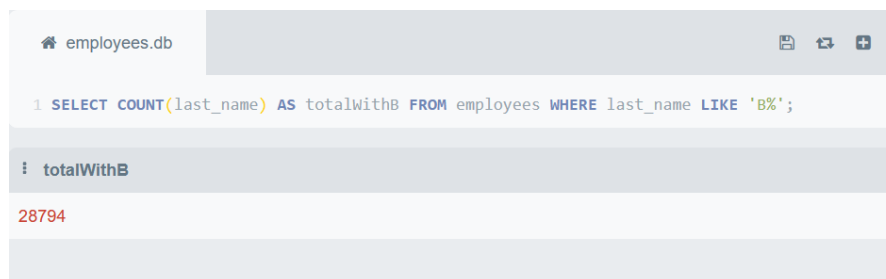


emp_id	birth_date	first_name	last_name	gender	hire_date
10002	1964-06-02	Bezalel	Simmel	F	1985-11-21
39631	1952-03-26	Jiafu	Simmel	M	1985-04-18
47766	1954-03-26	Gunilla	Simmel	F	1985-08-26
48233	1954-01-02	Ugo	Simmel	M	1985-05-06
76743	1953-05-21	Mechthild	Simmel	M	1985-09-13
80534	1960-06-28	Jeane	Simmel	F	1985-08-05
105136	1959-02-03	Stein	Simmel	M	1985-10-27
204187	1954-04-08	Wayne	Simmel	M	1985-10-12
217870	1954-05-21	JoAnna	Simmel	F	1985-06-07
237922	1959-04-12	Etsuo	Simmel	M	1985-03-16
246815	1964-08-08	Conrado	Simmel	F	1985-06-20
247973	1952-11-26	Xuejun	Simmel	F	1985-02-02
252312	1955-07-07	Gonzalo	Simmel	M	1985-09-23

1.2.5 How many past/current **employees'** **last names** begin with the capital letter B?

Use a column alias **total with B** to output your results.

CODE: SELECT COUNT(last_name) AS totalWithB FROM employees WHERE last_name LIKE 'B%';



totalWithB
28794

1.2.6 Create a new table called **emp_training** with 3 columns:

- **trainer_no**: this should be the primary key and is of type integer and is an auto-increment.
- **first_name**: this data type is **varchar(30)** and should not be NULL
- **last_name**: this data type is **varchar(30)** and should not be NULL
- **t_module**: this data type is **varchar(20)**

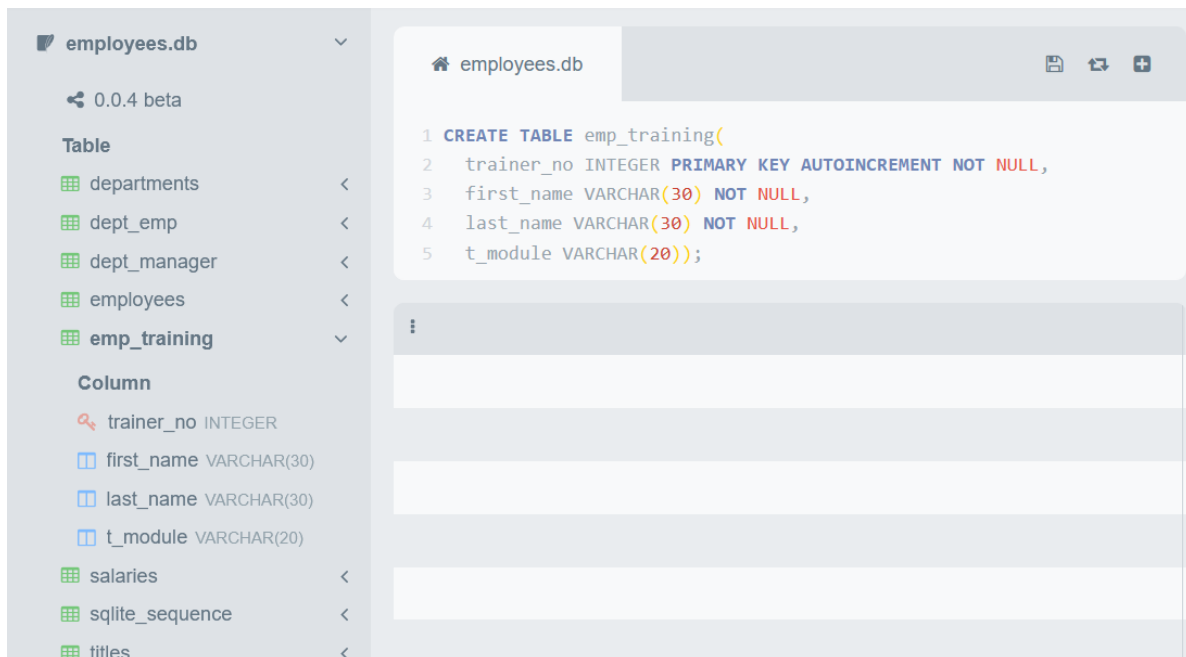
CODE: CREATE TABLE emp_training (

trainer_no INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,

first_name VARCHAR(30) NOT NULL,

last_name VARCHAR(30) NOT NULL,

t_module VARCHAR(20));



1.2.7 Insert 2 new rows into the **emp_training** table:

Row 1: fname: Joe

lname: **Bloggs**

module: **Google Docs**

Row 2: fname: Fred

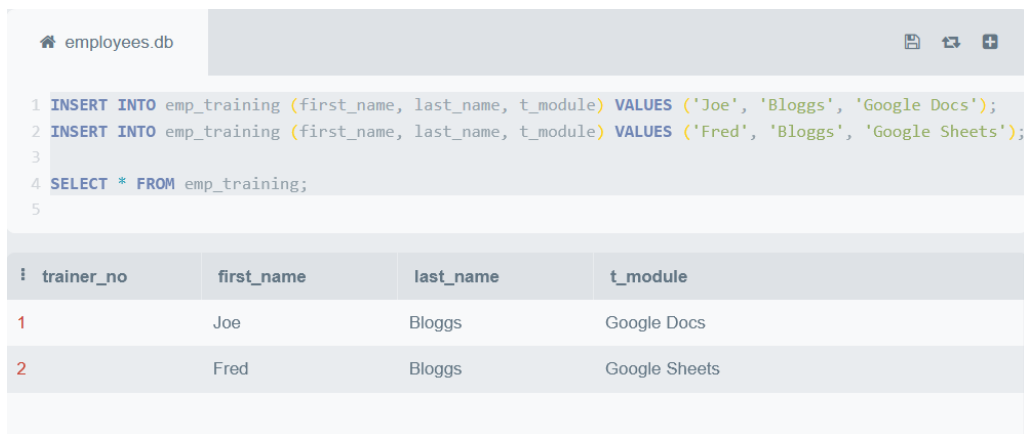
lname: **Bloggs**

module: **Google Sheets**

CODE:

```
INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Joe', 'Bloggs', 'Google Docs');
```

```
INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Fred', 'Bloggs', 'Google Sheets');
```



The screenshot shows a database interface for 'employees.db'. The SQL editor contains the following code:

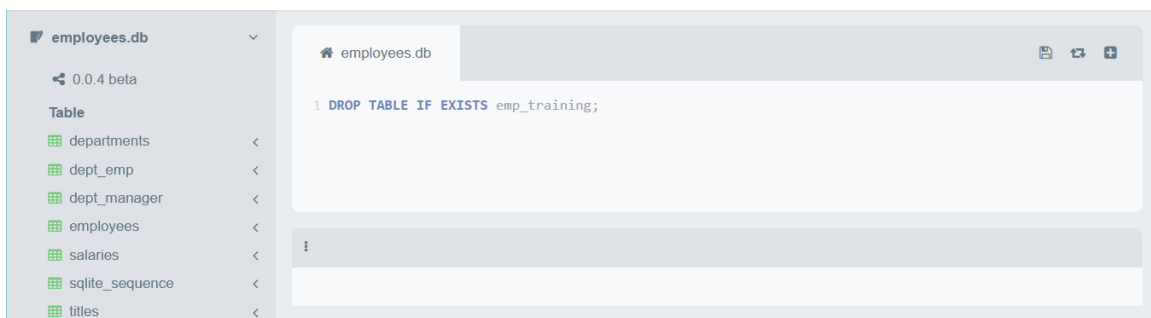
```
1 INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Joe', 'Bloggs', 'Google Docs');
2 INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Fred', 'Bloggs', 'Google Sheets');
3
4 SELECT * FROM emp_training;
5
```

Below the code, a table view displays the data inserted into the **emp_training** table:

trainer_no	first_name	last_name	t_module
1	Joe	Bloggs	Google Docs
2	Fred	Bloggs	Google Sheets

1.2.8 The organisation no longer wishes to record the employees training within the database. Therefore, delete the newly created **emp_training** table.

CODE: DROP TABLE IF EXISTS emp_training;



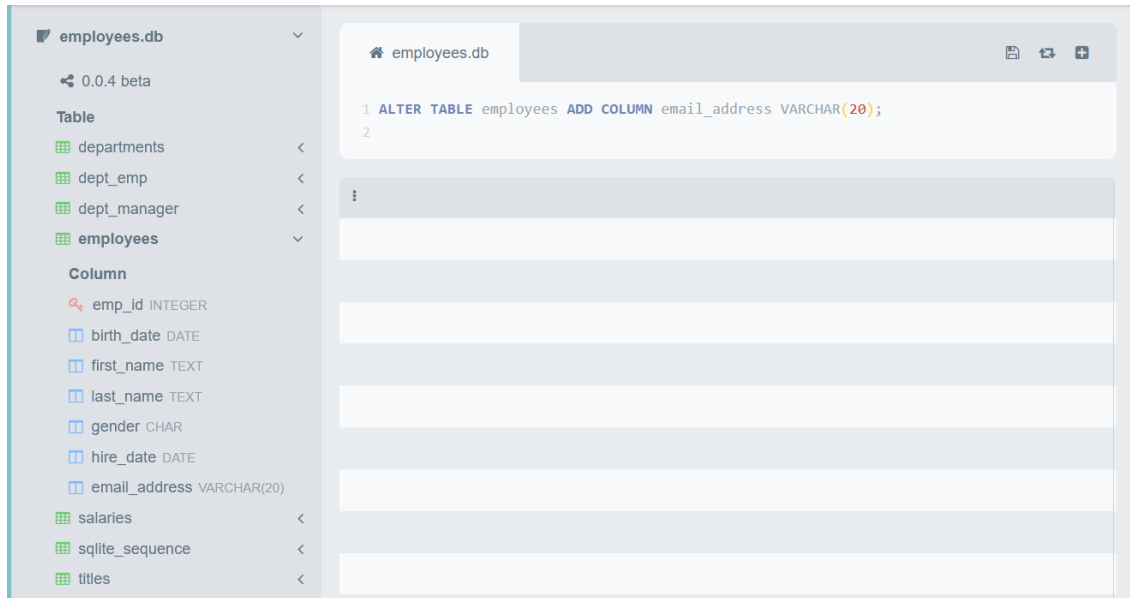
The screenshot shows a database interface for 'employees.db'. The SQL editor contains the following code:

```
1 DROP TABLE IF EXISTS emp_training;
```

On the left side, a sidebar lists the database tables: departments, dept_emp, dept_manager, employees, salaries, sqlite_sequence, and titles.

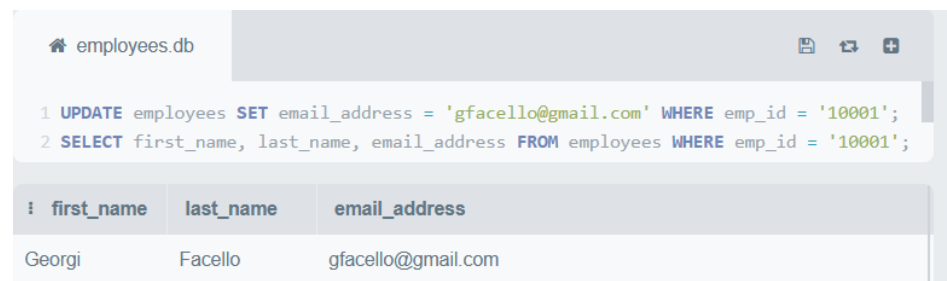
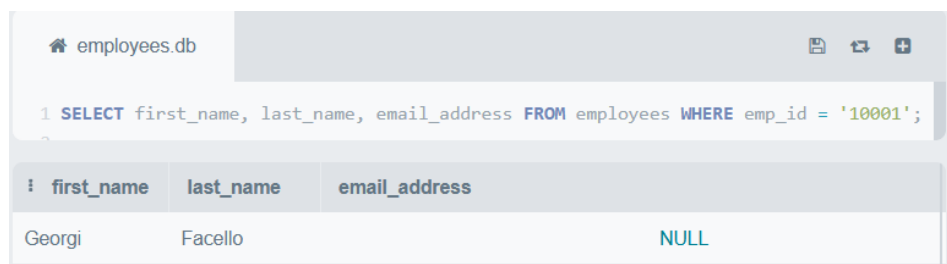
1.2.9 Alter the **employees** table to include an **email_address** field of type **varchar(20)**.

CODE: ALTER TABLE employees ADD COLUMN email_address VARCHAR(20);



1.2.10 Update the email address of **Georgi Facello** to **gfacello@gmail.com**, where **emp_no** equals to **10001**.

CODE: UPDATE employees SET email_address = 'gfacello@gmail.com' WHERE emp_id = '10001';



1.3 Database CA Part 3

1.3.1 List the number of male managers and female managers who work for each department. Make sure to display the gender, the number of employees (renamed as num_empGender) and dept_no, ordered by department number in an ascendant order.

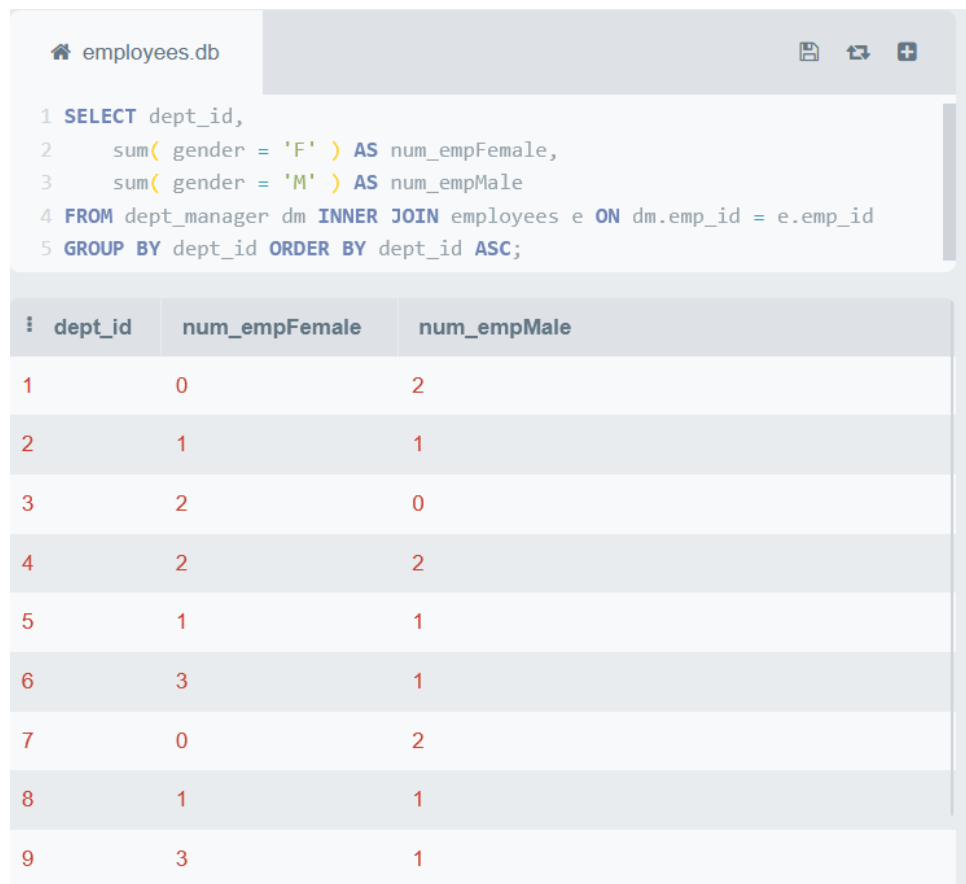
CODE:

```
SELECT dept_id,

sum( gender = 'F' ) AS num_empFemale,

sum( gender = 'M' ) AS num_empMale

FROM dept_manager dm INNER JOIN employees e ON dm.emp_id = e.emp_id
GROUP BY dept_id ORDER BY dept_id ASC;
```



The screenshot shows a database query interface with the following SQL code:

```
1 SELECT dept_id,
2     sum( gender = 'F' ) AS num_empFemale,
3     sum( gender = 'M' ) AS num_empMale
4 FROM dept_manager dm INNER JOIN employees e ON dm.emp_id = e.emp_id
5 GROUP BY dept_id ORDER BY dept_id ASC;
```

The results are displayed in a table with the following columns: dept_id, num_empFemale, and num_empMale. The data is ordered by dept_id in ascending order.

dept_id	num_empFemale	num_empMale
1	0	2
2	1	1
3	2	0
4	2	2
5	1	1
6	3	1
7	0	2
8	1	1
9	3	1

1.3.2 List the average salary of male and female employees whose title is "Technique Leader". In your result table should appear, gender, average salary named as avg_salary and title.

CODE:

```
SELECT gender, AVG(salary) AS avg_salary, title FROM titles tile INNER JOIN employees e,
salaries sal ON tile.emp_id = e.emp_id
```

```
AND tile.emp_id = sal.emp_id AND e.emp_id = sal.emp_id
```

```
WHERE title = 'Technique Leader' GROUP BY gender;
```



The screenshot shows a SQL query in a text editor with the following code:

```
1 SELECT gender, AVG(salary) AS avg_salary, title
2 FROM titles tile INNER JOIN employees e
3 INNER JOIN salaries sal ON tile.emp_id = e.emp_id
4 AND tile.emp_id = sal.emp_id AND e.emp_id = sal.emp_id
5 WHERE title = 'Technique Leader' GROUP BY gender;
```

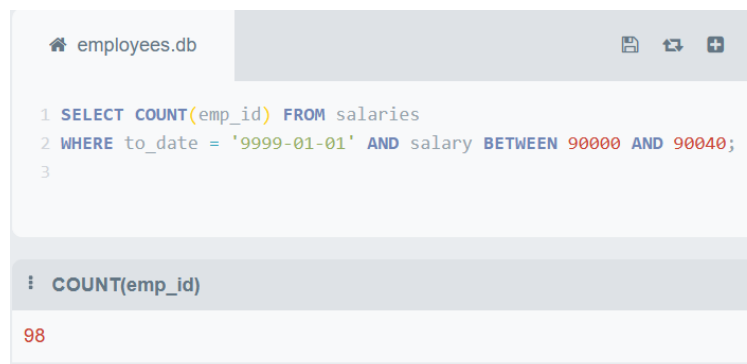
Below the query, the results are displayed in a table with three columns: gender, avg_salary, and title.

gender	avg_salary	title
F	59238.58634267654	Technique Leader
M	59332.19594183215	Technique Leader

1.3.3 The number of employees that have a current salary (i.e., to_date equals to 9999-01-01) between 90000 and 90040.

CODE: SELECT COUNT(emp_id) FROM salaries

```
WHERE to_date = '9999-01-01' AND salary BETWEEN 90000 AND 90040;
```



The screenshot shows a SQL query in a text editor with the following code:

```
1 SELECT COUNT(emp_id) FROM salaries
2 WHERE to_date = '9999-01-01' AND salary BETWEEN 90000 AND 90040;
3
```

Below the query, the results are displayed in a table with one column: COUNT(emp_id).

COUNT(emp_id)
98

1.3.4 List all unique employees' last and first names (using **GROUP BY** method) that have a current salary (i.e., **to_date** equals to **9999-01-01**) greater than **90000**, outputting both names in descending order (sort by the last name first and then the first name) and also displaying their current salaries (using the **INNER JOIN** method).

CODE:

```
SELECT DISTINCT last_name, first_name, salary
```

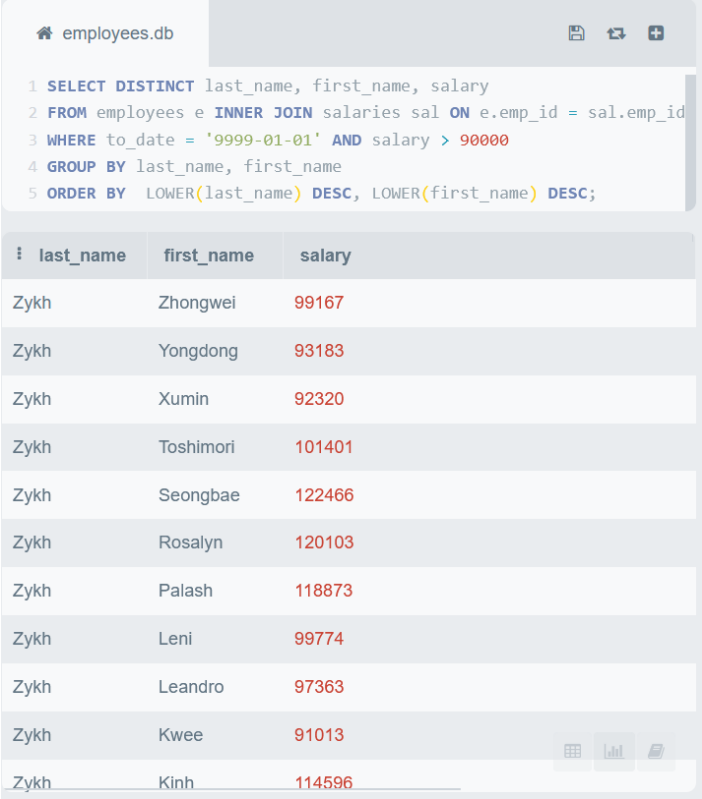
```
FROM employees e INNER JOIN salaries sal ON e.emp_id = sal.emp_id
```

```
WHERE to_date = '9999-01-01' AND salary > 90000
```

```
GROUP BY last_name, first_name
```

```
ORDER BY LOWER(last_name) DESC, LOWER(first_name) DESC;
```

/* Lower should be used since there are people with the surname called " dAstous" which basically starts with a lowercase letter*/



The screenshot shows a database query interface with the following SQL query:

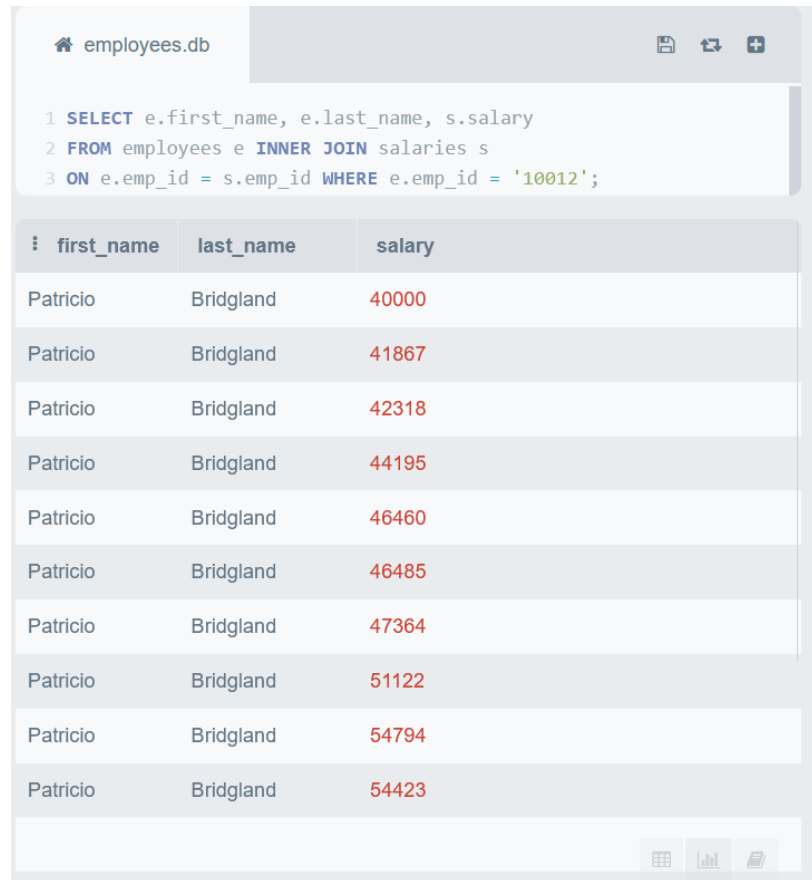
```
1 SELECT DISTINCT last_name, first_name, salary
2 FROM employees e INNER JOIN salaries sal ON e.emp_id = sal.emp_id
3 WHERE to_date = '9999-01-01' AND salary > 90000
4 GROUP BY last_name, first_name
5 ORDER BY LOWER(last_name) DESC, LOWER(first_name) DESC;
```

The results are displayed in a table with the following data:

last_name	first_name	salary
Zykh	Zhongwei	99167
Zykh	Yongdong	93183
Zykh	Xumin	92320
Zykh	Toshimori	101401
Zykh	Seongbae	122466
Zykh	Rosalyn	120103
Zykh	Palash	118873
Zykh	Leni	99774
Zykh	Leandro	97363
Zykh	Kwee	91013
Zykh	Kinh	114596

1.3.5 First name, last name, all salary dates and related amounts for the employee with employee number 10012.

CODE: SELECT e.first_name, e.last_name, s.salary FROM employees e INNER JOIN salaries s ON e.emp_id = s.emp_id WHERE e.emp_id = '10012';



```
1 SELECT e.first_name, e.last_name, s.salary
2 FROM employees e INNER JOIN salaries s
3 ON e.emp_id = s.emp_id WHERE e.emp_id = '10012';
```

first_name	last_name	salary
Patricio	Bridgland	40000
Patricio	Bridgland	41867
Patricio	Bridgland	42318
Patricio	Bridgland	44195
Patricio	Bridgland	46460
Patricio	Bridgland	46485
Patricio	Bridgland	47364
Patricio	Bridgland	51122
Patricio	Bridgland	54794
Patricio	Bridgland	54423

1.3.6 In relation to the table named salaries in Figure 1 above. Answer in text:

a) What is the **degree** of this table?

- The table named salaries has four degrees, which are emp_id, salary, from_date and to_date, at total.

b) What column(s), if any, make(s) up the **primary key**?

-emp_id and from_date are the primary keys in this table.

c) What column(s), if any, make(s) up the **foreign key**?

-emp_id is the only foreign key in this table.

1.3.7 In the given schema, the tables dept_emp, dept_manager, salaries, titles have composite keys.

Explain for each relation why this is the case? Support your answer with appropriate references.

-TABLE **dept_emp**: This table has a composite key, consists of emp_id FOREIGN KEY and dept_id FOREIGN KEY . This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and **departments** TABLE, thus one can identify an employee, retrieve the data of the department an employee works in, and the date an employee starts and ends working in that department.

-TABLE **dept_manager**: This table has a composite key, consists of emp_id FOREIGN KEY (also a PRIMARY KEY in this table) and dept_id FOREIGN KEY . This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and **departments** TABLE, and therefore one can identify an employee, who is a manager, retrieve the data of the department a manager manages, and the managing period of a department.

-TABLE **salaries**: This table has a composite key, consists of emp_id FOREIGN KEY and from_date PRIMARY KEY. This is a composite key, but also a compound key since it consists of one primary and one foreign key. This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and its own PRIMARY KEY so that one can identify an employee, retrieve the data of the salary an employee gets, and the period an employee gets a salary. However

-TABLE **titles**: This table has a composite key, which is also a compound key, which consists of emp_id FOREIGN KEY (also a PRIMARY KEY in this table), title PRIMARY KEY and from_date PRIMARY KEY. This composite key uses the combination of the PRIMARY KEY of the **employees** TABLE and its own PRIMARY KEYS so that one can identify an employee, retrieve the data of a title of an employee, and the period an employee holds the title.

SQL QUERIES SUMMARY:

- 1.1.1 SELECT * FROM departments;
- 1.1.2 SELECT emp_id, first_name, last_name FROM employees;
- 1.1.3 SELECT title FROM titles;
- 1.1.4 SELECT DISTINCT title FROM titles ORDER BY title ASC;
- 1.1.5 SELECT first_name, last_name FROM employees ORDER BY first_name ASC;
- 1.2.1 SELECT COUNT(from_date) FROM dept_emp WHERE from_date = '1991-05-01';
- 1.2.2 SELECT emp_id, COUNT(title) FROM titles GROUP BY emp_id HAVING COUNT (*) > 2 ;
- 1.2.3 SELECT * FROM employees WHERE gender = 'F';
- 1.2.4 SELECT * FROM employees WHERE hire_date < '1986-01-01' AND last_name = 'Simmel';
- 1.2.5 SELECT COUNT(last_name) AS totalWithB FROM employees WHERE last_name LIKE 'B%';
- 1.2.6 CREATE TABLE emp_training(trainer_no INTEGER

PRIMARY KEY AUTOINCREMENT NOT NULL, first_name

VARCHAR(30) NOT NULL, last_name VARCHAR(30) NOT

NULL, t_module VARCHAR(20));
- 1.2.7 INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Joe',
'Bloggs', 'Google Docs');

INSERT INTO emp_training (first_name, last_name, t_module) VALUES ('Fred',
'Bloggs', 'Google Sheets');

- 1.2.8 DROP TABLE IF EXISTS emp_training;
- 1.2.9 ALTER TABLE employees ADD COLUMN email_address VARCHAR(20);
- 1.2.10 UPDATE employees SET email_address = 'gfacello@gmail.com' WHERE emp_id = '10001';
-
- 1.3.1 SELECT dept_id, sum(gender = 'F') AS num_empFemale, sum(gender = 'M') AS num_empMale FROM dept_manager dm INNER JOIN employees e ON dm.emp_id = e.emp_id GROUP BY dept_id ORDER BY dept_id ASC;
- 1.3.2 SELECT gender, AVG(salary) AS avg_salary, title FROM titles tile INNER JOIN employees e, salaries sal ON tile.emp_id = e.emp_id AND tile.emp_id = sal.emp_id AND e.emp_id = sal.emp_id WHERE title = 'Technique Leader' GROUP BY gender;
- 1.3.3 SELECT COUNT(emp_id) FROM salaries WHERE to_date = '9999-01-01' AND salary BETWEEN 90000 AND 90040;
- 1.3.4 SELECT DISTINCT last_name, first_name, salary FROM employees e INNER JOIN salaries sal ON e.emp_id = sal.emp_id WHERE to_date = '9999-01-01' AND salary > 90000 GROUP BY last_name, first_name ORDER BY LOWER(last_name) DESC, LOWER(first_name) DESC;
- 1.3.5 SELECT e.first_name, e.last_name, s.salary FROM employees e INNER JOIN salaries s ON e.emp_id = s.emp_id WHERE e.emp_id = '10012';

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